ESSAYS ON AN INDIAN OCEAN ECONOMY

Regional Trade and Integration in the Global Periphery, 1870 – 1914

KEVIN A. TANG

Doctor of Philosophy
ECONOMIC AND SOCIAL HISTORY

Faculty of History, Brasenose College
Oxford University, UK
Michaelmas 2019

0.1 Acknowledgments

The main themes and ideas of this thesis have slowly developed and evolved over the course of my entire academic career, from my undergraduate and graduate study at Northwestern and Oxford Universities, to my professional work experiences and personal interests in and around the cities and shores of the Indian Ocean. To those professors, students, managers, colleagues, and individuals whom I have met and who have encouraged and supported me to think about and imagine alternative conceptualisations surrounding a particular geography and history of economic development in Asia, I offer my deepest gratitude. The thesis for my M.Sc. in economic and social history completed at Pembroke College, Oxford formed the initial foundation of the research and claims upon which this thesis is based, many passages from which have found their way, often with modifications, into this thesis. To those who read, commented, and encouraged me to develop those initial ideas from my master's thesis, I am very grateful.

The research that underlies this thesis has taken place over several years, and would not have been possible without the research support from the Global History of Capitalism project, based at the History Faculty, Oxford. I thank the Amersi Foundation Scholarship, as well as Professor Chris McKenna and Professor Rowena Olegario, who offered valuable guidance and support. Additionally the support of research grants from Pembroke College and Brasenose College, Oxford.

I thank participants in seminars which I presented drafts of each of the three principal analytical chapters contained in this thesis, notably the Oxford University economic and social history graduate seminars, graduate seminars and conferences at the London School of Economics and Political Science, Cambridge University, the University of Chicago, University of Groningen, Vienna School of Business and Economics, University of Southern Denmark, University of Lund, University of Turin, and the University of Manchester. Special thanks go to Professor David Chilosi for his guidance, comments, and feedback on all three chapters of this thesis from various seminars and conferences.

Stephen Broadberry who supervised this thesis, has been a formative influence on me and my work throughout this project. He has always influenced me to stay on a true path in my research, a contribution that has been invaluable to me, and has helped shape so much of my thinking and passion for economic history. I am incredibly grateful for his advice and guidance through so many drafts and revisions of this project.

Gregg Huff who advised me during my master's thesis provided invaluable support and encouragement on my master's research in pursuing my ideas into a doctoral research program. The foundational ideas from my master's research were based on work done with Professor Huff. His work on the history of trade and economic development of Southeast Asian port cities in the post–war period, particularly Singapore, has significantly influenced much of my thinking about the exceptional role of port cities in the Indian Ocean.

Kevin O'Rourke has provided valuable advice and support to me at critical points in the development of the research contained in this thesis. His feedback has aided my thinking and the development of my research immeasurably. I am extremely grateful and indebted to him for his guidance and support. His seminal work on trade and globalisation have been a great inspiration for me, the influence of which can be found throughout this thesis.

Additional research support, comments, and advice have been provided by Robin Adams, Marco Molteni, Giacomo Gabutti, Nicolo Cavalli, Andrew Martinez, Benjamin Schneider, Kristoffer Hammarback, Krystyna Wojnarowicz, and my brother Colin Tang.

Finally I would like to thank my parents for their unwavering support and encouragement throughout this project.

Several ideas contained in this thesis have also come from my experience collaborating on research projects with the Program for Economic Modelling and the Program for Economic Sustainability, both at the Institute for New Economic Thinking, as well as research conducted with UK Research and Innovation. To the research collaborators and colleagues that I worked with on those projects, as it has assisted me in thinking about this thesis, I am deeply grateful for all that I have learned.

0.2 Essays on an Indian Ocean economy: Long abstract

This thesis analyses the role of the Indian Ocean in contributing to a distinctly integrated regional maritime market, and assesses some of the implications this has for trade and industrialisation in the region during the period of high imperialism from 1870 to 1914. Through the collection of trade data and commodity price statistics from British, French, and Dutch colonial archives, this thesis firstly looks at the relative factors driving market integration in the Indian Ocean in the era of high imperialism between 1870 and 1914. Second, this thesis looks at trade costs within the Indian Ocean compared to trade from the Indian Ocean to other maritime regions either within the global periphery, or from the Indian Ocean to the global core of Europe. Third, considering previous analysis on regional market integration and trade costs in the Indian Ocean, this thesis looks at some of the implications that an integrated Indian Ocean market had for trade growth and exports of large-scale industrial manufactures from some of the primary entrepot cities of the region.

The thesis is organised into five chapters, chapter 1 is the introduction, which lays out the organisation of the contents of this thesis, summarises the main conclusions and contributions from each analytical chapter, and discusses some of the literature and scholarship that the research engages with and contributes to. Chapter 2 analyses market integration in the Indian Ocean in the era of high imperialism. Chapter 3 looks at comparative trade costs within the Indian Ocean compared to trade from the Indian Ocean to the Eastern Mediterranean, as part of trade within the global periphery, and trade from the Indian Ocean to Europe, from the global periphery to the global core. Chapter 3 looks at the intensive and extensive margins of trade for the two primary Indian port cities of Bombay and Calcutta. Chapter 5 concludes the main findings of the thesis as it more broadly relates to the bodies of literature and scholarship that it engages with.

Chapter 1 outlines the three analytical chapters, and presents a review of the main literature, which is the history of the Indian Ocean, the role of colonial port cities in economic growth and development in Asia, and the economic geography of the global core and periphery. First, the main premise of this thesis is inspired by historical frameworks of maritime world history, which study historical events and processes through social, cultural, and economic unities across maritime regions that have traditionally been treated as barriers, rather than as unifying factors across discrete subcontinental geographic space. Second, port and hub cities of Asia, historically and presently, form a wide body of literature for how they drive economic growth and integration for the countries

that they are a part of. Finally, much of the analysis of trade in this thesis is based on structural relations between the global core and periphery during the period, with all areas of the Indian Ocean being a part of the global periphery, and Europe forming the global economic core.

Compiling an original dataset of rice prices for 85 cities across the Middle East, South, and Southeast Asia between 1870 and 1914, chapter 2 analyses the relative role of factors driving market integration in the Indian Ocean. This is assessed by measuring market integration according to equilibrium price adjustment speed and relative price volatility between bilateral pairs of cities defined by different geographic, transportation, and urbanisation relationships. Both measures of market integration between bilateral pairs of cities assess a different aspect of the trading relationship, with confirmation of findings observed according to consistency between the measures on the relative impact of each variable in driving market integration. First, results show that the Indian Ocean witnessed a rapid process of market integration in the period, and that growing integration of Indian port cities with other port cities across the ocean at great distances were the primary drivers of this process, compared to integration between cities of the colonial interior, or port cities with interior cities in closer proximity. Second, comparing the relative contributions of forms of transportation technology in driving market integration in the region is assessed between railroads and steamships. Chapter 2 finds that steamships connecting port cities of the Indian Ocean played a greater role in driving market integration compared to railroads connecting cities of the colonial interior of the Indian subcontinent. Third, despite the extensive literature dedicated to studying the unique social, cultural, and economic role of the major colonial entrepot cities, they were not exceptional drivers of regional integration as gateways linking the colonial hinterland with the global economy, but were instead a part of a larger process of integration that was primarily driven by simply having access to the Indian Ocean.

Considering the findings from chapter 2 demonstrating that the Indian Ocean was a driving factor for regional market integration, chapter 3 looks at whether or not the Indian Ocean was a distinctly integrated maritime region, rather than it simply being a part of a larger process of globalisation occurring during the period. The time period 1870 to 1914 offers a unique opportunity to relatively evaluate this by looking at trade through the Suez Canal, which for the first time offered a sea-route connecting the two most widely studied historical maritime worlds: the Mediterranean and the Indian Ocean. To assess whether or not the Indian Ocean was a distinctly integrated maritime region, trade costs are comparatively assessed through a unique dataset of goods directly matched between origin price at a port in the Indian Ocean, and the price of the same good imported at a port of the Eastern Mediterranean, as part of the global periphery, or Europe, as part of

the global core. Findings demonstrate that trade costs were low for short-distance routes between ports of the Indian Ocean, as well as for long–distance routes from the Indian Ocean to Europe through the Suez Canal. However trade costs were most expensive for trade within the global periphery, and between the two maritime regions of the Indian Ocean and the Eastern Mediterranean, despite the opening of the new sea-route that connected the two. Thus chapter 3 shows that the Indian Ocean was a distinctly integrated maritime region within the global periphery. However in relation to the global core of Europe, the Indian Ocean was highly integrated as part of a larger process of globalisation taking place during the period. Additionally results show that the Middle East, as a sub-continental region bordering two separate maritime worlds, was not economically integrated as a regional landmass, but instead was integrated in two separate directions according to maritime frameworks of regional unity: westward across the Mediterranean, and eastward across the Indian Ocean.

Based on the results of chapter 2, demonstrating that the Indian Ocean was a factor driving regional market integration of the colonial port cities, and the results from chapter 3, that the Indian Ocean was a distinctly integrated region of the global periphery, chapter 4 looks at some of the implications of these forms of integration in contributing to industrialisation in two of the primary port cities of the region. Through the collection of two highly disaggregated datasets on exported goods produced and manufactured at each of the port cities of Bombay and Calcutta between 1875 and 1910, chapter 4 evaluates the intensive and extensive margins of trade according to regional destination. By disaggregating export products from each city according to level of product differentiation and according to destination, chapter 4 finds that the two cities operated in both capacities as traditional colonial entrepots specialising in the export of raw materials and staple commodities to Europe, but also as industrial exporters of more highly differentiated manufactured goods to destinations around the Indian Ocean. As the cities have long been economically characterised in the era of high imperialism as peripheral port cities primarily specialising in the export of staple commodities, the two cities were indeed characterised by this type of trade relationship in relation to Europe. However at a secondary, but still sizeable level, the two cities functioned as core economies within the global periphery, exporting more highly differentiated and more highly valued industrial manufactures across the Indian Ocean. Despite the similarities between the two cities, comparing the margins of trade between Bombay and Calcutta also highlights important contrasts in the origins of each city's trade networks and foundations in large–scale manufacturing. Although both cities exhibited geographic spheres of trade in types of products according to regional destination, such regional biases were more evident in the case of Bombay, and less pronounced for Calcutta,

most likely due to the distinct political and economic functions and foundations of each city.

Finally, chapter 5 concludes by discussing the contributions of the three analytical chapters of this thesis to the history of the Indian Ocean in the long-run. First, across the three chapters analysing long-distance trade in the Indian Ocean, this thesis presents the construction of a quantitative 'model' of an Indian Ocean economy. Such a quantitative model has often been theorised and discussed by maritime world historians without ever being formally structured. Second, although such a model is based on trade in the era of high imperialism, across the three analytical chapters this thesis confirms recent work by Indian Ocean historians which finds continuity in the framework of maritime world history for the modern period, despite the imposition of European imperialism. The analysis done in this thesis demonstrates that Indian Ocean unity persisted economically according to long-distance trade in the era of high imperialism, and that this had significant implications for economic growth and industrialisation of the region's primary port cities.

Contents

0.1 Acknowledgments i

0.2 Essays on an Indian Ocean economy: Long abstract iii

0.3 Thesis abstract ix

1 Introduction **1**

1.1 Maritime world history and an Indian Ocean economy 1

1.2 The Indian Ocean 6

1.3 Colonial port cities 8

1.4 Global core and periphery 11

1.5 Agenda 16

2 Market Integration in the Colonial Indian Ocean **23**

2.1 Introduction 23

2.2 Methods of market integration 28

2.3 Grain price and grain trade in the Indian Ocean, 1870 – 1914 34

2.4 Empirical data 36

2.5 Price variation across geographic dimensions 41

2.6 Half life convergence time analysis 44

2.7 Volatility analysis 54

2.8 Time trends 60

2.9 Conclusion 70

2.10 Appendix 72

2.11 Bibliography 81

3 The Middle East in the Global Periphery of Maritime Worlds **88**

3.1 Introduction 88

3.2 Transportation infrastructure and trade routes in the Middle East 92

3.3 Commodity trades through the Suez Canal 99

3.4 Price correlations of Middle Eastern trade, 1870 – 1914 . . . 103
3.5 Middle Eastern trade price ratios . . . 107
3.6 Regional trade routes and trade costs . . . 114
3.7 Price gap trends . . . 121
3.8 Regional trade flows . . . 125
3.9 The Persian tobacco trade . . . 129
3.10 Middle Eastern shipping . . . 136
3.11 Conclusion . . . 142
3.12 Appendix . . . 146
3.13 Bibliography . . . 154

4 Trade and Industrialisation in the Period of Dual Dominance 162
4.1 Introduction . . . 162
4.2 Characteristics of 'Dual Dominance' . . . 167
4.3 Cotton and jute textile industries . . . 170
4.4 Market size . . . 175
4.5 Data . . . 178
4.6 Decomposition 1: Diversification of exports . . . 185
4.7 Decomposition 2: Classification by level of differentiation . . . 192
4.8 Trade according to product differentiation . . . 197
4.9 Intensive margin of trade . . . 202
4.10 Extensive margin of trade . . . 205
4.11 Robustness checks . . . 208
4.12 Conclusion . . . 211
4.13 Appendix . . . 214
4.14 Bibliography . . . 220

5 Conclusion 225
5.1 Indian Ocean history in the long–run . . . 225
5.2 A model of maritime worlds . . . 232

0.3 Thesis abstract

This thesis analyses the role of the Indian Ocean in contributing to a distinctly integrated maritime region, and assesses some of the implications this has for regional trade and industrialisation in the era of high imperialism between 1870 to 1914. The thesis also presents a collection of original trade data and commodity price statistics from British, French, and Dutch colonial archives, which form the basis of analysis.

First, this thesis looks at the relative factors driving market integration in the Indian Ocean. Results show that market integration was primarily driven by port city integration with other port cities across the Indian Ocean, rather than with or between cities of the colonial hinterland. It also finds that steamships connecting port cities overseas contributed more to regional integration compared to railroads connecting cities of the colonial interior over land, and that the size or political function of a port city was not as much of a factor driving regional integration as simply whether or not a city was accessible to the Indian Ocean.

Second, this thesis looks at trade costs within the Indian Ocean compared to trade from the Indian Ocean to other maritime regions either within the global periphery, or from the Indian Ocean to the global core of Europe. Findings show that trade costs were low for short–distance routes within the Indian Ocean, as well as long–distance routes from the Indian Ocean to Europe. However trade costs were the highest for trade from the Indian Ocean to other regions of the global periphery such as the Eastern Mediterranean, thus establishing that the Indian Ocean was a distinctly integrated maritime region within the global periphery. However in relation to the global core of Europe, the Indian Ocean was also highly integrated as part of a larger process of globalisation taking place during the period.

Third, considering previous analysis on regional market integration and trade costs within and between the Indian Ocean and other regions, this thesis looks at some of the implications that an integrated Indian Ocean market had on trade growth and the export of large-scale industrial manufactures from the primary entrepot cities of Bombay and Calcutta. Comparative analysis of the intensive and extensive margins of trade for both cities demonstrates that trade ties across the Indian Ocean served as a major destination for more highly differentiated, higher value manufactured goods from both cities. Additionally, even though the vast majority of exports from both cities went to Europe, this was primarily in staple commodities rather than in manufactured goods. Thus an

integrated Indian Ocean market provided an important destination for emerging manufacturing industries at the region's primary entrepot cities.

List of Figures

2.1 Retail prices and trade unit prices for select cities for years in which both are listed 38

2.2 Import/export price gap ratios of grains between select cities across the Atlantic and Indian Oceans, 1870 – 1914 39

2.3 Location of Markets with 1870 – 1914 Price Series 40

2.4 Coefficient of variation for Indian ports, Indian interior, and other ports 41

2.5 β adjustment speeds between bilateral pairs taken from equation 2.3 against distance in kilometres 45

2.6 Half–life length of convergence time between bilateral pairs from equation 2.4 against distance in kilometres 46

2.7 Relative price volatility between bilateral pairs against distance in kilometres . . 55

2.8 Half life convergence time trends of Z_{ijt} variables. 62

2.9 Volatility time trends of Z_{ijt} variables. 63

2.10 Percentage of total 7,225 city pairs in each period connected along the same railroad network 68

2.11 Percentage of total 7,225 city pairs in each period operating on the gold standard 69

3.1 Map of origin and destination trade locations around the Eastern Mediterranean and the Persian Gulf [1] 101

3.2 Import/Export price ratio for rice from Rangoon to various destinations 109

3.3 Import/Export price ratio for tea from Bombay to various destinations 110

3.4 Import/Export price ratio for pepper from Batavia to various destinations 111

3.5 Import/Export price ratio for indigo from Calcutta to various destinations 112

3.6 Import/Export price ratio for Persian tobacco from Bushire to various destinations 113

3.7 Map of ij cities according to regional trade routes IO, PG, EM, EU 116

3.8 Regional trade route trends in 15–year sub–periods for 4 commodities traded across all 4 regions. 123

3.9 Trade flows from ports of the Indian Ocean to regional destinations of Europe, the Eastern Mediterranean, and the Persian Gulf. 127
3.10 Value of exports of Persian tobacco from Bushire to various destinations 131
3.11 Trade route trends for Persian tobacco in 15–year sub–periods from equation 3.1 . 135
3.12 Correlation matrix for bilateral pairs of cities across the Middle East 147
3.13 Correlation matrix for bilateral pairs of cities across the Arabian Sea and Indian Ocean 148
3.14 Rolling correlations of first difference in commodity prices in the Middle East . . 150
3.15 Value of Indian exports traded via the Suez Canal against any other route 151
3.16 Number of vessels of any type passing through the Suez Canal 151
3.17 Suez Canal duties charged per ton of cargo 153

4.2 Variety of 3 and 4–digit SITC goods exported, 1875 – 1910.[2] 179
4.3 Number of Export Destinations, 1875 – 1910.[3] 181
4.4 Combined number of SITC products export by continental destinations, 1875 – 1910.[4] 183
4.5 Bombay Export Shares by Sector, 1875 – 1910 186
4.6 Calcutta Export Shares by Sector, 1875 – 1910 187
4.7 Bombay Export Shares by Destination, 1875 – 1910 188
4.8 Calcutta Export Shares by Destination, 1875 – 1910 189
4.9 Share of exports by category for top two regional destinations, 1875 – 1910 . . . 190
4.10 Share of export value in 4 categories of product differentiation, 1875 – 1910 . . . 196
4.11 Share of export value by 4 categories of product differentiation to top two regional destinations, 1875 – 1910 197
4.12 Regional destinations 215

List of Tables

2.1 Detailed Summary of underlying price data and observations for each 10–year time period 42

2.2 Equation 2.6 OLS Half Life Equilibrium Convergence Time Results 51

2.3 Equation 2.5 OLS Relative Price Volatility Results 58

2.4 Comparison of convergence time estimates under multiple methods 74

2.5 Comparison of volatility estimates under multiple methods 76

2.6 Time and city panel effects, with and without controls for auto–correlation on measures of half life convergence time 78

2.7 Time and city panel effects, with and without controls for auto–correlation on measures of relative price volatility 80

3.1 Length of railway lines for countries and territories of the Middle East (in kilometres) 97

3.2 Correlation coefficients of rice prices for cities of the Middle East 105

3.3 Correlation coefficients of rice prices for cities of the Arabian Sea and Indian Ocean 106

3.4 Marginal trade costs for 9 regional trade routes 118

4.1 Composition of exports: Percentage share of combined Bombay and Calcutta exports in total export value by categories, 1875 – 1910 170

4.2 Cotton Textile Industry in Bombay 171

4.3 Jute Textile Industry in Calcutta 172

4.4 Location of Large–Scale Industry, 1911 174

4.5 Total exports of textile manufactures compared to total Indian production and consumption in m. yds. 177

4.6 Quantity of exports of cotton textiles from Bombay and jute textiles from Calcutta by destination region 178

4.7 Total Indian exports by destination: Percentage share of exports by geographic region, 1875 – 1910 184

4.8 Number of SITC products according to 10 category 1–digit SITC classification, and 7 category archival trade classification, 1875 – 1910 185
4.9 Classification of goods according to differentiation and number of SITC items in each category for Bombay and Calcutta 193
4.10 Determinants of total value of trade for Bombay and Calcutta exports by "level of differentiation", 1875 – 1910 200
4.11 Determinants of intensive margin (Total value/number of goods) for Bombay and Calcutta exports by "level of differentiation", 1875 – 1910 203
4.12 Determinants of extensive margin (Number of goods) for Bombay and Calcutta exports by "level of differentiation", 1875 – 1910 207
4.13 Firm–Level Estimations of Distance and Population for 20 Industries, 1875 – 1910[5] 209
4.14 List of goods exported and degree of differentiation, 1875 – 1910 216

Chapter 1

Introduction

1.1 Maritime world history and an Indian Ocean economy

Several historians have claimed that the first "global economy" emerged in Asia.[1] This economy has been identified by its systems of long–distance trade, economic specialisation, and growth that traces its roots back for millennia.[2] Although defined as an Asian "global economy", historians have predominantly focused on long–distance trade routes across the Indian Ocean. Forms of cultural, social, and economic unity stretching from the coast of East Africa, across Mesopotamia, India, China, and Indonesia were interconnected in a way that formed a "global" maritime economy.[3]

It is the history of long–distance trade in the Indian Ocean that made it, "the oldest of the seas in history", predating commerce across all other comparably sized oceans.[4] The first sea passage in human history was over its waters, regular connections between early civilisations date back over 5,000 years. By comparison, similar long–distance trade routes across the Atlantic are only 1,000 years old, when accounting for the Viking voyages, however an economy across the entire geography of the Atlantic is just over 500 years old. The Pacific has seen long–distance voyages and trade for at most 2,000 years, though nowhere near the density of routes and networks as that

1. Andre Gunder Frank, *ReOrient: Global Economy in the Asian Age* (Berkeley, CA: University of California Press, 1998), pp. 84 - 116.

2. K. N. Chaudhuri, *Trade and civilisation in the Indian Ocean: An economic history from the rise of Islam to 1750* (Cambridge: Cambridge University Press, 1985), pp. 1 - 6.

3. K. N. Chaudhuri, *Asia Before Europe: Economy and civilisation of the Indian Ocean from the rise of Islam to 1750* (Cambridge: Cambridge University Press, 1990), pp. 19 - 41.

4. Ravi Arvind Palat, *The Making of an Indian Ocean World-Economy, 1250 - 1650: Princes, Paddy Fields, and Bazaars* (Basingstoke, Hampshire: Palgrave Macmillan, 2015), pp. 1 - 31.

across the Indian Ocean.[5] As the "oldest of the seas in history", historians of the Indian Ocean have often studied it in the context of the *longue durée*, emphasising the long–run continuity of such forms of unity across the region. However for Indian Ocean historians, external control of the region under European imperialism in the modern period from approximately 1800 represents a key turning point in Indian Ocean history; it is either a crucial and irreparable end to the history of the Indian Ocean world, or it is simply an aberration and transitory moment in a much longer history of a regional economy that spans six millennia.[6]

Claims of persistence and continuity in Indian Ocean history throughout the period of European colonialism have become a growing field of research for maritime world historians.[7] Despite external political and economic forces bearing down and breaking up the Indian Ocean world from 1800, the distinctive influence of the ocean on the coastal communities arguably remained. Means of travel, movements of people, economic exchange, climactic and historical forces created elements of cohesion that persisted throughout colonialism.[8] European hegemony in the modern world system was very late in developing, and was quite incomplete, and never unipolar.[9] Throughout the early modern period and well into the nineteenth century, the world economy remained predominantly Asian.

Considering the importance of the Indian Ocean in the history of the global economy, and its persistent unity throughout the period of colonialism, the framework of the Indian Ocean world is not just one that can be applied to understanding the region's social, cultural, and historical unity, but it is also an economic framework in which the regional economy was integrated and from which post–colonial economies grew and developed. This thesis presents three studies analysing the economic implications of the conceptualisation of theories of maritime world history in the Indian Ocean in the era of high imperialism, not simply as a unit of historical analysis, but as a unit of economic study. In doing so, this thesis contributes a quantitative analysis of how frameworks of Indian Ocean history transcends an early modern periodisation, and it addresses the economic implications of such long–run, long–distance trade networks that made the Indian Ocean "the oldest of the seas in history". In order to study the economic dimension to Indian Ocean unity, it relies on three theories and frameworks to structure analysis.

5. Michael Pearson, *The Indian Ocean* (London: Routledge, 2003), pp. 3 - 4.

6. Chaudhuri, *Trade and civilisation in the Indian Ocean: An economic history from the rise of Islam to 1750*, pp. 9 - 33.

7. Sunil S. Amrith, *Crossing the Bay of Bengal: The furies of nature and the fortunes of migrants* (Cambridge: Harvard University Press, 2013); Sugata Bose, *A Hundred Horizons: The Indian Ocean in the Age of Global Empire* (Cambridge: Harvard University Press, 2006); Thomas R. Metcalf, *Imperial Connections: India in the Indian Ocean Arena, 1860 - 1920* (London: University of California Press, 2007).

8. Bose, *A Hundred Horizons: The Indian Ocean in the Age of Global Empire*, pp. 1 -35.

9. Frank, *ReOrient: Global Economy in the Asian Age*, pp. 166.

The first is the history of the Indian Ocean. The history of the Indian Ocean has been primarily evaluated and understood according to transoceanic network identification through long–distance trade between coastal communities. Historical analysis of the Indian Ocean focuses on the identification of various forms of unity consistently observed across the ocean's rim. The most common form of analysis is through ports, ships, and long–distance trade, "in spite of this great variety of landscapes the lands bordering the Arabian Seas still had a lot in common. It is well justified to speak about a single maritime world. There was the garland of harbours along the coasts: echelles where maritime trade met land–routes. There were the common kinds of ships used. There was the current of new products cultivated – moving generally west to east, like tobacco, coffee, tea, and maize in our period. There were the coins used, like the ubiquitous larin in the sixteenth century and the Maria Theresia Taler in the eighteenth."[10] Hence trade routes and networks between a series of port cities across the ocean has been the basic method of analysing the history of maritime worlds. The identification of trades across distant space functions as, "one of the most powerful features of social systems...the daily necessities of life – clothing, pottery, tools, prophylactics, and articles of food – assumed through the application of special skills and artistic imagination the status of valued, luxury objects. The process of exchanging such items incorporated many different forms, social customs, ritual usage, economic considerations, and above all, the problem of distance...long–distance trade as an international movement of goods and people provided a measure, even in our period, of the role of money and prices and of the state of the arts."[11] As the study of long–distance trade in the Indian Ocean has been so fundamental to the history of the region, analysis of transoceanic trades, routes, and networks are the base unit of analysis for evaluating the economy of the Indian Ocean in this thesis. Through the collection of detailed statistics on trade, shipping, and commodity prices, this thesis contributes the quantitative dimension to historical studies that have so far focused only on the identification of such routes.

Second, this thesis relies on and contributes to the history of port cities. Historians have claimed that the unity of the Indian Ocean was distinct because the coastal communities were exceptionally more connected to other communities overseas than they were to those further inland, but in closer proximity. Hence the coastal communities are exceptional to the rest of the inland region that they are traditionally viewed as being a part of. This is primarily evaluated according to the unique interactions and the exceptional role of the port cities. Thinking about cities and markets as part of a topography of interconnected regions contests several dominant cartographies.

10. Pearson, *The Indian Ocean*, pp. 7.

11. Chaudhuri, *Trade and civilisation in the Indian Ocean: An economic history from the rise of Islam to 1750*, pp. 4 - 5.

Absent colonial, imperial, and nation–state topography, the Indian Ocean becomes illuminated by an alternate geography mapped according to the networks and connections between port cities in relation to other cities across the region, as Andre Gunder Frank describes, "we may visualise a sort of necklace of port–city emporia strung around Asia."[12]

Part of why historians have deemed the Indian Ocean as the first "global economy" is based on the history of Indian Ocean port cities. Scholars across disciplines have focused attention on the port cities of Asia, as they formed an exceptional confluence of a plurality of groups occupying shared and distinct spaces. From these microcosms of interactions of diverse peoples across distant lands, the Asian port cities became the first "global cities".[13] As the first global cities, they subsequently formed a network that contributed to the notion of the larger region as the first "global economy". From the early modern period through the colonial period, the port cities formed a major subject of historical analysis that is part of the analysis of this thesis, but has also emerged as a distinctive field of study in its own right.

From a global perspective, urban history is concerned with identifying commonalities between urban spaces across vast distances, as such commonalities are the cause or result of large–scale global historical phenomena.[14] Hence, the focus of global urban history is that of the concept of networks, looking at urban connections across oceans, between colony and metropole, or along trade routes and supply chains. Additionally, scholars see cities in relation to everything else that is not urban, thus based on the relationship between the city and the hinterland. Other comparative studies in urban history are based on the relationship between the sizes of cities, such as a single 'hub' city with linkages to minor cities that spread across a region as a series of 'spokes'. All of these types of dynamics and relationships have made the study of the colonial Asian port city during the era of high imperialism a particular focus in urban history, as the cities that emerged during the period have remained predominant to the present day, and as they capture all of the

12. Frank, *ReOrient: Global Economy in the Asian Age*, pp. 84 - 85.

13. "The most important of these port–cities were, going clockwise, Aden and later Mocha, Hormuz, several in the Gulf of Cambay (at different times Diu, Cambay, and Surat), Goa, Calicut, Colombo, Madras, Masulipatam, Malacca, and Aceh. All no doubt rose and fell in importance during our period, but certain common characteristics can be mentioned. In all of them the population was exceedingly diverse, including usually representatives of all the major seafaring communities of the Indian Ocean, and sometimes from outside: Chinese in Malacca, Europeans in most of them ... all of these port cities also acted as transhipment centres. Some with unproductive interiors, such as Hormuz and Malacca, had this as their almost exclusive role, but even exporting ports funnelled on goods from elsewhere. Politically all these port cities had a large, or at least a necessary, degree of autonomy. Some were completely independent." (Michael N. Pearson and Ashin Das Gupta, *India and the Indian Ocean, 1500 - 1800* [Oxford: Oxford University Press, 1987], pp. 13)

14. Celine Rozenblat, "International and Transnational Perspectives on Urban Systems," chap. Urban systems between national and global: Recent reconfigurations through transnational networks, 1st ed., ed. Celine Rozenblat, Denise Pumain, and Elkin Velasquez, vol. 1, Advances in Geographical and Environmental Sciences, Chapter 2 (Singapore: Springer, 2018), 19–49.

dynamics that are the focus of global urban history.[15] Thus the colonial Asian port cities, through their network of linkages via long–distance trade routes, function as a key unit of analysis for this thesis. The quantification of the interconnections of this network, how they shaped a regionally integrated economy, and drove growth, are analysed in this thesis as it contributes to the literature on the history of the colonial Asian port cities.

Third, this thesis is analysed in terms of frameworks of core and periphery structural relations. Traditionally the Indian Ocean region in the modern period is characterised entirely as the global periphery. However recent scholarship in Indian Ocean history and the colonial Asian port cities are often focused on recasting historical topographies as they contributed to forming a distinct maritime world.[16] The reconceptualisation of the region imagines it not as a peripheral actor that was subject to external forces from Europe. Instead, by viewing the Indian Ocean in its historical unity, other dynamics and relations across the region emerge, thus no longer simply being a part of the global periphery in relation to the global core. Maritime world historians reimagine the Indian Ocean as one with its own distinct economic structures, and set of core and periphery relations within it. Politically, British India was not simply another colony of the empire, but it was a core from which British colonialism across the region emanated, "the geographical and economic centre of this Indian Ocean world was the Indian subcontinent itself."[17] Additionally, as suggested by urban historians, there are core 'hub' cities from which a network of secondary cities are connected through.[18] Economically, as a region's trade and integration grows, specialisation leads to core and periphery sub–regions.[19] Treating the Indian Ocean in its historical unity, observed through a system of linkages and networks of port cities, suggests that there are several other dynamics to core and periphery relations and economic developments within the Indian Ocean, rather than it being broadly cast as a part of the global periphery in the era of high imperialism. This thesis analyses trade routes, trade costs, and integration according to relations between core and periphery, identifying differences in cost and routes depending on whether or not trade was within the global periphery, or from the periphery to the core, thus demonstrating an alternative framework to and implications of core and periphery dynamics in understanding the historical Indian Ocean economy.

15. Carl Nightingale, "The Global Urban History Project," *Planning Perspectives* 33, no. 1 (2018): 135–138.
16. Amrith, *Crossing the Bay of Bengal: The furies of nature and the fortunes of migrants*, pp. 32 - 62.
17. Frank, *ReOrient: Global Economy in the Asian Age*, pp. 85.
18. Celine Rozenblat and Denise Pumain, "International and Transnational Perspectives on Urban Systems," chap. A New World Typology of Cities and Systems of Cities, 1st ed., ed. Celine Rozenblat, Denise Pumain, and Elkin Velasquez, vol. 1, Advances in Geographical and Environmental Sciences, Chapter 3 (Singapore: Springer, 2018), 51–65.
19. Pinelopi Koujianou Goldberg and Nina Pavcnik, "Distributional effects of globalisation in developing countries," *Journal of Economic Literature* 45, no. 1 (March 2007): 39–82; Brian McCaig, "Exporting out of poverty: Provincial poverty in Vietnam and US market access," *Journal of International Economics* 85, no. 1 (2011): 102–113.

This thesis approaches three economic features to the historical conceptualisation of the Indian Ocean world based on long–distance trade between major port cities in the first period of globalisation from 1870 to 1914. To this extent, this thesis relies on, engages with, and contributes to these three themes, topics, and literatures that have been studied and developed as fields of academic disciplines in their own right, which are addressed to varying degrees in the following chapters, forming the basis of this thesis, and to which the research contained in this thesis contributes. The three themes are the historical concept of Indian Ocean unity, the economic history of the colonial Asian port cities, and the economic geography of core and periphery relations. The chapters contained in this thesis more directly address particular issues and questions related to the Indian Ocean economy, but these three themes are used as frameworks and theories for structuring an understanding and forming the basis of analysis to which this thesis also makes a contribution.

1.2 The Indian Ocean

The study of the configuration of ideas, institutions, and trade across units of space from the rise of Islam to the eighteenth century is a growing field amongst several scholars of the Indian Ocean. While the field has rapidly grown in popularity, it remains a topic that has been confined to historical scholarship based on the identification of forms of social, cultural, and economic unity. Trade features prominently as a form of identification, but the extent to which overseas trade actually mattered in forming a littoral society distinct from a continental one, or in defining the relationship of overseas or continental connections has not been systematically approached, either across the entirety of the ocean, or within smaller sea regions.

"Is it possible then to discover the unity and diversity of Indian Ocean civilisations through the study of long–distance trade, which of necessity takes place across geographical and cultural watersheds and which has a compelling temporal dimension?" This is the main question posed by Chaudhuri in his seminal book *Trade and Civilisation in the Indian Ocean* (1985), and to which the themes of this thesis broadly addresses. While trade features prominently in studies of overseas regional unity, the economic dimension to Indian Ocean studies have been largely overlooked as such trades have never been approached under an empirical economic analysis. Historians analysing trade networks merely seek to identify them as evidence of a unified region. When such networks are uniquely formed overseas, and not overland, then this is seen as evidence of a distinct littoral society across the seas, a method of analysis that has been applied by Braudel with the Mediterranean, and by Chaudhuri and other scholars of the Indian Ocean.[20] However this thesis provides a

20. Chaudhuri, *Trade and civilisation in the Indian Ocean: An economic history from the rise of Islam to 1750*, pp. 1

quantitative analysis to the identification of such historical trade networks by studying the implications that the persistence of long–distance trade had across the ocean in terms of how it contributed to regional market integration. While the identification and existence of long–distance trade routes provides evidence of unity, the measure of how such trade networks contributed to economic unity across the ocean is not simply whether or not such trade routes existed, but that they contributed to a process of market integration.[21] The implications of transoceanic trade networks have never been studied under an historical analysis of the Indian Ocean, but are measured under an empirical analysis in this thesis.

For maritime world scholars, the identification of long–distance trade networks is seen as one of the most powerful forms of unifying social systems. Distance has always occupied a large and important place in the study of maritime world history, and likewise features prominently in this thesis as one of the primary barriers to transoceanic unity, particularly across such a large space as the Indian Ocean. The process of conducting trade across a vast and disparate space occupied by communities that scholars have typically viewed as separate entities involved a set of social and cultural conventions, as well as a cultural perception of the extent of their communal world around which merchants were willing to operate. International exchange in the early modern Indian Ocean incorporated many different forms of social customs and traditions, economic factors, and perceived cultural similarities.[22] First, it could not have survived without universal agreement on the notion of safe–conduct, on the law of nations, and on the means to distribute the economic gains. Second, the organisation of trade, which reflected the scale of distances, reveals the perceived cultural extent of the commercial community.[23] Whether a merchant would actually accompany his goods to the overseas markets, use junior partners to fulfil that function, or follow the method of consigning the cargo to agents and friends abroad was decided by the institutional character of the market and its cultural–legal conventions. While such conventions and arrangements have been studied by historians as a measure of perceived distance and the extent of the cultural community of the Indian Ocean, they have not been evaluated in terms of the effect it had on the price of a good, and the cost of trading. In conducting a quantitative study of the Indian Ocean world in the era of high imperialism, this thesis has compiled three original datasets of long–distance trade where the price of goods traded across the region have been collected as a measure of market integration, or

- 6.

21. Kevin H. O'Rourke and Jeffrey G. Williamson, "When did globalisation begin?," *European Review of Economic History* 6, no. 1 (2002): 23–50.

22. Amrith, *Crossing the Bay of Bengal: The furies of nature and the fortunes of migrants*, pp. 10 - 14.

23. Chaudhuri, *Trade and civilisation in the Indian Ocean: An economic history from the rise of Islam to 1750*, pp. 15 - 16.

precisely matched between port of origin and port of destination to observe the cost of trading. In this way, the role of distance in maritime worlds is not just a feature of the social and cultural extent of the community, but is also measured directly through the collection and analysis of commodity prices and trade costs.

While a historical study of long–distance trade establishes the underlying cohesion and unifying narratives to the perception of distinct societies across the Indian Ocean, an economic history of long–distance trade establishes a quantitative assessment of the extent, distinctiveness, and implications of these networks. Although primarily interested in the origins of Indian Ocean economic unity in the early modern period, Chaudhuri claims that the economic growth of the region through transoceanic unity was the consequence of three economic structural features, "a highly productive agriculture supporting a complex system of political and social institutions. Industrial production for the export markets introduced some elements of capitalistic principles governing the relationships between the artisans and merchants. Economic exchange primarily took the form of local and long–distance trade and the market for agricultural and industrial goods operated on the allocation of principle of relative prices indexed by money and currency."[24] Given Chaudhuri's interest in the Indian Ocean world of the early modern era, the region's economic development is based on qualitative evidence of growth through network identification, institutional development, and social interactions. However in contributing the quantitative dimension to economic growth and development of the Indian Ocean, this thesis similarly looks at topics of trade, the market for agricultural and industrial goods, and industrial production. Although Chaudhuri was interested in the factors that shaped and motivated Indian Ocean unity, this thesis is concerned with the implications that such unity had for the region's long–run economic growth and development in the modern period. The implications of long–distance trade analysed in this thesis are assessed through the collection of an original dataset of commodity prices and their trade routes across the region, and analysed according to measures of market integration, trade costs, and the geographic distribution of exports from major Indian Ocean port cities.

1.3 Colonial port cities

The study of cities in general, and the colonial Asian port cities in particular, has developed into a distinct field of study across a diverse set of disciplines, ranging in approach from the theoretical to methodological, and in subject matter from the economic and geographic, to the historical and

24. Chaudhuri, *Asia Before Europe: Economy and civilisation of the Indian Ocean from the rise of Islam to 1750*, pp. 39.

discursive. Urbanised areas, formed out of the unique confluence of environmental, geographic, transportation, and human factors, form discrete and individual subjects of study as they are defined by the unique interactions amongst groups brought together by a set of activities that are entirely distinct from the surrounding rural, hinterland areas.[25]

The entrepots of the nineteenth century Indian Ocean in particular are a focal point of urban studies, as their colonial origins and exceptional degree of social, political, and economic concentration far exceeded that of any other city within a colony or country.[26] Their size and function made them essentially 'primate' cities within their respective countries, dominant in the urban structure, and distinctive from the rest of the region. Additionally, the Indian Ocean entrepots are an exceptional subject for urban studies as the cities in general are relatively recent constructs, established in the nineteenth century by colonial powers, being either non–existent or of little importance prior to European imperialism, but taking on key functions in the colonial economy, evolving over the course of the nineteenth century to have a position of unchallenged supremacy.[27] As such, a study of the Indian Ocean economy in the late nineteenth and early twentieth centuries must also consider the role of the major port cities. The theme of the exceptional role of port cities in general, and the colonial Asian port cities in particular, is the primary focus of this thesis due to their widely cited role in contributing to market integration.

As a subject of social history, the Indian Ocean port cities are a mosaic of cultural and racial worlds. The cities formed a unique plural society of disparate peoples and cultures, represented through mixing of architectural styles, city planning, and infrastructure, "the tree–lined avenues of Phnom–Penh and Saigon reminiscent of Paris; the canals and stuffy buildings of old Batavia, replicas of the medieval Dutch town; the bustling overcrowded Chinatowns with their pavements full of hawkers and stalls that reached back into the cool of the open shops; the streets of Indian textile sellers – white–draped figures beckoning the potential purchaser with the frenzy of a Greek chorus at the moment of tragedy."[28] These nineteenth century interactions form distinct narratives of urban history and the plural society. The Asian bazaars, as described through the blending of cultures and peoples, functioned not only as the nexus of cultural exchange of disparate communities brought together at commercial centres, but also as a distinct economy.[29] Through the

25. T. G. McGee, *The Urbanization Process in the Third World: Explorations in Search of a Theory* (London: G. Bell / Sons, 1971), pp. 37 - 48.

26. Gregg Huff and Luis Angeles, "Globalisation, industrialisation, and ubranisation in Pre-World War II Southeast Asia," *Explorations in Economic History* 48, no. 1 (2011): 20–36.

27. T. G. McGee, *The Southeast Asian City: A Social Geography of the Primate Cities of Southeast Asia* (London: G. Bell / Sons, 1967), pp. 23 - 24.

28. Ibid., pp. 25.

29. James Forbes writing on Mumbai in the 1770s wrote of how, "Bussorah, Muscat, Ormus, and other ports in the Persian Gulph, furnished Mumbai's merchants with pearls, raw silk, Carmenai wool, dates, dried fruits, rose water, attar

collection of trade statistics and market prices for widely traded staple commodities at the major colonial port cities of the Indian Ocean, this thesis addresses the role of the cities as either distinct economies uniquely integrated and oriented towards international markets, or part of a larger process of integration based around the Indian Ocean. Separately, this thesis also looks at their role in early industrialisation under colonialism according to the types of exports by level of product differentiation and their geographic distribution.

The bazaar economy of the colonial Asian port cities were a unique byproduct of European colonialism, more than a centre for transactions at local markets, "but as indigenous money markets, which financed, through promissory notes, bills of exchange and other negotiable instruments, for the wholesale and forward trade over long distances. Throughout the period of European colonialism in the Indian Ocean, there were specialised flows of capital and labour, administrative skills and professional services, ideas, and culture."[30] These flows across bazaar markets, although becoming subsumed by European colonialism, continued to operate outside of colonial boundaries and across port cities. The interconnections of the bazaar and port city economies have not only been treated as unique cases distinct from the history of the rest of the colony, but are also studied collectively as they form networks. Such connections and flows formed nodal points on the canvas upon which the history of Indian Ocean unity has been written. The colonial expansion of the international capitalist economy and the rise of the new pan–Asian economic formation dubbed 'the bazaar' have been interpreted as it relates to historical processes of the modern era, from the era of high imperialism to the twentieth century.

Taken together, the network of colonial Asian port cities form an interconnected, and potentially distinct region, which contests several predominant cartographies. The port cities and their trade networks created a unified social and economic construct that overlay geographical space. Colonial port cities, both major and minor across the Indian Ocean, and their connections, form a constellation of urbanised nodal points that subsequently illustrate a new geography of Asia, one defined by the seas, and stretching from the ports of South Africa to Hong Kong, in one continuous urbanised network dotting the Indian Ocean coast.[31]

---

of roses, coffee, gold, drugs and honey. A number of ships annually freighted with cotton and bullion to China, returned laden with tea, sugar, porcelains, wrought silks, nankeens, and a variety of useful and ornamental articles. From Java, Malacca, Sumatra, and the eastern islands, they brought spices, ambergris, perfumes, arrack, and sugar: the cargoes from Madagascar, the Comorro isles, Mozambique, the other ports on the eastern coast of Arica, consisted chiefly of ivory, slaves, and drugs: while the different parts of India produced cotton, silk, muslin, pearls diamonds, and every precious gem; together with ivory, sandal–wood, pepper, cassia, cinnamon, and other luxuries. This valuable commerce was carried on by vessels belonging to the European or native merchants settled in Bombay; totally independent and unconnected with the trade of the East India Company." (Pearson, *The Indian Ocean*, pp. 159 - 160)

30. Bose, *A Hundred Horizons: The Indian Ocean in the Age of Global Empire*, pp. 14.

31. Shail Mayaram, "The Other Global City," chap. Rereading Global Cities: Topographies of an alternative cosmopolitanism in Asia, ed. Shail Mayaram, 1 (London: Routledge, 2009), 1–32.

Whatever the shape or boundaries that define the region, the port cities created and were created by a network of transportation routes. As Lucien Febvre wrote of the Mediterranean that, "the Mediterranean is the sum of its routes," likewise so is the Indian Ocean.[32] A quantitative study of such transportation routes, their trade costs, the distance between ports, and how they compared to other routes outside of the Indian Ocean has not been conducted on the economic history of the Indian Ocean. By focusing on trade routes between major and minor port cities, through the compilation of original trade statistics of market prices and trade costs of various commodities, this thesis contributes to the literature on the history of the colonial Asian entrepot, the role of urban networks in urban studies, and it provides an assessment of their role in the colonial economy as transportation hubs.

The bazaar economy, with its high degree of social and cultural plurality, was simultaneous with notions of difference as it was with unity. The effort in area studies therefore has been to treat these subregions more locally, rather than in grand narratives across continents. In treating the system of port cities collectively, rather than as they functioned as exceptional localities in the history of Asian sub–regions, as such regions are defined geographically or perceived culturally, the focus of this thesis is instead to evaluate the port cities as they form a network with other cities, through which an alternative geography is mapped across the Indian Ocean through nodal points on a constellation across discrete regions of Asia and Africa. The chapters included in this thesis complement the literature on the exceptional history of colonial Asian port cities, which has so far conducted qualitative case studies on these linkages and networks between colonial hubs. Instead this thesis provides quantitative analysis to these linkages between South, Southeast, Western Asia, and East Africa that have traditionally been divided by the operations of Western–oriented international relations, area studies, and foreign policy establishments.

1.4 Global core and periphery

From a colonial perspective of the late nineteenth and early twentieth centuries, India represented the centre of the British Empire. It was not just one among many British colonies, it was a centre from which peoples, ideas, goods, and institutions – everything that enables an empire to exist – radiated outward. For much of South Africa, Central and East Africa, for the Arabian and Gulf coasts, for the islands of the Indian Ocean, for the Malayan peninsula and beyond, the ties of empire ran not only from London, but also from Calcutta and Bombay. However it was precisely

32. Fernand Braudel, *The Mediterranean and the Mediterranean World in the Age of Philip II*, vol. 1 (London: Harper Row, 1966), pp. 277.

with the arrival of European colonialism, beginning in the eighteenth century, that historians have traditionally considered to be the end of Indian Ocean history, becoming a mere "British lake", subsumed and remade into an appendage of empire as a part of the global periphery, an arena in which Britain demonstrated its imperial hegemony at the expense of "millennia–old indigenous maritime activities that crumbled as they were overwhelmed."[33] While more recently, scholars have focused on the continuity of Indian Ocean history operating beneath or alongside the British Empire in the Indian Ocean, such continuity can also be applied to the economy of the region.

As this thesis is focused on the implications of long–distance trade networks and forms of unity identified by historians of the Indian Ocean, such networks suggest an integrated market driven by linkages across and access to the ocean. The integration of regions across the Indian Ocean influences the distribution of production and agglomeration within an integrated market. Typically production and growth are not evenly dispersed, but are spatially concentrated, such that some regions become heavily industrialised while others do not.[34] Subsequently economic integration across the Indian Ocean would lead to greater growth, development, and competitive advantages for core regions at the expense of peripheral ones.[35]

The primary entrepot cities that emerged in Asia in the first period of globalisation are representative of such differences in the distribution of economic agglomeration and growth in the period, which was centred at the ports. The collection of ports themselves form clusters of economic activity, thus creating a core within the global periphery. Cores and peripheries exist at various magnitudes of spatial analysis. There are peripheries within a core country, and there are core economies within the periphery.[36] To this extent, Asia in the period of high imperialism was a part of the global periphery, but as economic activity tends to cluster, with optimal location driving agglomeration across a unified Indian Ocean, a colonial agglomeration emerges with industry and growth focused on the cluster of ports connected via the ocean, forming a distinctive core urban system within the periphery.[37]

The expansion of European imperial control into the Indian Ocean in the nineteenth century created a chain of urban settlements far greater than anything that had previously existed in the

33. Metcalf, *Imperial Connections: India in the Indian Ocean Arena, 1860 - 1920*, pp. 9.

34. Masatsugu Tsuji, Emanuele Giovannetti, and Mitsuhiro Kagami, "Industrial Agglomeration and New Technologies: A Global Perspective," chap. Introduction, ed. Masatsugu Tsuji, Emanuele Giovannetti, and Mitsuhiro Kagami, 1 (Cheltenham, UK: Edward Elgar, 2007), 1–6.

35. Paul Krugman and Anthony J. Venables, "Globalisation and the inequality of nations," *Quarterly Journal of Economics* 110, no. 4 (1995): 857–880.

36. Richard E. Baldwin and Rikard Forslid, "The core-periphery model and endogenous growth: Stabilising and destabilising integration," *National Bureau of Economic Research Working Papers* 1, no. 6899 (January 1999): 1–20.

37. Gregg Huff, "Export-led Growth, Gateway Cities and Urban Systems Development in Pre-World War II Southeast Asia," *The Journal of Development Studies* 48, no. 10 (2012): 1431–1452.

region.[38] New port cities were established on the basis of first–nature geographic advantages based on their transportation access that linked ports to the regions of major staple commodity production. As the port cities became gateways between the global core and the colonial periphery, there was a rapid growth in the agglomeration of production of intermediate and final product goods related to the staple commodity extraction activities, based on the competitive advantage of scale economies located in closer proximity to the commodity–producing hinterland regions due to transportation costs, leading to second–nature location advantages.[39]

First and second–nature location advantages arise due to increasing returns to scale, which are fundamental when accounting for the spatial unevenness of economic activity.[40] Firms are strongly encouraged to concentrate production in space as a way to benefit from the advantages of scale economies. In other words, there is a notable incentive for firms to geographically concentrate rather than disperse across several locations due to the benefits of production costs derived from creating larger production facilities.[41] The ultimate location of production is based on an equilibrium of spatial factors, giving rise to the distinctiveness of the port cities. Their entrepot status arising out of the first and second–nature agglomeration advantages, essentially being that growth affects location and location affects growth.[42] Subsequently a small difference in the initial economic size of two otherwise equivalent locations may grow over time. As the port city continues to draw in buyers and sellers, the economic agglomeration of the port with other ports form a clustered, economically integrated network.[43]

While the story of economic agglomeration has been assessed in several cases of urban location studies, particularly in developing countries, such a story has not been told according to a new economic geography across the entire Indian Ocean.[44] Considering the literature on Indian Ocean history in the modern period, the persistence of long–distance trade networks, and the unity of the

38. Chaudhuri, *Trade and civilisation in the Indian Ocean: An economic history from the rise of Islam to 1750*, pp. 98 - 118.

39. Paul Krugman, "First nature, second nature, and metropolitan location," *Journal of Regional Science* 33, no. 2 (1993): Producers and sellers choose locations that have access to large markets, and have access to supplies of goods that they need or that their work requires. A place that either already has a concentration of producers offers access to larger markets because of the demand the producers and their workers generate, and a good supply of inputs and consumer goods made by the producers that are already there. These two advantages correspond precisely to the backward and forward linkages of development theory. A. F. Burghardt, "A hypothesis about gateway cities," *Annals of the Association of American Geographers* 61, no. 2 (June 1971): 269–285.

40. Masahisa Fujita, Paul Krugman, and Anthony J. Venables, *The Spatial Economy: Cities, Regions, and International Trade* (London: MIT Press, 1999), pp. 1 - 12.

41. Karsten Junius, *The Econmic Geography of Production, Trade, and Development* (Kieler Studien 300: Mohr Siebeck, 1999), pp. 12 - 13.

42. Krugman, "First nature, second nature, and metropolitan location."

43. Paul Krugman, "On the number and location of cities," *European Economic Review* 37, no. 1 (1993): 293–298.

44. Paul Krugman and Raul Livas Elizondo, "Trade policy and the Third World metropolis," *Journal of Development Economics* 49, no. 1 (1996): 137–150.

littoral region, this thesis quantitatively addresses first whether or not such historical evidence of transoceanic trade and unity existed when analysed according to market integration, and second addresses some of the implications that an integrated market had on agglomeration between or within the major colonial entrepots.

A unique feature of integrated urban networks is not only how one primary city drives the economic activity of the surrounding region and often the entire country, but also how those primary economic centres are embedded in an even larger network of urban clusters. City clusters form urban agglomerations, themselves forming economic clusters specialising in certain industries, such as those that have been identified as the manufacturing belt or the farm belt of regional economies.[45] Distance features prominently in the extent of urban and industrial clustering. Distance in the form of trade costs for the shipment of goods to other regions determines the extent of clustering.[46] As a consequence, firms decide whether it is more convenient to concentrate in a single location and serve other regions by exporting across a low trade cost integrated market, or alternatively incur additional fixed costs to open up a second plant in a different location, due to higher trade costs. With this in mind, the interaction between the level of transport costs and increasing returns constitutes a crucial force towards the agglomeration or dispersion in a firm's location behaviour. Since trade costs are paid in addition to domestic prices, consumers have an advantage to be located in the region that has the largest manufacturing sector in order to save on these trade costs and to realise higher wages. Hence core economies emerge out of an integrated market. Therefore if the Indian Ocean continued to function as an integrated market throughout the era of high imperialism, then there should naturally form an economic core, even if it was entirely within the global periphery.

Yet such a core network may not have simply existed within one country or colony, but instead existed across the Indian Ocean. The ocean itself functions as the geographically defined cluster that, while overshadowed by the main economic functions as exporter of staple commodities to Europe, continued to operate beneath the global core and periphery system. Based out of the bazaar economy, such linkages could have created an economically integrated region, the integrated market could have subsequently evolved, based on agglomeration forces, into a manufacturing and industrial cluster. By studying market integration according to an historical geography defined by

45. Tomoya Mori, "A modeling of megalopolis formation: The maturing of city systems," *Journal of Urban Economics* 42, no. 1 (1996): 133–157.

46. Junius, *The Econmic Geography of Production, Trade, and Development*, If the payment of trade costs outweighs the savings of concentrated production, then production will be distributed according to local demand. Conversely, if there are greater gains from concentrated production in the form of increasing returns and monopolistic competition, then the savings of concentrated production will increase, creating economic centres within an integrated, low trade cost region. The impact of transportation costs on a firm's location choices depends on the level of such costs; pp. 10.

the Indian Ocean, this thesis analyses the economic orientation and extent of clustering among the major colonial port cities in forming an Indian Ocean economic core, even as it was a part of the global periphery, and some of the implications that such clustering had on regional industrialisation.

Urban clustering of port cities has been studied extensively in the historical literature on the Indian Ocean, but has never been quantitatively evaluated in the market integration literature of the region, nor the focus of integration literature in general. This thesis quantitatively determines the extent of market integration in the Indian Ocean, and looks at the implications of integration according to urban–industrial clustering. The emergence of highly urbanised centres of industry, in the form of monopolistic competition, is a decisive element that underpins the existence of scale economies and integrated markets. Economies of scale implies that there is also imperfect competition since each firm can increase production while reducing the average cost per unit.[47] The existence of increasing returns allows for the creation of larger factories that are in turn more efficient than smaller ones, since a firm that concentrates production in one location benefits from scale economies that give it an advantage over spatially dispersed firms. Firms are subsequently able to benefit from scale through access to larger, integrated markets. Scale markets also encourage specialisation within it. As the Indian Ocean is evaluated as an integrated market, this should naturally result in agglomeration of Indian Ocean industry and production, thus forming an industrial core within the global periphery.

Literature on the history of the Indian Ocean has focused on the identification of transoceanic unity and linkages in the form of long–distance trade networks, but has not considered the implications of such linkages, either in terms of how it should be observed according to market integration, nor how it should subsequently lead to agglomeration. Through the compilation of original trade and commodity price statistics across the region, this thesis quantitatively determines whether or not the persistence of long–distance trade networks contributed to regional market integration. Additionally, as trade and integration create an uneven and unequal distribution of production and economic growth, then this should similarly occur in an integrated Indian Ocean economy, leading to a core region within the global periphery of the Indian Ocean.[48] Where such clustering existed, how an integrated Indian Ocean market may have facilitated this, and how it contributes to regional economic growth beyond colonial boundaries are themes that thread throughout this thesis.

47. Masahisa Fujita, "A monopolisitic competition model of spatial agglomeration: Differentiated product approach," *Regional science and urban economics* 18, no. 1 (1988): 87–124.

48. Baldwin and Forslid, "The core-periphery model and endogenous growth: Stabilising and de-stabilising integration."

1.5 Agenda

This thesis looks at various dimensions of trade and growth in the Indian Ocean economy. The individual chapters are organised around and address select topics related to Indian Ocean history, engaging to various degrees with the key themes and frameworks to the historiography of the Indian Ocean: maritime world history, the role of port cities, and core and periphery economies. Within and across these three themes, the subject of distance, trade and transportation costs, and urban agglomeration each form a part of the analysis, which brings together the three chapters. Although the included chapters closely analyse certain subjects, they also neglect others. Hence the chapters make no attempt to be a comprehensive empirical study of the Indian Ocean economy in general. Instead they are best considered as a set of essays that collectively offer a view into the economy of the Indian Ocean world in the first period of globalisation through the empirical trade data, with long–distance trade being a subject that has featured so prominently in the literature of colonial port cities, the history of the Indian Ocean, and the economies of the global periphery.

Through the collection of three original datasets of trade statistics and commodity prices, this thesis first analyses market integration in the Indian Ocean, second trade costs within and between the Indian Ocean and other regions of the world, and third it looks at the role of the Indian Ocean in the margins of trade for the primary entrepot cities of Bombay and Calcutta. Data on trade prices for a selection of commodities widely distributed across the region are used as the basis for analysis of trade costs and market integration throughout all three analytical chapters. Commodities such as rice, tea, indigo, and spices are the focus of analysis, and are used to infer a general process of market integration across the region. Although analysis of market integration is based on a limited number of staple commodity trades to infer integration, the general process of integration involves far greater exchanges and price unities than that which is observed according to a narrow set of commodities included in this thesis. Nevertheless the use of commodity prices and trades is the standard product by which market integration is measured in the economic history literature.[49]

As research on the history of the Indian Ocean world continues to expand temporally into the modern period, it allows for further studies based on the geography, economy, and implications for long–run growth in the region. The essays included contribute to the literature through a quantitive analysis of historical, long–distance trade across the region, and some of the implications such networks had on long–run growth. It is hoped that this can additionally lead to further re–conceptualisations of trade and growth, with some implications for economic policy shaping the

49. Giovanni Federico, "How much do we know about market integration in Europe?," *Economic History Review* 65, no. 2 (2012): 470–497.

future of the Indian Ocean.

In the seminal work that inspired the study of Indian Ocean history, Fernand Braudel posed the question in *The Mediterranean*, "have we here enough material to measure the Mediterranean, to construct a comprehensive, quantitative 'model' of its economy? As a unit it could then be compared to other 'world economies' either bordering on or connected to the Mediterranean."[50] While the chapters included make no attempt to be comprehensive in addressing Braudel's question, they make an attempt to construct a quantitative model of the Indian Ocean economy.

Chapter 2, "Market integration in the colonial Indian Ocean" quantitatively analyses Indian Ocean unity as a discrete unit according to market integration. Through the collection of rice prices for 85 cities across the Indian Ocean between 1870 and 1914, chapter 2 comparatively evaluates the overall process of market integration according to various geographic relationships between bilateral pairs of cities, innovations in transportation technology, and the role of the major entrepot cities. Chapter 2 constructs a quantitative model of a maritime world economy by calculating two measures of market integration between bilateral pairs of cities: the equilibrium price adjustment speed, and the relative price volatility. In this way, chapter 2 makes an attempt at constructing a comprehensive, quantitative 'model' of the maritime world economy that Braudel had initially proposed for the Mediterranean World. The results from chapter 2 confirm firstly that market integration in the Indian Ocean was primarily driven by integration between port cities across the ocean rather than between interior cities of the colonial hinterland in closer proximity, second that overseas transportation via steamships contributed more to regional market integration than inland transportation via railroads, and third that access to the Indian Ocean was the primary factor driving integration rather than the size of the port city itself. That access to and connections across the Indian Ocean were the primary drivers of regional market integration provide quantitative support for the persistence and continuity of frameworks of maritime world history in the Indian Ocean in the modern period, thus confirming claims by recent historians of the Indian Ocean that such unities continued to exist despite colonialism.

The second part of Braudel's question is addressed in chapter 3. He asks, "if a quantitative model of the Indian Ocean economy can be established, can it then be compared to other 'world economies' either bordering on or connected to the Mediterranean?" The first period of globalisation offers a unique opportunity to address the second part of Braudel's question, as the period is widely associated with the opening of the Suez Canal that linked together for the first time the two maritime worlds that have been the subject of such extensive historical study, and as the Mid-

50. Braudel, *The Mediterranean and the Mediterranean World in the Age of Philip II*, pp. 418 - 419.

dle East has conceptually been treated by maritime world historians as the boundary between two maritime worlds. Drawing from the structure of the Indian Ocean economy established in chapter 2, chapter 3 entitled, "The Middle East in the global periphery of two maritime worlds" quantitatively analyses trade costs for a set of 5 commodities where the trade route between ports of origin in the Indian Ocean and the Persian Gulf are directly matched to ports of destination in either the Eastern Mediterranean as part of the global periphery, or to Europe as part of the global core. By directly matching the price of a commodity at port of origin in the Indian Ocean or Persian Gulf to port of destination in the Eastern Mediterranean or Europe, the precise trade cost through the Suez Canal is directly observed, and can be compared to determine the relative process of market integration within the global periphery compared to the global core. Long–distance trade costs along major routes between major ports in Europe and Asia are compared to relatively short–distance routes between minor ports of the Persian Gulf and Eastern Mediterranean in the Middle East. Results of chapter 3 show that the Middle East, as a continental sub–region between the maritime worlds of the Mediterranean and the Indian Ocean, was more economically integrated according to the two distinct maritime regions, rather than integrated as a traditionally–defined sub–region of southwestern Asia. Comparative analysis of trade costs between the Mediterranean and the Indian Ocean demonstrate that both seas remained distinctly integrated, rather than integrated as part of a larger process of globalisation occurring during the period, thus providing confirming quantitative evidence of the continued significance and distinctiveness of frameworks of maritime worlds as economic units of analysis in the modern period.

While Indian Ocean historians have studied long–distance trade routes, the social and economic nexus of the bazaar economy, and how economic growth gave rise to an Indian Ocean unity, nothing has been done to assess the implications of a unified and integrated Indian Ocean economy. Chapter 4, "Trade and industrialisation in the period of dual dominance" analyses the implications of a uniquely integrated Indian Ocean market, as it helped shape and support export industries in two major entrepots of Bombay and Calcutta. Drawing from original compiled disaggregated datasets of exports for each city, chapter 4 compares the intensive and extensive margins of trade for both port cities according to exports by regional destination to see how much an integrated Indian Ocean market contributed to fostering and supporting local industry. Based on the evidence from previous chapters 2 and 3, an integrated Indian Ocean market should lead to urban–industrial agglomeration within the integrated region. By looking at granular trade data for two of the primary port cities to the universe of exports, chapter 4 looks at the the degree to which an integrated Indian Ocean market supported the growth and agglomeration of industry at the ports. Chapter 4 finds

that the Indian Ocean, as an economically integrated historical unit of analysis, served as a major destination market for the emerging large–scale export industries at the two primary port cities of Bombay and Calcutta during the era of high imperialism. Thus chapter 4 demonstrates that an integrated Indian Ocean economy played a significant role in the industrialisation, urbanisation, and growth of the region's major cities.

Considering the origins of competitive colonial industries through local Indian Ocean markets, the importance of market integration for economic growth, and differences in trade costs within the Indian Ocean compared to between the Indian Ocean and other maritime worlds, chapter 5 concludes with the potential implications of the economic history of the Indian Ocean. Between the Mediterranean and the Indian Ocean, maritime world historians have used evidence of long–distance trade to inform their studies, and have repeatedly deliberated over the ability to create a "quantitative 'model' of its economy." While the chapters included in this thesis are by no means comprehensive, they provide a quantitative analysis of three aspects of an Indian Ocean economy. It is hoped that the chapters included contribute to a greater understanding of long–distance trade in the Indian Ocean world in the modern era, that it may serve to inspire further studies of other maritime worlds, and that such a framework to modelling an Indian Ocean economy can contribute to an understanding of the region's future in the twenty–first century.

References

Amrith, Sunil S. *Crossing the Bay of Bengal: The furies of nature and the fortunes of migrants*. Cambridge: Harvard University Press, 2013.

Baldwin, Richard E., and Rikard Forslid. "The core-periphery model and endogenous growth: Stabilising and de-stabilising integration." *National Bureau of Economic Research Working Papers* 1, no. 6899 (January 1999): 1–20.

Bose, Sugata. *A Hundred Horizons: The Indian Ocean in the Age of Global Empire*. Cambridge: Harvard University Press, 2006.

Braudel, Fernand. *The Mediterranean and the Mediterranean World in the Age of Philip II*. Vol. 1. London: Harper Row, 1966.

Burghardt, A. F. "A hypothesis about gateway cities." *Annals of the Association of American Geographers* 61, no. 2 (June 1971): 269–285.

Chaudhuri, K. N. *Asia Before Europe: Economy and civilisation of the Indian Ocean from the rise of Islam to 1750*. Cambridge: Cambridge University Press, 1990.

———. *Trade and civilisation in the Indian Ocean: An economic history from the rise of Islam to 1750*. Cambridge: Cambridge University Press, 1985.

Davis, Donald R., and David E. Weinstein. "Bones, bombs, and break points: The geography of economic activity." *American Economic Review* 92, no. 5 (December 2002): 1269–1289.

Engel, Charles, and John H. Rogers. "Regional patterns in the law of one price: The roles of geography vs currencies." *National Bureau of Economic Research Working Papers* 5395 (December 1995): 1–36.

Federico, Giovanni. "How much do we know about market integration in Europe?" *Economic History Review* 65, no. 2 (2012): 470–497.

Frank, Andre Gunder. *ReOrient: Global Economy in the Asian Age*. Berkeley, CA: University of California Press, 1998.

Frankel, Jeffrey A., and David Romer. "Does trade cause growth?" *American Economic Review* 89, no. 3 (1999): 379–399.

Fujita, Masahisa. "A monopolisitic competition model of spatial agglomeration: Differentiated product approach." *Regional science and urban economics* 18, no. 1 (1988): 87–124.

Fujita, Masahisa, Paul Krugman, and Anthony J. Venables. *The Spatial Economy: Cities, Regions, and International Trade*. London: MIT Press, 1999.

Goldberg, Pinelopi Koujianou, and Nina Pavcnik. "Distributional effects of globalisation in developing countries." *Journal of Economic Literature* 45, no. 1 (March 2007): 39–82.

Huff, Gregg. "Export-led Growth, Gateway Cities and Urban Systems Development in Pre-World War II Southeast Asia." *The Journal of Development Studies* 48, no. 10 (2012): 1431–1452.

Huff, Gregg, and Luis Angeles. "Globalisation, industrialisation, and ubranisation in Pre-World War II Southeast Asia." *Explorations in Economic History* 48, no. 1 (2011): 20–36.

Junius, Karsten. *The Econmic Geography of Production, Trade, and Development*. Kieler Studien 300: Mohr Siebeck, 1999.

Keller, Wolfgang, and Carol H. Shiue. "Market integration and economic development: A long-run comparison." *Review of Development Economics* 11, no. 1 (February 2007): 107–123.

Krugman, Paul. "First nature, second nature, and metropolitan location." *Journal of Regional Science* 33, no. 2 (1993): 129–144.

———. "Increasing returns and economic geography." *Journal of Political Economy* 99, no. 3 (1991): 483–499.

———. "On the number and location of cities." *European Economic Review* 37, no. 1 (1993): 293–298.

Krugman, Paul, and Raul Livas Elizondo. "Trade policy and the Third World metropolis." *Journal of Development Economics* 49, no. 1 (1996): 137–150.

Krugman, Paul, and Anthony J. Venables. "Globalisation and the inequality of nations." *Quarterly Journal of Economics* 110, no. 4 (1995): 857–880.

Mayaram, Shail. "The Other Global City." Chap. Rereading Global Cities: Topographies of an alternative cosmopolitanism in Asia, edited by Shail Mayaram, 1–32. 1. London: Routledge, 2009.

McCaig, Brian. "Exporting out of poverty: Provincial poverty in Vietnam and US market access." *Journal of International Economics* 85, no. 1 (2011): 102–113.

McGee, T. G. *The Southeast Asian City: A Social Geography of the Primate Cities of Southeast Asia*. London: G. Bell / Sons, 1967.

———. *The Urbanization Process in the Third World: Explorations in Search of a Theory*. London: G. Bell / Sons, 1971.

Metcalf, Thomas R. *Imperial Connections: India in the Indian Ocean Arena, 1860 - 1920*. London: University of California Press, 2007.

Mori, Tomoya. "A modeling of megalopolis formation: The maturing of city systems." *Journal of Urban Economics* 42, no. 1 (1996): 133–157.

Nightingale, Carl. "The Global Urban History Project." *Planning Perspectives* 33, no. 1 (2018): 135–138.

O'Rourke, Kevin H., and Jeffrey G. Williamson. "When did globalisation begin?" *European Review of Economic History* 6, no. 1 (2002): 23–50.

Palat, Ravi Arvind. *The Making of an Indian Ocean World-Economy, 1250 - 1650: Princes, Paddy Fields, and Bazaars*. Basingstoke, Hampshire: Palgrave Macmillan, 2015.

Pearson, Michael. *The Indian Ocean*. London: Routledge, 2003.

Pearson, Michael N., and Ashin Das Gupta. *India and the Indian Ocean, 1500 - 1800*. Oxford: Oxford University Press, 1987.

Rozenblat, Celine. “International and Transnational Perspectives on Urban Systems.” Chap. Urban systems between national and global: Recent reconfigurations through transnational networks, 1st ed., edited by Celine Rozenblat, Denise Pumain, and Elkin Velasquez, 1:19–49. Advances in Geographical and Environmental Sciences, Chapter 2. Singapore: Springer, 2018.

Rozenblat, Celine, and Denise Pumain. “International and Transnational Perspectives on Urban Systems.” Chap. A New World Typology of Cities and Systems of Cities, 1st ed., edited by Celine Rozenblat, Denise Pumain, and Elkin Velasquez, 1:51–65. Advances in Geographical and Environmental Sciences, Chapter 3. Singapore: Springer, 2018.

Studer, Roman. “India and the Great Divergence: Assessing the efficiency of grain markets in eighteenth and nineteenth century India.” *Journal of Economic History* 68, no. 2 (June 2008): 393–437.

Tsuji, Masatsugu, Emanuele Giovannetti, and Mitsuhiro Kagami. “Industrial Agglomeration and New Technologies: A Global Perspective.” Chap. Introduction, edited by Masatsugu Tsuji, Emanuele Giovannetti, and Mitsuhiro Kagami, 1–6. 1. Cheltenham, UK: Edward Elgar, 2007.

Chapter 2

Market Integration in the Colonial Indian Ocean:

The Role of Geography, Technology, and Urbanisation, 1870 – 1914

Chapter Abstract

Using grain price data for 85 cities across the Middle East, South, and Southeast Asia between 1870 and 1914, this paper addresses three questions on the economic history of colonial Asia: 1. Was growing market integration in the region driven by integration between port cities across different countries and colonies of the Indian Ocean, or driven primarily by increased integration between port cities with interior cities of the colonial hinterland? 2. What was the relative impact of railroad and steamship transportation technology in contributing to regional market integration? 3. Among colonial port cities, was there an exceptional role for the primary entrepots as centres of the colonial economy in driving regional market integration compared to smaller, minor ports of the Indian Ocean? Results show firstly that the Indian Ocean region underwent a process of rapid market integration in the period, and that growing integration of the Indian port cities with other ports at greater distances drove this process across the seas, rather than interactions with other cities of the subcontinental hinterland in closer proximity. Second, steamships connecting port cities across the Indian Ocean played a greater role in contributing to the process of integration compared to railroads connecting interior cities over land. Third, despite the extensive literature dedicated to studying the unique social, cultural, and economic role of the major Asian entrepots, they were not exceptional drivers of regional integration as gateways linking the colonial hinterland with the global economy, but were part of a larger process of integration driven mainly by access to the Indian Ocean. This paper demonstrates that by expanding the geographic scope of analysis, several other dimensions of market integration in the colonial Indian Ocean emerge.

2.1 Introduction

The world of the Indian Ocean is best characterised as an interregional arena composed of discrete entities such as the Middle East, South, and Southeast Asia, each of which individually forms and to a degree reinforces a distinct system of social, cultural, and economic study. Such regional constructs are relatively recent frameworks that arbitrarily project legacies of colonial power onto the domain of knowledge in the post-colonial era. A recent, but rapidly expanding body of historical

literature seeks to recast the formerly discrete regions through their interactions across traditionally conceived boundaries by reconceptualising the ocean in its unity, with the littoral society forming its own unified region that transcended territorially defined units of analysis. Fernand Braudel, in his landmark work, *La Méditerranée* sees the Mediterranean not as a dividing factor between three continents, but instead in its unity, with the coastal communities and societies forming a distinct identity tied to the sea.[1] That same framework has been applied more recently by scholars of the Indian Ocean, where trade features prominently as a form of transoceanic unity. However the extent to which overseas trade actually contributed to creating a distinct littoral society and economy has not been assessed.

If overseas Indian Ocean trade networks fostered a distinct economy, then this implies that there should also be a process of regional market integration oriented around, driven by, and uniquely defined by the ocean rim. As trade increases between two port cities, prices of a traded commodity should also converge, leading to an integrated market. Conversely, if there was no trade between two locations, then commodity prices would simply be determined by the local supply, and would not converge.[2] If such trade networks as those that have been identified by historians do contribute to a distinct form of regional unity, then this would similarly be reflected as an integrated transoceanic market where commodity prices in those cities converged, volatility declined, and prices quickly return to equilibrium after a shock. Analysis of commodity market prices for cities, and the change in prices over time between cities across the Indian Ocean region would thus establish whether or not market integration in the Indian Ocean was mainly driven by, and distinct from a continentally–defined one.

Indian Ocean studies typically treat the rise and spread of Islam across the Indian Ocean as the beginning of the region's social and economic unity, and ending with the break up of the region by European colonialism over the course of the eighteenth and nineteenth centuries. However more recent Indian Ocean studies have focused on the persistence of linkages, networks, and unities throughout the era of high imperialism, "Indian and Chinese chains of trade and finance stretching from Zanzibar to Singapore formed a distinct international system that never lost its identity in the large dominant world system of the West. The bazaar nexus occupying the intermediate tier of a three–tiered system – with European capital at the top and the world of peasants, peddlers, and pawnbrokers below – provided the critical link across the Indian Ocean during the nineteenth

1. Fernand Braudel, *The Mediterranean and the Mediterranean World in the Age of Philip II* (University of California Press, 1995).

2. Roman Studer, "India and the Great Divergence: Assessing the Efficiency of Grain Markets in Eighteenth and Nineteenth Century India," *Journal of Economic History* 68, no. 2 (2008): 393–437.

century...interregional networks were utilised, moulded, reordered, and rendered subservient by Western capital and the more powerful colonial states, but never torn apart."[3]

Indeed the notion of a unified Indian Ocean and a distinct littoral society and economy that was more oriented overseas rather than overland in the era of high imperialism has more than just historical implications in terms of re–conceptualising the history of the region. It is also important for understanding colonial economies in terms of trade networks and linkages within the global periphery, the impact of colonial transportation infrastructure, and the exceptional role of the major bazaar entrepots as the intermediate tier gateway cities that linked the commodity producing hinterland with the global economy.

Analysis of core and peripheral trade focuses on how colonial Asian commodity specialisation was detrimental to industrialisation and growth, since the entire economy was susceptible to sharp changes in prices of a particular commodity in which the colony was specialised.[4] A study of market integration based on grain prices across colonies of the Indian Ocean is therefore an indicator of stability in agriculture and basic sustenance, which has been a key feature of economic growth throughout history.[5] Additionally, research on trade between the core and the periphery focuses on trade between the two regions, or trade only within the core, rather than looking at trade within the periphery itself.[6] However outside of Europe and the Atlantic economy there was already rapid market integration within countries of the global periphery, such as China and Japan.[7] Within this literature, this paper addresses regional trade within the global periphery of colonial Asia by focusing on the extent of market integration based around the seas, avoiding colonial, political, regional, and continental boundaries of the market, and by evaluating integration within the colonial periphery, rather than in relation to the global core.

Research on the impacts of large–scale colonial transportation infrastructure have typically been limited to studies of a single colony, which does not capture the relative effects of different types of transportation technology across different geographies or beyond colonial borders, such as those identified by Indian Ocean historians. Such studies extensively focus on the Indian railways, but demonstrate mixed results on the impact that railways had on Indian market integration, famine

3. Sugata Bose, *A Hundred Horizons: The Indian Ocean in the Age of Global Empire* (London: Harvard University Press, 2006), pp. 13 - 14.

4. Jeffrey G. Williamson, *Trade and Poverty: When the Third World Fell Behind* (Cambridge: MIT Press, 2011).

5. Robin Burgess and Dave Donaldson, "Can openness mitigate the effects of weather shocks? Evidence from India's Famine Era," *American Economic Review* 100, no. 2 (May 2010): 449–453.

6. Kris James Mitchener and Marc Weidenmier, "Trade and Empire," *Economic Journal* 118, no. 533 (November 2008): 1805–1834; David S. Jacks, "Intra and international commodity market integration in the Atlantic economy, 1800 - 1913," *Explorations in Economic History* 42 (2003): 381–413.

7. David Chilosi and Giovanni Federico, "Early Globalisations: The integration of Asia in the world economy, 1800 - 1938," *Explorations in Economic History* 57, no. 1 (2015): 1–18; Carol H. Shiue and Wolfgang Keller, "Markets in China and Europe on the Eve of the Industrial Revolution," *NBER Working Papers*, no. 10778 (2004): 1–48.

mitigation, and economic growth.[8] This paper relatively assesses the role of innovations in railroad and steamship technology in colonial Asia by evaluating their impact on market integration, but across a larger, and more balanced geography.

The colonial Asian port cities that arose during the the second half of the nineteenth century have been the subject of extensive research across several disciplines as it functioned as a social and cultural melting pot of migrants and entrepreneurs.[9] The colonial entrepot is of interest economically as it functioned as the foundation for the colony's economic growth through its integration with the global economy.[10] For several Asian colonies, the colonial capital was also the primary port, which gave the city a unique role as the centre of political and economic activity that far exceeded any other city in the colony.[11] The history of the colonial Asian port has therefore developed into a distinct field of research separate from the rest of the colony, as its composition and foundation in the era of high imperialism made it entirely unique. To this extent, historians have widely considered the colonial port cities to be crucial drivers of market integration via their linkages between the global economy, the colonial hinterland, and other colonial port cities, which made them distinct from the colonial hinterland to which it was politically attached, "commerce and culture created a strong sense of unity across the Indian Ocean; for those who made their living from oceanic trade, the far shores of the sea's littoral were often closer – culturally, economically, imaginatively – than their own hinterlands."[12]

While the distinctive role of colonial port cities remains applicable across the region, the ports of India in particular captures the exceptional economic and social nature of colonial Asian urbanisation, as British India was the largest colony of Asia, and the Indian ports some of the largest cities and trading centres of the region, "the port cities of India remained as plural as any on Earth, and more so than most...Ethnic conflict and cultural cosmopolitanism coexisted in uneasy balance, a result of this meeting of many Asian diasporas."[13] The ports of India were not only highly

8. Tahir Andrabi and Michael Kuehlwein, "Railways and Price Convergence in British India," *The Journal of Economic History* 70, no. 2 (June 2010): 351–377; Dave Donaldson, "Railroads of the Raj: Estimating the Impact of Transportation Infrastructure," *LSE Asia Research Centre Working Papers*, no. 41 (2010): 1–54; Burgess and Donaldson, "Can openness mitigate the effects of weather shocks? Evidence from India's Famine Era"; Niall Ferguson and Moritz Schularick, "The Empire Effect: The Determinants of Country Risk in the First Age of Globalisation, 1880 - 1913," *The Journal of Economic History* 66, no. 2 (June 2006): 283–312.

9. John S. Furnivall, *Colonial Policy and Practice: A Comparative Study of Burma and Netherlands India* (Cambridge University Press, 1948).

10. Gregg Huff, "Export-led Growth, Gateway Cities and Urban Systems Development in Pre-World War II Southeast Asia," *Journal of Development Studies* 48, no. 10 (August 2012): 1431–1452; W. G. Huff, *The Economic Growth of Singapore: Trade and Development in the Twentieth Century* (Cambridge University Press, 1994).

11. T. G. McGee, *The Southeast Asian City: A Social Geography of the Primate Cities of Southeast Asia* (London: G. Bell / Sons, 1967).

12. Sunil S. Amrith, *Crossing the Bay of Bengal: The Furies of Nature and the Fortunes of Migrants* (Harvard University Press, 2013), pp. 26.

13. Ibid., pp. 2.

characteristic of the Indian Ocean plural society, but were also more economically central to the Indian Ocean economy, "the commercial life of the Indian Ocean had long sustained a maritime labour force. Fishing was the life–blood of the coastal economy...Bombay emerged as the most important centre of Indian shipping...Bengal too was an ancient centre of shipping, and Calcutta and Chittagong continued to thrive in the nineteenth century."[14] Therefore in addition to assessing the role of the Indian Ocean as an integrating factor during a period in which trades, societies, and economies were divided and reorganised under European colonialism, this paper addresses the unique role of the primary Indian entrepots in linking the colonial hinterland to the global economy.

This paper addresses these three features of Indian Ocean history through an analysis of market integration. First, the extent to which the process of market integration of a historical, social, and cultural maritime unity was driven by integration between port cities across the ocean, as suggested by Indian Ocean historians, or between port cities and interior cities of the colonial hinterland in closer proximity, as traditionally defined according to territorial units. Second, the role of colonial transportation infrastructure is analysed in terms of how innovations contributed to the process of regional integration, via steamships connecting ports, and the Indian railways connecting cities of the colonial hinterland. Third, the exceptional nature of the major colonial entrepot cities, primate in their size and economic functions, is determined by whether the impact on Indian Ocean integration was greater between other primary entrepots across the ocean, or if minor coastal ports were integrated to a similar or even greater degree as the major entrepots.

This paper will first discuss the measures of market integration that will be used to address these three questions in section 2.2. Background on the grain trade and grain markets across the Indian Ocean are discussed in section 2.3. It will then present the data and discuss patterns of price convergence in section 2.4. Analysis of the coefficient of variation providing an initial indication of the geographic features of integration in the Indian Ocean is presented in section 2.5. Drawing from two measures of market efficiency between bilateral pairs of cities, each measure will be formally evaluated in a modified gravity model framework to determine the factors driving market integration in the region in sections 2.6 and 2.7. Section 2.8 will assess how the variables of interest in driving market integration in the Indian Ocean trends over time. Finally, section 2.9 concludes.

14. Ibid., pp. 80.

2.2 Methods of market integration

The identification of integration is based on two conditions: that prices should be equal between locations, and that they must return quickly to their equilibrium level after a shock. While some methods assess whether prices are equal or converging, other methods determine efficiency, but of all the methods employed, no method tests for both conditions at the same time.[15] Hence this paper draws upon a wide variety of methods of market integration, based on the premise that consistency in the results across methods evaluating both conditions provides the best evidence of the degree and process of integration according to the three dimensions that this paper seeks to address: the relative impacts on the process of regional market integration across the ocean versus over land, the relative contributions of innovations in transportation technology, and whether there was an exceptional role of the major colony port cities. In identifying the general process of regional integration, and identifying market integration according to different types of geographies, this paper addresses first whether or not prices are equal or converging, as well as the variation of prices. Second this paper addresses market efficiency based on the primary variables of interest in driving regional integration. In order to address the questions set out in this paper, measures of integration are focused on evaluating the relative impact of the variables of interest in contributing to market integration in terms of change over time, rather than the absolute level of integration, in order to allow for naturally higher or lower levels of integration.

Price ratio

In order to observe the process of integration in the Indian Ocean, this is most easily and directly observed through a decline in the price gap or the price ratio between two locations. It is also the most straightforward method of assessing the process of integration over time, as O'Rourke and Williamson assert that, "the only irrefutable evidence that globalisation is taking place is a decline in the international dispersion of commodity prices or what might be called commodity price convergence."[16] The calculation and interpretation of the price ratio is also the simplest and most direct:

$$PG_{ij}^{k} = \frac{P_{i,t}^{k}}{P_{j,t}^{k}} \tag{2.1}$$

15. Giovanni Federico, "How much do we know about market integration in Europe?," *Economic History Review* 65, no. 2 (2012): 470–497.

16. Kevin H. O'Rourke and Jeffrey G. Williamson, "When did globalisation begin?," *European Review of Economic History* 1, no. 6 (2002): 23–50.

Where the price ratio $PG^k_{ij,t}$ is simply the ratio between the price of a commodity k in location i relative to the same commodity's price in location j in year t. Measuring the price ratio between two locations based on the rule of one price for a series and observing the trend over time serves as evidence of convergence or divergence, however it is highly limited by the number of locations. Price ratios can only be studied between two locations, and hence the method is restricted by the size of the region and the number of locations. While evidence of integration can be clearly observed between two locations that may represent different geographies of the Indian Ocean, the factors driving integration between any two cities cannot be firmly established unless this procedure were similarly done across a large and varied set of cities across geographies. Although it is the most direct measure of an integrated market, this measure must be assessed over time, and cannot be aggregated into a single value that can be compared across different geographies or factors of integration. Observed alone and in a single period, it does not establish a clear relationship between two markets, as it does not give an indication of whether or not markets can be considered integrated, or if prices in the two markets are converging or diverging.

COEFFICIENT OF VARIATION

A common alternative to evaluating equal prices between locations when datasets are large and involve numerous cities is to consider the dispersion of all markets together by computing the coefficient of variation in each period of time, where all observations are assumed to be equilibrium prices between the two markets. The equation is as follows:

$$CV_t = \frac{\delta \sum_{n=1}^{85} P_t^k}{\mu \sum_{n=1}^{85} P_t^k} \tag{2.2}$$

Where the coefficient of variation is the standard deviation of the price of commodity k in all markets in time t divided by the average price of commodity k across all markets in the same time period. This method is an effective way of aggregating data across a wide variety of locations rather than simply observing the price ratio between two cities. As a method of aggregating price data into a single value, the coefficient of variation is used across locations that represent particular geographies of interest to comparatively assess the relative degree of integration or dispersion of prices among interior or coastal cities of India, and coastal cities across the Indian Ocean. Observing the coefficient of variation over time and across different types of geographic relationships offers a direct assessment of market integration according to economic orientation of coastal cities

as being more integrated with other coastal cities overseas or with cities of the colonial hinterland. In addition, it also addresses whether or not integration within the colonial Asian periphery was generally occurring, as it has been similarly evaluated between the core and the periphery, by evaluating a decline in price variation over time.

RATE OF CONVERGENCE

Analysis of the price ratio and the coefficient of variation address the first condition of integrated markets, which is whether or not prices are equal or converging between locations. In order to address the second condition on the speed at which prices between locations return to equilibrium prices, thus establishing a measure of the process of integration, the standard measure of analysing this is the equilibrium error correction model, which has been widely applied to studies of market integration as a way of establishing a clear relationship between locations.[17] It is additionally efficient for observing the relationship between a large number of cities, whereas looking at price ratios is highly constrained by the number of cities being compared, and does not assess whether or not an actual trading relationship existed. For example, the price ratio between two locations could be converging, but this does not mean that they actually traded with each other, but could instead be the result of a broader process of globalisation. Price convergence could look like integration between two cities, but it could actually be that the two locations traded with a third location, which both cities were integrating with instead, and not with each other. Since the interest in this study is to comparatively look at the specific forms of integration within the colonial periphery based on geography, transportation, and urbanisation, establishing whether or not two locations actually traded is important, therefore the rate of convergence is a more useful measure for addressing the impact of factors driving integration.

However the model is not without its limitations. Most importantly it assumes that price differentials converge to an equilibrium point.[18] Therefore there may be a tendency for the model to overestimate the size of the correction after any given shock, and thus, underestimate the speed of adjustment. This model is employed largely due to the lack of further information on transportation costs between all locations, in which case a parity–bound threshold autoregression (TAR) model would be used. The parity–bound TAR is preferred to give better estimates of the speed of adjust-

17. Studer, "India and the Great Divergence: Assessing the Efficiency of Grain Markets in Eighteenth and Nineteenth Century India"; Shiue and Keller, "Markets in China and Europe on the Eve of the Industrial Revolution"; Victoria N. Bateman, "The Evolution of Markets in Early Modern Europe, 1350 - 1800: A Study in Grain Prices," *Oxford Discussion Papers*, no. 350 (2007): 1–66.

18. A. M. Taylor, "Potential pitfalls for the purchasing-power-parity puzzle? Sampling and specification biases in mean-reversion tests of the law of one price," *Econometrica* 69 (2001): 473–498.

ment after a shock. In this model, for any pair of cities, the change in price in one market at time t is: $\Delta P_t^k = P_t^k - P_{t-1}^k$ should be negatively related to the level of the margin between the two markets in the previous period $t-1$, but only if the margin exceeds the band of trade costs. If the margin is less than the band of trade costs, which are the thresholds, then the change in price is free to follow a random walk within the upper and lower parity–bound corridor.[19] However for this study, the only data available between all city pairs is the retail or import price of rice, rather than observing the direct trade costs. Therefore without an estimate of trade costs between city pairs, there is not enough information to establish the upper and lower bounds for the corridor within which prices are free to move. Hence this study relies on the equilibrium error correction model. However in recognising the limitations of the model, to control for potential biases in the estimation due to shocks, this paper approaches estimation of the entire 44 year period from 1870 to 1914 within smaller 11–year overlapping estimates. In this way, the more narrow 11–year estimates should not overestimate the rate of convergence due to the more narrow timeframe in which adjustments after shocks occur. The model, applied to all city–pairs includes an additional lag on the change in price differential between locations i and j as follows:

$$\Delta(P_{it} - P_{jt}) = \beta_0 + \beta_1(P_i - P_j)_{t-1} + \varepsilon_t \tag{2.3}$$

In this model the β_1 estimates are interpreted as the rate at which prices converge between two locations following a shock. The coefficients will equal zero in the case of no integration and –1 in the case of perfect integration. Therefore the closer the coefficients are to –1, the more integrated the two locations are. A lag of the dependent variable $\Delta(P_i - P_j)_{t-1}$ is also included to estimate the error correction mechanism within a Dickey-Fuller regression to control for serial correlation between the $\Delta(P_{i,t} - P_{j,t})$ which distorts the effectiveness of inference on the β_1 estimates. Essentially it is not assumed that ε is normally distributed with a zero mean. In this case, only one lag is used since the data is annual. β_0 captures the long–run differences in the price levels, which has been left unrestricted to allow for different transportation costs in either direction.

Since the lower the β_1 coefficient represents a faster adjustment speed, thus a higher degree of integration, the interpretation of the β_1 estimates from equation 2.3 is counterintuitive. Therefore instead of using the adjustment speed, the half life length of time to convergence is calculated, a method that is standard practice when using an error–correction model so that the interpretation of the rates of convergence is more intuitive and is as follows, where β_1 is the adjustment speed

19. David S. Jacks, "What drove 19th century commodity market integration?," *Explorations in Economic History* 43 (2006): 383–412.

obtained from equation 2.3.[20]

$$\lambda = \frac{log(0.5)}{log(1+\beta_1)} \tag{2.4}$$

Instead of a measure of the speed or rate of price convergence between two cities to equilibrium prices, the half life calculates the time span needed to cover half the 'distance' to the steady state. Therefore the greater the distance between two cities, the greater the length of time required to return to equilibrium. The calculation of the half life rate of convergence is straightforward and direct, hence there is no loss of information in taking the β_1 rates of convergence from equation 2.3 and reinterpreting them as λ from equation 2.4 in order to evaluate the second condition to market integration, which is to determine market efficiency according to the rate of equilibrium price convergence between bilateral pairs of cities. In contrast to price gap and coefficient of variation measures, coefficients on adjustment speeds are a better assessment of whether or not there is an actual trading relationships between two cities, hence these values from equations 2.3 and 2.4 can be comparatively analysed to determine which type of geographic, transportation, or city size bilateral relationship were the main drivers contributing to integration in the Indian Ocean.

VOLATILITY

An alternative measure to evaluating market efficiency between bilateral city pairs is to observe changes in the relative variance of prices, rather than the speed of adjustment. Relative price volatility looks at changes in the volatility of the price ratio between two locations. It can be measured across all city pairs, and thus can be used as a basis of comparison between measures of rates of convergence to confirm whether or not the same factors affecting convergence also affected price volatility. This measure has been used in several studies of market integration evaluating the factors and determinants of integration, rather than whether or not a process of integration broadly existed.[21] It is expected that a variable that has a strong effect on increasing the rate of convergence between city pairs should also have a similar effect on reducing price volatility. Additionally, the use of two different metrics that show different aspects of integration should provide a stronger and more robust picture of the forms of Indian Ocean integration. In calculating volatility to look at the various factors that drove regional integration, a similar methodology as that of Engel and

20. William Hynes, David S. Jacks, and Kevin H. O'Rourke, "Commodity market disintegration in the intwerwar period," *European Review of Economic History* 16 (January 2012): 119–143.

21. Charles Engel and John H. Rogers, "How Wide is the Border?," *American Economic Review* 86, no. 5 (1996): 1112–1125; C. Simon Fan and Xiangdong Wei, "The law of one price: Evidence from the Transitional Economy of China," *Review of Economics and Statistics* 88, no. 4 (2006): 682–697.

Rogers (1996) is used that looks at the effect of international borders on price volatility:

$$V(P_{ij,k}) = \sigma\left(log\left(\frac{P_{j,k}}{P_{i,k}}\right)_t - log\left(\frac{P_{j,k}}{P_{i,k}}\right)_{t-1}\right) \tag{2.5}$$

In equation 2.5, $V(P_{ij})$ is taken as the standard deviation of first–differenced logged price ratios between city pairs, where $P_j$is the price of a commodity k in location j relative to the price of the same commodity k in location i. The first difference is the log of the relative price in location j to i in time t and $t-1$. Finally, the standard deviation of the first difference in relative price is calculated for each bilateral city pair as the measure of volatility $V(P_{ij})$. In the case of a full pass–through of price shocks, $V(P_{ij})$ is zero only if shocks are already proportional to prices, otherwise changes in the volatility of price ratios are greater than zero. Under this measure, the model assumes that transaction costs are proportional to prices, and that the initial prices between locations are already the same.[22] Consequently, based on these assumptions relative volatility can be misleading if the proportion of common shocks varies in time and space. By observing relative volatility within 11–year overlapping time periods, this should reduce the variance in the proportion of shocks.

Price volatility offers an alternative measure of integration as it provides a more direct assessment of prices between cities, without extrapolating too much from the raw price data, and not overlooking how prices between two locations have evolved over time. Additionally, volatility remains an important estimator that is widely used in the market integration literature.[23] The role of increased efficiency in trade networks on reducing price volatility has been widely studied, and shows that increased international trade lowers the price volatility of individual commodities, which leads to a more stable price environment overall, even for countries with a comparative advantage in primary products.[24] This should be particularly true in the case of the Indian Ocean in this period, as the entire region became specialised in commodity exports, and particularly food grains, with India being a major global exporter of both.

Among the four methods of market integration presented, price ratios and coefficient of variation evaluate the first condition of equal or converging prices between markets, and measures of rate of convergence and volatility between bilateral pairs evaluate the second condition on the efficiency of markets. While all four methods approach different features and definitions of an integrated market, collectively the measures present a comprehensive and dynamic picture of all

22. Federico, "How much do we know about market integration in Europe?"

23. Antonio Fatas and Ilian Mihov, "Policy Volatility, Institutions, and Economic Growth," *Review of Economics and Statistics* 95, no. 2 (May 2013): 362–376.

24. David S. Jacks, Kevin H. O'Rourke, and Jeffrey G. Williamson, "Commodity price volatility and world market integration since 1700," *Review of Economics and Statistics* 93, no. 3 (2011): 800–813.

aspects of market integration in the Indian Ocean. By using four different methods, confirming evidence on the economic orientation of the coastal communities, the role of transportation technology, and the role of the major colonial entrepots in Indian Ocean integration is determined by consistency across measures.

2.3 Grain price and grain trade in the Indian Ocean, 1870 – 1914

The best assessment of market integration is through commodity prices, since they are less heterogeneous than many other traded products, and have the highest bulk to value ratio. High bulk to value commodities are also less frequently traded due to their lower value, and the shipment of such goods requires a much more effective transport infrastructure than goods with a low bulk to value ratio. Therefore evidence of price convergence for such commodities is a strong indicator of market integration since they represent a difficult commodity to ship. For most studies of market integration, the commodities that are most representative of this are grains, as they have a low price elasticity and have stable, universal short–term demand across all regions.

Amongst grains, rice and wheat are by far the largest in terms of the volume of production at around 150 million metric tons annually each at the beginning of the twentieth century.[25] Extensive studies have shown that between the two grains, rice and wheat formed an internationally integrated market where both prices moved together from the nineteenth and twentieth centuries.[26] While consumption patterns and preferences between rice and wheat varied around the world, with rice being the more predominant grain in Asia, and wheat being preferred in Europe and North America, it has been argued by Latham and Neal (1983) that the two grains did not constitute separate markets, but functioned as a singular grain market linked via India's export of both, but in different directions.[27]

Major rice consuming countries depended on the inter-Asian grain trade to a much higher degree than other grain trades, as it supplied on average 80 to 90 per cent of all food calories in all of the countries of monsoon Asia. This was a result of lower real incomes in Asia, where rice was a cheap and readily available dietary staple. Despite the grain's efficiency and cheapness, it has been argued that rice demand was general rather than class-specific and income inelastic across

25. V. D. Wickizer and M. K. Bennet, *The Rice Economy of Monsoon Asia* (Stanford: Food Research Institute Stanford University, 1941), pp. 3

26. U.S. Department of Agriculture, Bureau of Agricultural Economics, *Gross Farm Income and Indices of Farm Production and Prices in the United States, 1869 – 1937,* by Frederick Strauss and Louis H. Bean, Technical Bulletin No. 703 (Washington, DC, 1940), 36 – 40, 69 –71.

27. J. H. Latham and Larry Neal, "The International Market in Rice and Wheat, 1868 – 1914," *The Economic History Review* 36, no. 2 (1983), pp. 260 – 280.

monsoon Asia, and it was similarly general in Europe and North America during periods of crop failure and shortfalls.[28] Since rice was the predominant staple of the region, it was also income inelastic, hence for the regions of monsoon Asia and the Middle East, rice best captures trade networks across the Indian Ocean region.

Although rice and wheat form a singular grain market, there was a geographic distinction between the rice growing regions of the east, such as Bengal and Burma, and the wheat growing regions of the western Indian Ocean around the Arabian Sea. In the early 1860s, Bengal was the chief rice exporting province, however this shifted to Burma by 1868, with other parts of Southeast Asia rapidly expanding their export of rice as well. Bengal continued to be a major exporter, with nearly all of the rice produced being sent through the port of Calcutta, and mostly shipped to other Indian ports, particularly Bombay, and to a lesser extent Madras.[29] Outside of monsoon Asia, the Persian Gulf and the Middle East were also rice growing regions that are a part of the Indian Ocean, and exporters to global markets, although their export was relatively small compared to the rest of Asia. Persia and Egypt constituted major rice exporting countries of the region, with rice being the only major grain exported from both countries.[30]

As the Egyptian and Persian economies became more specialised in their staple commodity exports, it was uniquely rice that was the only grain export from these two countries. For Egypt in 1900, of the 12 principal export commodities, rice was the only grain exported, and the eighth largest export by value.[31] In Persia, rice was both consumed domestically and exported in Persia. For the provinces of Azerbaijan, Gilan, Isfahan, and Fars, "the greater part of the rice crop is consumed within the country, but part of the Mazandaran crop goes to Russia. The best kinds of Persian rice grow not in the Caspian provinces but in Fars (the shahri and champa varieties), the latter of Indian origin."[32] For the regions of Fars and around the Caspian Sea, the harvest and trade of rice was the main economic activity and preferred grain for the agricultural and landowner classes. As it constituted the main economic activity, rice prices had a significant effect on standards of living, as increases to the rice price alone caused the price of all other consumer articles to rise as well.[33] Although the region around the Caspian Sea was highly dependent on the rice trade with Russia, the best varieties of Persian rice came from Fars Province in the south, in close

28. Peter A. Coclanis, "Distant Thunder: The Creation of a World Market in Rice and the Transformation it Wrought," *The American Historical Review* 98, no. 4 (1993), pp. 1050 – 1078.
29. H. J. S. Cotton, "The Rice Trade in Bengal", *Calcutta Review*, 58 (1874), pp. 171 – 88.
30. Diplomatic and Consular Reports on Trade and Finance, Trade of Mohammerah (1904), pp. 4 – 5.
31. Ibid., Trade of Alexandretta (1900), pp. 11.
32. M.L. Tomara, *Ekonomicheskoe Polozhenie Persii* (Saint Petersburg, 1895), pp. 8 – 17, in Selection 13, "Tobacco and Other Cash Crops" Issawi, *The Economic History of Iran*, pp. 249.
33. Diplomatic and Consular Reports on Trade and Finance, Trade of Resht (1895), pp. 3 – 4.

proximity to the four main port cities of Persia, which was mostly shipped around the Persian Gulf region. While the Middle East is not typically treated as part of the rice producing region of monsoon Asia, it was a part of the rice trade, as several regions were exporters of rice, while others maintained a steady import from Bengal and Burma.

As rice was widely consumed across Asia, and as rice and wheat formed a single grain market, the use of either of the two grains can be studied interchangeably. Since the dominant and preferred grain for most of the region was rice, it is used as the primary staple commodity to establish market integration across the Indian Ocean. Additionally, the international trade of wheat has been the subject of many studies of globalisation and market integration, but mostly as it applies to the integration between a European core, and the New World periphery.[34] The international trade in rice has not been nearly as widely studied as it shapes global trade networks, and was more extensively traded across the global periphery in comparison to wheat, which was largely shipped to the global core.[35] By shifting the focus of market integration from the wheat trade in the North Atlantic to rice trade in the Indian, it is possible to observe whether or not similar trends, linkages, and forms of economic growth observed according to market integration within the late nineteenth century global core similarly applied elsewhere in the global periphery. The story of wheat has been extensively studied as a tale of farm expansion in North America, Argentina, Australia, Russia, and India, etc., and even though wheat and rice operated as a singular grain market, rice has not formed the basis of study of Indian Ocean integration.

2.4 Empirical data

Grain prices across the Middle East, South and Southeast Asia have been collected covering the period from the opening of the Suez Canal to the beginning of the First World War. Since the analysis is focused on the grain trade in the Indian Ocean, the retail price of rice is used for all cities where available. All such prices come directly from government publications and statistical journals for individual cities, or sub-national districts. Retail prices are directly collected for all cities in British India, including the cities of present day Pakistan, India, Bangladesh, and Burma. For cities that were not part of British India, but part of the British Empire, such as Malaya and Singapore, market price data was separately collected in the annual series of statistical tables for

34. C. Knick Harley, “Late Nineteenth Century Transportation, Trade, and Settlement," in Wolfram Fischer, R. Marvin McInnis, and Juergen Schneider, eds., *The Emergence of a World Economy, 1500 – 1914, Part II* (Franz Steiner Verlag Wiesbaden GmbH, 1986, pp. 593 – 617.

35. Francesca Bray, “Global Networks and New Histories of Rice", in Francesca Bray, Peter A. Coclanis, Edda L. Fields-Black, and Dagmar Schaefer, eds., *Rice: Global Networks and New Histories* (Cambridge: University of Cambridge Press, 2015), pp. 33

colonial and other possessions of the United Kingdom. For cities in foreign countries or colonies belonging to foreign countries, the local rice price is derived from the import prices and quantities of common rice collected from the annual series of British consular trade reports. The unit price is calculated from the import trade statistics for each city or consular district. This is used for all cities of the Middle East, and the cities of Sarawak and North Borneo in Southeast Asia, for the majority of years, with the occasional and irregular reporting of the retail price.

Although the collection of price data varies as it is identified in the sources, to verify that the derived unit rice price based on the import data is an accurate approximation of the retail price, there are some cities for which a small series of years include both the trade statistics for rice, as well as the retail prices for several grains including rice. Comparable data is available for Calcutta, Baghdad, and Smyrna, and the plots in figure 2.1 demonstrate a comparison of the retail rice price and the derived unit price collected from the *Statistical Abstracts for British India*, and the *Diplomatic and Consular Reports* for Baghdad and Smyrna.

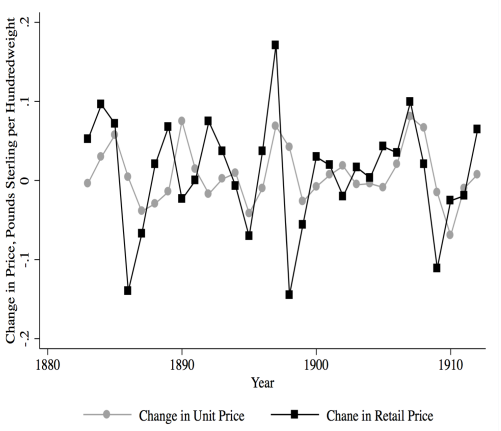
The trade of Calcutta comes from an annual series that are published separately and focused on more detailed statistics of the Bengal Presidency specifically. Since the city of Calcutta was an exporter of rice and the capital of the Bengal Presidency, no trade data is available on the import of rice from neighbouring markets around Calcutta, which would be a more precise comparison, so the export price has been taken. The same is true for Baghdad, in which the export price of rice is used since the city was a net exporter. For Smyrna, both the import price and the retail price are available and shown.

Even though the export unit value is taken in the case of Calcutta and Baghdad, the figure demonstrates the strong relationship between using the retail price or the trade unit price for all cities. The correlation between the two series in Calcutta is 0.82, a strong indication of the relationship between the retail price in a location versus the derived unit price from the trade data. Similarly the correlation for Smyrna is 0.7, and for Baghdad it is 0.95. The high correlation and the similar trends shows strong evidence of the representativeness of deriving the import unit price to create the price series for several cities so that it can cover a broad and diverse geography of the Indian Ocean region.

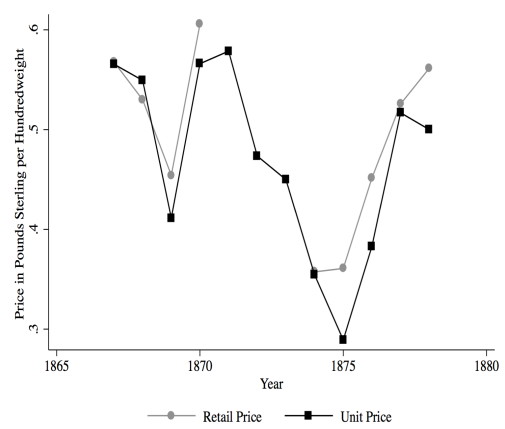
Studies on Atlantic market integration serve as a main starting point and comparative motivation for this study, in particular whether or not the same factors that drove integration in the north Atlantic, as the global economic core, were the same factors shaping integration in a colonial, peripheral context. Figure 2.2 shows a basic comparison of the price series that has been collected for rice between locations of the Indian Ocean, as part of the global periphery, compared to the price



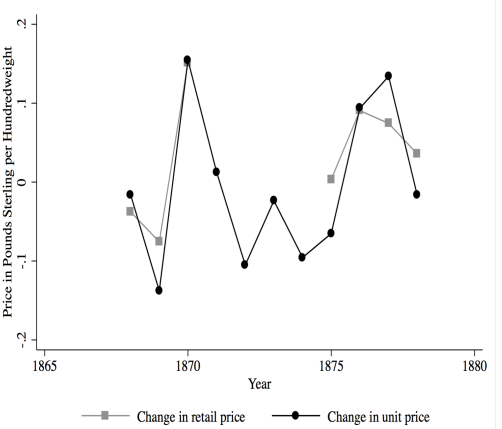
(a) Calcutta price levels



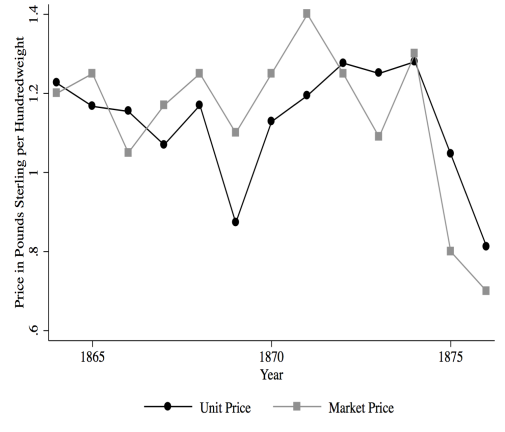
(b) Calcutta price changes



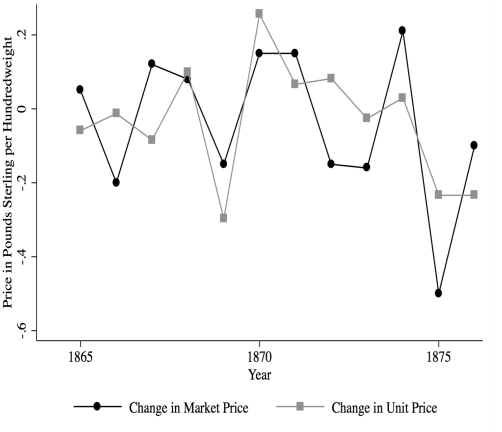
(c) Baghdad price levels



(d) Baghdad price changes



(e) Smyrna price levels



(f) Smyrna price changes

Figure 2.1: Retail prices and trade unit prices for select cities for years in which both are listed



(a) London – New York

(b) London – Rangoon

(c) Bombay – Rangoon

(d) Alexandria – Singapore

(e) Bombay – Bangkok

(f) Jeddah – Calcutta

Figure 2.2: Import/export price gap ratios of grains between select cities across the Atlantic and Indian Oceans, 1870 – 1914

series of wheat between New York and London within the global core, and for rice from London to Rangoon, representing bilateral cities of the core and the periphery.[36]

Across the six plots, the nature of the rice price data shows a higher degree of annual fluctuations and larger price gaps between city pairs within the Indian Ocean in comparison to across the Atlantic, or between Asia and Europe. For several city pairs of the Indian Ocean, the import price at destination reaches nearly 5 times the export price at origin. In comparison, the London – New York wheat price gap never surpasses a doubling of the export price. Additionally, although the London – Rangoon rice price gap is more than double at the beginning of the period, it converges by the end to nearly the same level as the London – New York wheat price gap.

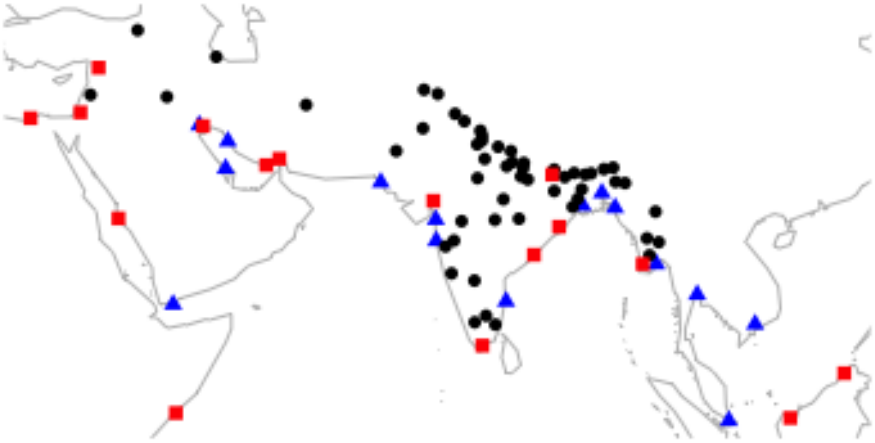


Figure 2.3: Location of Markets with 1870 – 1914 Price Series

Evidence from price ratios in figure 2.2 shows that, despite a high degree of annual variation at the beginning of the period, all city pairs exhibit a convergence to a similar level of less than 2 by the end of the period. Nevertheless despite general evidence of a process of price convergence within the Indian Ocean, the price ratio remains smallest and annual variation lowest between London and New York in panel 2.2:A, followed by London and Rangoon in panel 2.2:B. Hence overall, integration remains much more evident across the North Atlantic, and between Europe and Asia than within the global periphery of the Indian Ocean.

While figure 2.2 only provides a snapshot of bilateral price gap trends in rice and wheat across major entrepots of the Atlantic and Indian Oceans, in total, data on retail or import unit prices for common rice has been collected for 85 cities, with 17 cities in the Middle East, 11 cities in Southeast Asia, and 57 cities of the Indian subcontinent. The Indian subcontinent is further broken

36. Price gaps in figure 2.2 are taken as the ratio of the import price to the export price as previously shown in equation 2.1.

down into regions to be roughly balanced with that of the Middle East and Southeast Asian regions, with 20 cities of East India, 13 cities of Western India, 8 cities of Southern India, and 16 cities of North and Central India. A full summary of the price data for the overlapping time periods is included in table 2.1. Given the unbalanced representation of the data that is more heavily weighted by the Indian subcontinent, analysis is focused on the relative orientation of Indian ports either with the subcontinental interior, or with other port cities across the Indian Ocean. The distribution of markets is shown in figure 2.3. Cities across the region have been separately identified by their geography, in order to evaluate the relative economic orientation of markets either internally across the colonial hinterland, externally between port cities across the Indian Ocean, or between primary port cities of colonial Asia. From figure 2.3 black circles denote interior cities for which rice price data has been collected. Red squares refer to coastal port cities, and blue triangles distinguish those port cities that are specifically referred to as the 'primary port' or colonial entrepot in the archival trade record.

2.5 Price variation across geographic dimensions

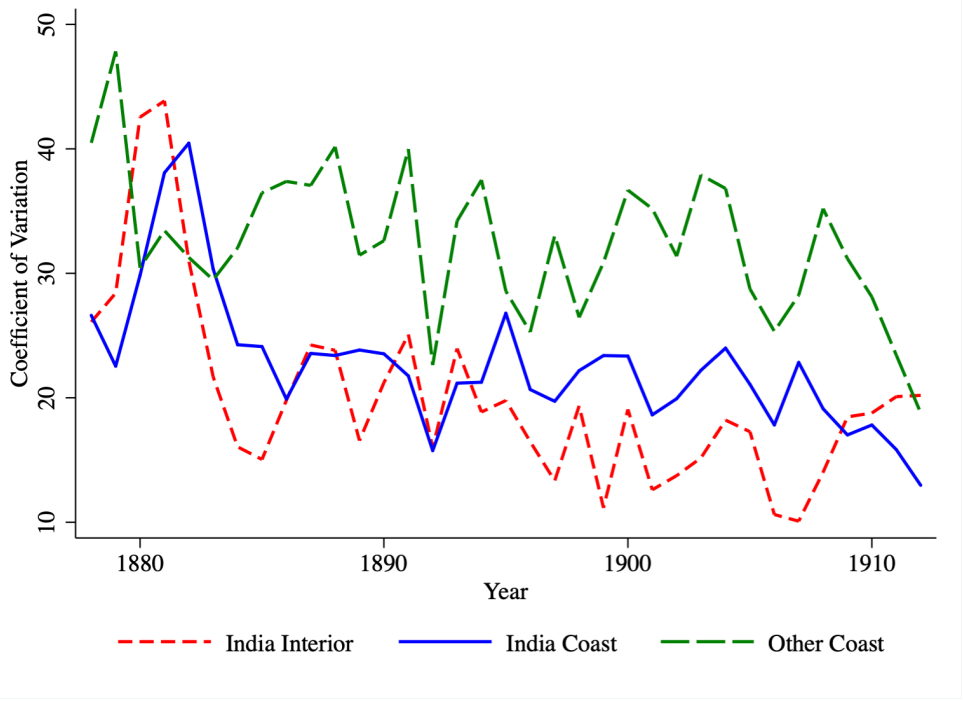


Figure 2.4: Coefficient of variation for Indian ports, Indian interior, and other ports

As a first measure of the relative economic orientation of colonial Asian port cities that either witnessed a greater process of integration with the colonial hinterland or with other port cities across the ocean in the period, the coefficient of variation in the rice price across all 85 cities is

Table 2.1: Detailed Summary of underlying price data and observations for each 10–year time period

Resulting underlying observations on rice prices	East India	North India	West India	South India	Ottoman Empire	Bahrain	Persia	Aden	Somalia	Burma	Indochina	Thailand	Malaya	Full Panel
	1020	738	735	397	268	27	205	21	20	235	35	45	72	3818
1870–1880	19	14	14	7	3		1			2		1	1	62
1875–1885	19	14	14	8	4		1			2	1	1	1	65
1880–1890	19	15	12	8	5		2			5	1	1	1	69
1885–1895	19	15	13	8	7	1	6			6	1	1	1	78
1890–1900	19	15	13	8	7	1	7	1	1	6	1	1	1	81
1895–1905	20	15	13	8	7	1	7	1	1	6	1	1	2	83
1900–1910	20	16	13	8	7	1	7	1	1	6	1	1	3	85
1905–1915	20	16	13	8	7	1	7	1	1	6	1	1	3	85

Notes: Table shows each city for which rice price data is available across the entire 10–year time span. Price data also goes back as far as 1860 for some cities, but are not included in the analysis as there is not enough cities for which data is available. The four geographic subregions of India are defined by the Indian states, which are the states of Bihar, Assam, Odisha, and Bengal for East India, Punjab, Sind, Gujarat, and Maharashtra for West India, Tamil Nadu and Karnataka for South India, and the states of Uttar Pradesh, Madhya Pradesh, and Chhattisgarh for North India.

compared according to the geographic types outlined in figure 2.3. Although figure 2.3 makes a distinction between primary colonial entrepots and minor ports, they are in this case all treated as coastal port cities. The geographic distinction is instead made according to whether port cities were a part of British India, or if they were ports of the Middle East and Southeast Asia, referred to as "other coast". To determine the degree to which the coastal Indian cities functioned as exceptional gateway cities to the colonial hinterland, or were genuinely representative of the integration of the region or colony, the coefficient of variation evaluates how much prices vary across all cities of the geographic subgroups. Figure 2.4 shows the variation of prices among the Indian ports, the Indian interior cities, and other ports of the Indian Ocean.

For all three geographic subregions, the "other coast" of the Indian Ocean shows the highest level of variation, followed by the Indian coast, with the Indian interior having the lowest levels of variation.[37] This is expected due to the greater distances between ports across the ocean rather than between cities of the subcontinental interior.

More important to addressing the questions on the relative economic orientation of the port cities are the trends in integration over time, rather than simply the level of price variation. However the trends from figure 2.4 do not give a clear indication of a distinctly greater process of integration of the Indian ports with either the interior or with other ports of the Indian Ocean, since all three regions show some degree of similar movements, and other periods of distinctly different movements. Interestingly, the Indian ports do not show a clear indication of co–movement with the Indian interior, suggesting that the Indian ports were exceptional in their economic orientation. When both coastal and interior regions are compared to variation of the other Indian Ocean ports, the similar movements suggests a well–integrated Indian Ocean region overall, as variation for other ports are separated by far greater distances and fall under different colonial tariff regimes.

Aside from movements in the annual variation, all three subregions demonstrate a decline in the coefficient of variation over the period, indicating that the region overall experienced a process of integration that has been similarly observed at a global level. The Indian interior shows the fastest rate of decline, with a time coefficient of –0.020 (0.005) when the annual logged coefficient of variation is regressed on the pure time trend. The decline in variation is slower for the Indian ports and for other ports of the Indian Ocean, with coefficients on the pure time trend of –0.015 (0.003) and –0.010 (0.002), respectively. The level of variation in figure 2.4 and the trend for Indian port cities is approximately halfway between the time trend for the Indian interior cities and

37. Indian coast includes all of the 12 ports of India, and in this case includes Rangoon and Basseim as Indian ports. Other coast is for port cities of Southeast Asia and the Middle East, including ports along the Eastern Mediterranean of the Middle East. The Interior Indian cities includes all 45 cities of the interior of India.

other port cities of the Indian Ocean. This suggests the unique role and nature of the colonial port cities as gateways between the global economy and the colonial hinterland, where Indian port city variation does not decline as fast as those of the Indian interior, but declines faster than other ports of across the Indian Ocean, and the level of variation lies between those of the Indian interior and "other coasts" of the Indian Ocean.

However there are several other factors that influence the level, degree, and orientation of Indian port cities' price variation with the colonial hinterland or with the other coasts, such as distance, transportation technology, levels of urbanisation, and different colonial tariff regimes. While analysis of the economic orientation of the Indian Ocean based on the coefficient of variation only offers an initial indication of the exceptional role of the Indian port cities, analysis has not accounted for these other factors that also fundamentally shape market integration. Hence analysis that is focused on evaluating the relative impact of factors affecting market integration in the Indian Ocean better addresses questions concerning the economic orientation of the region, the role of transportation technology, and the unique role of the colonial entrepots.

2.6 Half life convergence time analysis

Analysis of the factors determining market integration in the Indian Ocean are assessed in a modified gravity model framework on the two measures of market efficiency discussed previously. As a first measure, this paper has made use of a standard error–correction mechanism, or the equilibrium threshold autoregression as shown previously in equation 2.3. The model is applied to the data on bilateral, city–pair price data for common rice over the period from 1870 to 1914 in 85 cities of the Indian Ocean in 11–year sub–periods, as laid out in table 2.1. The complete resulting dataset of the rate of convergence coefficients calculated from previous equation 2.3 is plotted in figure 2.5.

The β coefficients remain bilaterally defined by city pairs, so for 85 cities in the total dataset, there are 7,225 estimates for each of the 8 time periods, making a total dataset of 57,800.[38] The coefficients on adjustment speed are regressed on a number of independent variables that are commonly cited in the market integration literature as factors driving market integration, which are of particular interest in the case of the Indian Ocean region, and which address the three questions set out in this paper.[39]

For example, figure 2.5 shows the distribution of adjustment speeds between bilateral pairs

38. Due to differences in data availability for some sub–periods and for some cities, observations are dropped, so the full 57,800 size dataset is never entirely used. The total non–zero observations in the dataset is 33,778.

39. Jacks, O'Rourke, and Williamson, "Commodity price volatility and world market integration since 1700."

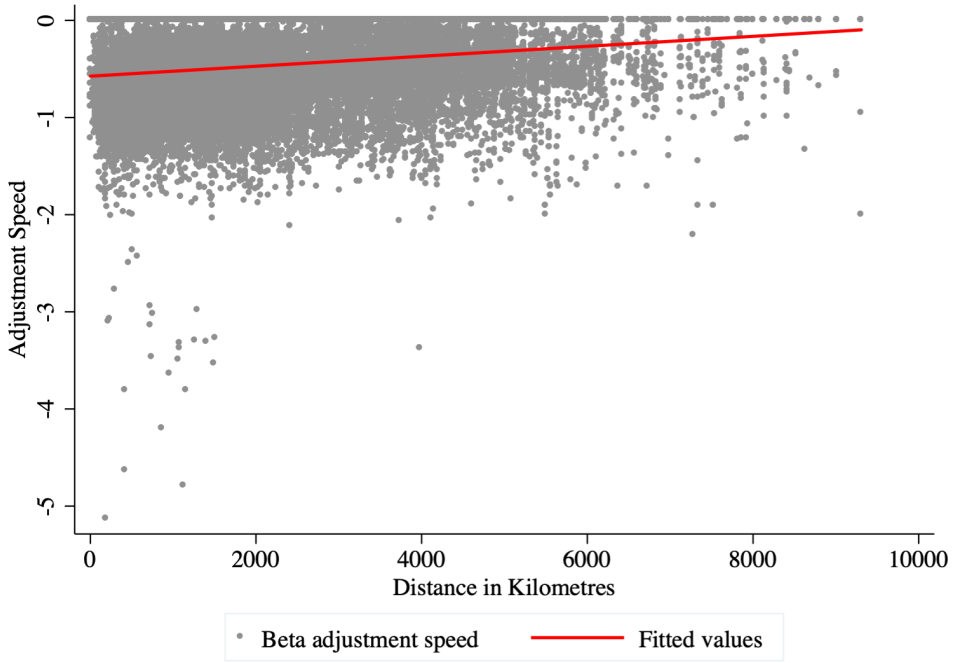


Figure 2.5: β adjustment speeds between bilateral pairs taken from equation 2.3 against distance in kilometres

according to distance, as distance is one of the main variables determining price and integration between markets. All coefficients are below zero, with 6,122 observations lower than –1 out of the total 33,778 observations. The greater the absolute value of the coefficients, the faster the convergence rate of prices between the two locations. The plot shows the expected relationship that, as distance increases, the β_1 coefficients rise towards zero, or no integration, illustrating that distance is one of the significant determinants affecting market integration. Regressing the β_1 coefficients against the log of distance as shown in figure 2.5 confirms that the log of distance on β_1 coefficients is positive, reducing integration with a coefficient of 0.028 (0.001).

As previously discussed, rates of convergence are converted from their β_1 coefficients from the error correction model to λ coefficients for the length of half life time to equilibrium prices, from equation 2.4. Figure 2.6 shows increasing half life coefficients, or lower integration, with increasing distance, with a coefficient for the log of distance of 0.386 (0.021). From figure 2.6 half lives vary from 0.079, or approximately 28 days to 541 years, indicating the time to obviate a half of the deviation of relative grain prices from the equilibrium level between two cities.

From the measures of half life convergence time between bilateral pairs of cities in figure 2.6, in order to address questions on the primary geographic orientation of market integration, the forms of transportation technology that drove it, and the role of major colonial entrepots in contributing

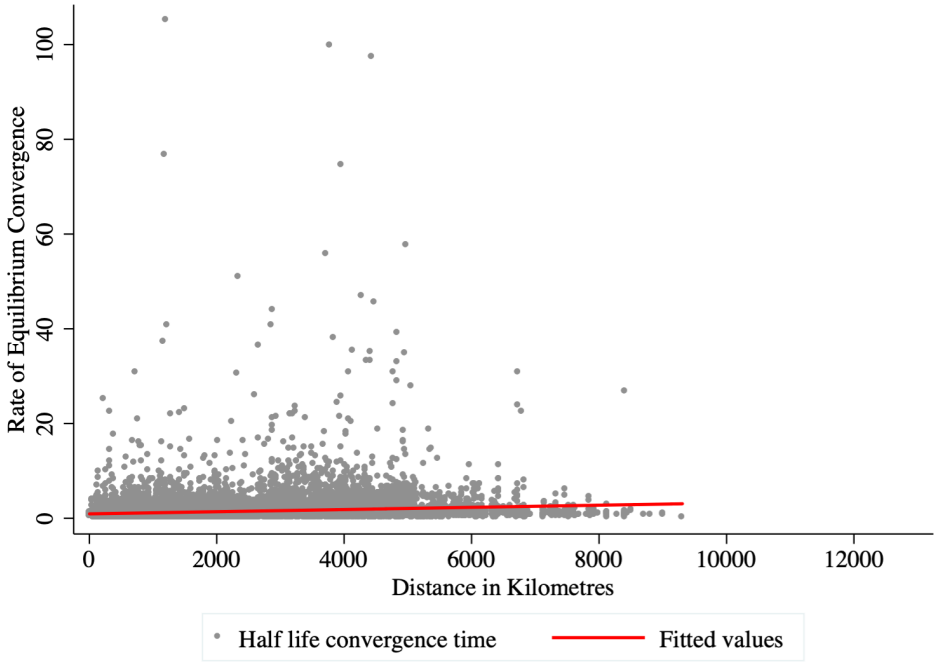


Figure 2.6: Half–life length of convergence time between bilateral pairs from equation 2.4 against distance in kilometres

to Indian Ocean integration, the data points are input into a modified gravity model equation. Since the half life convergence is calculated between city pairs, determining the relative impact of the factors that drove integration are evaluated by identifying the type of relationship between cities, and estimating the impact of that type of relationship across all similarly identified city pairs on the half life convergence time. Such an approach follows similar studies assessing the contribution of various factors of integration in a gravity model framework as those done by Engel and Rogers (1996), Parsley and Wei (2000), and Jacks (2006), however the model is adapted for the specific interest of looking at the effect of various well–established and often studied factors of integration that affect the rate of price convergence between two locations, as it has been similarly applied by Jacks (2006):

$$\lambda_{ijt} = \alpha_0 + \alpha_t + \alpha_{ij} + \beta_1 lnDist_{ij} + \beta_2 lnDist_{ij}^2 + \beta_3 Border_{ij} + Z_{ijt}\beta + \varepsilon_{ijt} \tag{2.6}$$

α_t is a set of time period dummy variables for each of the 8 sub–periods, to allow for an analysis of variables that change over time, such as the expansion of the regional railroad network and empires that adopted the gold standard at different times, as well as the expansion of steamship travel between major and minor coastal ports. α_{ij} represents a fixed effect for each city pair to capture any time–invariant attributes specific to a city pair that might influence the two cities'

propensity to trade with each other. $Dist_{ij}$ is the logged distance between cities i and j. B_{ij} indicates a border separating city pairs, defined as 1 when cities i and j are part of two different countries, thus where there is a national border separating a city pair, or 0 if cities i and j are part of the same country or empire.[40] Z_{ijt} is a set of indicator variables addressing the three questions set out in this paper on the relative impact of factors driving regional integration.

There is the potential in equation 2.6 for standard errors to be highly correlated as a result of the expansion of the dataset from equation 2.3, where estimates on bilateral pairs of cities are assumed to be independent relationships. This would result in the significance levels on each indicator variable in equation 2.6 to be biased upward. Additionally it is possible for a group of cities identified by one type of bilateral relationship of the Z_{ijt} variables to be collectively highly integrated, which would bias the significance level of estimating each bilateral relationship as independent, and would lead to artificially higher significance through serial correlated standard errors. Therefore the log–linear specification can lead to either heteroskedastic or serial correlated city pairs. To control for this potential bias in errors in either case, robust two–way clustering of standard errors are used according to each i, j city pair.

The set of Z_{ijt} indicator variables driving integration in the Indian Ocean includes two geographic variables, *river* and *coast*. *River* indicates whether or not both cities i and j are connected along the same navigable river system. The main river systems of the Indian Ocean region included in the dataset are the Ganges, the Indus, the Irrawaddy, the Bengal, and the Tigris and Euphrates rivers. There are 61 cities connected along the Ganges, 6 on the Indus, 6 on the Irrawaddy, 3 on the Tigris and Euphrates, 2 on the Kollidamn, 3 on the Pawana, 3 on the Mahanadi, and 5 on the Meghna Rivers. The *river* variable therefore identifies whether both cities i and j were on the same navigable river system.

As previously shown in figure 2.3, coastal cities are those that are port cities, but which are not distinguished as the 'chief port' from the archival trade record. The *coast* variable identifies whether or not both cities i and j are port cities, but where at least one of the i, j cities is not a primary entrepot. As a measure of the relative orientation in the process of market integration of colonial port cities either with the colonial hinterland or with other port cities across the ocean, the $coast - interior$ variable is 1 when city i is a landlocked interior city, as denoted by a black circle

40. For all cities of British India, trade was internal and did not cross a border or face tariffs between cities. This was true for cities of present–day India, Pakistan, Bangladesh, and Burma. For British protectorates such as Aden, although it was a part of the Bombay Presidency, it was administered separately as a province by the Chief Commissioner, therefore for trade between this port city and all other cities of British India, there is a border. For trade between two different British crown colonies in Asia, there is always a border between cities i, j if at least one city is part of different crown colony.

in figure 4.12 and city j is a port city or entrepot, a red square or blue triangle respectively, and takes a value of zero otherwise.

The *railroad* variable identifies any railroad–connected pair of cities, accounting for the evolution of railroad development over the 8 sub–periods. For bilateral pairs of cities to be connected by railroad, both cities have to be connected to the network. For the Indian Ocean region, only India had a railway network linking pairs of cities in the dataset.[41] Over the period, the Indian railway network permeated from the major port cities of Bombay, Calcutta, Madras, Karachi, and Rangoon, slowly expanding across the colonial hinterland. By 1900 all cities of British India in the dataset were connected by railroad. However the Indian lines did not link to the Burmese lines, so they are treated as two separate networks. Hence even though Rangoon and Delhi both had rail lines connecting to a larger network, since the Indian and Burmese networks did not link, this city pair is treated as 0.

Distinguishing between minor coastal cities and the chief colonial ports, the *entrepot* variable indicates whether or not both cities i and j were major entrepots, as identified in the archival records as the 'primary port' or the 'chief port' for the colony. From the trade record, there are 16 port cities of the total 33 coastal cities in figure 4.12 that are distinguished in this way. The major entrepot cities of the Indian Ocean are: Bombay, Madras, Calcutta, Chittagong, Dacca, Karachi, and Surat in India, Bahrain, Basra, Bushire, Aden, Mogadishu, Rangoon, Singapore, Saigon, and Bangkok. The *entrepot* variable only identifies city pairs where both i and j are major entrepots. Otherwise when one city is an entrepot and another is a port city but not an entrepot, then this is denoted by a 1 for the variable *coast*.

Lastly, the variable *gold* is a time–varying identifier for city pairs where both cities i and j were a part of countries on the gold standard. For the Indian Ocean region, there were only three countries that adopted the gold standard during the period, which were the Ottoman Empire, India, and the Straits Settlements. The Ottoman Empire was the first country in the region to adopt the gold standard in 1880 with the Imperial Ottoman Bank issuing gold–backed notes at a rate of one gold *lira* equal to 100 *kurus* or *piastres*.[42] India was the second country in the Indian Ocean region

41. The Ottoman Empire and Egypt also had railroad networks in the period studied. However in the case of the Ottoman Empire, lines were centred around Istanbul and connected cities across Anatolia, none of which included cities in the dataset from figure 4.12. Outside of Anatolia, the Hejaz railway was opened in 1908, and ran from Damascus to Medina across the Arabian desert. Although rice data from Damascus is included in the dataset, there is none for Medina. Jeddah is represented in the dataset as a port city on the Red Sea coast, but was not connected to the Hejaz railway. In the case of Egypt, there were lines running out of Alexandria, a port city that is included in the dataset, but there are no other Egyptian cities to which any Egyptian railway connected, as shown in figure 4.12.

42. Sevket Pamuk, *A Monetary History of the Ottoman Empire* (Cambridge: Cambridge University Press, 2000), Given the size of the Ottoman Empire's administration over several provinces, territorial exchange rates and currency zones continued to survive throughout the period. The circulation of silver was retained at high levels for domestic transactions, creating a dual monetary standard, "while the Ottoman Empire aimed at establishing gold as the standard of currency

to adopt the gold standard, which it did in 1893. Although India's official policy of adopting the gold standard was in 1893, between 1893 and 1898, the government of India had to stabilise the value of the rupee to rise to a fixed level with the British pound, of 1 rupee equal to 1 shilling and 4 pennies in 1899.[43] Indian adoption of the gold standard had a large impact on contributing to the country's remarkable growth from 1899. Between 1893–1894, Indian exports had been £70,877,900 and by 1902–03 exports had grown to £85,877,900, and in 1912–13 they had become £164,364,800.[44] The way that India's foreign trade was structured by allowing the country to go on the gold standard was to ensure that India had a large trade deficit with Britain, but that it maintained a large surplus with the rest of the world, as a basic element in the balancing of Britain's international accounts. Therefore the gold standard had an effect on the expansion of Indian exports to foreign countries in the region, and this made it the most significant factor to regional integration in comparison to countries that did not adopt the gold standard.

In addition to India's adoption of the gold standard, there were several other British colonies across the Indian Ocean that used the Indian rupee, hence also adopting the gold standard with India in 1893. This was true for the colonies of Aden and Bahrain in the Middle East, and for Mogadishu in East Africa. The Straits Settlements and Singapore were initially using the Indian Rupee from 1826, as the colony was administered from India. However from 1867, administration of the Straits Settlements was separated from India and the Straits dollar, as a form of the silver dollar common to the region was introduced and allowed to exchange freely. Only in 1906, in the final sub–period of study, was the Straits dollar pegged to sterling, and hence the gold standard, at an exchange rate of 2 shillings, 4 pence.

The results of analysis on the half life convergence time from equation 2.6 are illustrated in table 2.2. The table shows the effect that each variable along the left–hand column had on the length of time to reach price equilibrium between pairs of cities over 8 time periods, which is λ calculated from equation 2.4, becoming the dependent variable in equation 2.6. Column 1 shows the benchmark specification of indicator variables, that the existence of a border between cities causes a significant increase in the length of time for the two cities to reach equilibrium prices by 1.145, or a 114% increase in the length of time to reach halfway to price convergence relative to cities that are within the same country. However from column 6, if the two cities were both coastal

and tried to decrease the circulation of silver coinage, the economy continued to rely heavily on silver for most daily transactions." (pp. 217) Despite this, for all foreign transactions, particularly in trade with Europe, gold continued to be used.

43. Marcello de Cecco, *Money and Empire: The International Gold Standard, 1890 - 1914* (Oxford: Basil Blackwell, 1974), This fixed rate was slightly altered in the following year of 1900 to 16 rupees equal to 1 British sovereign: pp. 69.

44. Ibid., pp. 70 – 71.

and they were in two different countries, then the effect of a border in increasing convergence time is reduced by the fact that the two cities were both ports, so the net effect is an increase in the half–life convergence time by 37% (1.021 + –0.706 = 0.315).[45] Likewise, moving across columns, distance has a positive and significant effect on the convergence time under all specifications, meaning that an increase in distance is associated with an increase in the length of time required to return to equilibrium prices. This is consistent with previous results showing the effect of increased distance on reducing convergence time illustrated as figures 2.5 and 2.6.[46]

The variables of interest in addressing the questions on market integration in the Indian Ocean set out in this paper are firstly the geographic variables in columns 2 and 3, which assess the economic orientation of colonial port cities according to the relative contribution to integration between port cities across the ocean, or between port cities and interior cities of the colonial hinterland. Second, the variable for transportation technology in column 4 compares the relative impacts on integration of steamship–connected port cities across the Indian Ocean with railroad–connected cities of British India. Third, the role of the major colonial entrepot cities as distinct factors driving regional integration is assessed in column 5.

Establishing the economic orientation of Indian Ocean integration as being primarily driven by either the relationship between port cities and the colonial hinterland or between port cities and other port cities across the ocean is based on two variables: $coast$ and $coast - interior$, with the omitted category being $interior - interior$ city pairs in column 3 of table 2.2. From table 2.2, both variables show a negative effect reducing the length of time to price convergence between city pairs, demonstrating that port cities functioned as significant factors driving integration between the colonial hinterland and other overseas ports. Column 2 shows that the Indian Ocean was indeed a significant factor contributing to regional integration, as discussed in the historical literature, with the speed of adjustment to equilibrium prices between two port cities being 65% higher than between interior cities.[47]

The $coast - interior$ variable looks at bilateral pairs where one city is an interior city, and the

45. Natural logarithms have been used in equation 2.4, so the expected percent increase in the geometric mean from either *border* or *coast* is interpreted from the natural value e, such that $e^{0.315} = 1.3703, 1.3703 - 1 = 0.3703, 0.3703 \times 100 = 37\%$.

46. Jacks, "What drove 19th century commodity market integration?"

47. The geographic variables of *river* and *coast* are observed in column 2. While both reduce the equilibrium convergence time, only the coefficient on *coast* is significant, and has a larger magnitude than *rivers*. The *river* variable indicates a river connection between specific city pairs that are along the same river. It includes cities that lie along the main river, as well as other navigable tributaries to that river. It identifies all city pairs that lie along the Ganges, Indus, Irrawaddy, Tigris and Euphrates, as well as several other smaller river systems on the Indian subcontinent. There are 61 cities connected along the Ganges, 6 on the Indus, 6 on the Irrawaddy, 3 on the Tigris and Euphrates, 2 on the Kollidamn, 3 on the Pawana, 3 on the Mahanadi, and 5 on the Meghna Rivers. Interpreting the coefficients on geographic factors alone in table 2.2 indicates that for a colony without innovations in transportation infrastructure such as railroads, colonies were more integrated overseas via ports than they were along rivers.

Table 2.2: Equation 2.6 OLS Half Life Equilibrium Convergence Time Results

Dep. var. λ half–life	(1) Benchmark	(2) Geography	(3) Port Orient.	(4) Trans. Tech.	(5) Entrepot	(6) Gold
Log Distance	0.643**	0.573*	0.592*	0.470*	0.682**	0.527*
	(0.320)	(0.311)	(0.320)	(0.289)	(0.337)	(0.298)
Log Distance Squared	–0.054**	–0.049**	–0.048*	–0.038*	–0.055**	–0.042*
	(0.026)	(0.025)	(0.025)	(0.023)	(0.026)	(0.023)
Border	1.145***	1.190***	1.214***	1.010***	1.191***	1.021***
	(0.126)	(0.128)	(0.134)	(0.114)	(0.133)	(0.115)
River		–0.093	–0.096	–0.097	–0.106	–0.105
		(0.066)	(0.068)	(0.068)	(0.069)	(0.069)
Coast		–0.498***	–0.650***	–0.649***	–0.713***	–0.706***
		(0.063)	(0.086)	(0.086)	(0.092)	(0.092)
Coast–Interior			–0.274***	–0.274***	–0.313***	–0.313***
			(0.094)	(0.094)	(0.097)	(0.097)
Railroad				–0.299**	–0.123	–0.336**
				(0.135)	(0.090)	(0.138)
Entrepot					–0.602***	–0.602***
					(0.142)	(0.144)
Gold						–0.225**
						(0.104)
Constant	–0.718	0.039	–0.013	0.320	–0.230	0.175
	(0.999)	(0.968)	(1.000)	(0.905)	(1.048)	(0.933)
Time–period fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
City–pair fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs	33778	33778	33778	33778	33778	33778
R2	0.0206	0.0212	0.0217	0.0218	0.0220	0.0221

Notes: Log distance is the logarithm of the direct circular distance between two cities in kilometres. Squared log distance is included to capture non–linear effects of distance, such as distance between two port cities. *Railroad* is a time–varying variable accounting for the expansion of the railway network connecting any two cities of the Indian Ocean region. By 1900, all cities of the Indian subcontinent are connected by rail, but a separate line connected only the Burmese cities with each other, and not with the other cities of the subcontinent. *Entrepot* is an indicator for only the major ports of the Indian Ocean as identified in the British Consular Reports for that country. The entrepot cities included are Bombay, Madras, Calcutta, Chittagong, Dacca, Karachi, Surat, Bahrain, Basra, Bushire, Aden, Mogadishu, Rangoon, Singapore, Saigon, and Bangkok. Fixed effects are used for each time period and for each city pair, with robust two–way clustered standard errors according to each city i and j from equation 1 reported in parenthesis. *, **, and *** denote significance at the 10, 5 and 1 per cent level.

other is either *coast* or $entrepot$.[48] Across all specifications, the $coast - interior$ variable significantly reduces the length of time to price convergence, indicating that port cities drove the process of integration with the interior, rather than interior cities driving integration with each other. Coefficients on $coast - interior$ are also smaller than *coast* city pairs across all specifications, with convergence time only 37% faster than $interior - interior$ city pairs, compared to nearly 100% for port cities based on column 3. Therefore while the colonial port cities were significant factors to market integration both overseas and with the colonial hinterland as demonstrated by both *coast* and $coast - interior$ variables, Indian Ocean integration was driven mostly by port cities integra-

tion with other ports overseas rather than with cities of the colonial hinterland, as indicated by the difference in the magnitude of coefficients. This finding confirms the exceptional role of colonial port cities as drivers or gateways of market integration in the period, where integration of interior cities was mostly oriented towards and driven by integration with port cities rather than with other interior cities, and the greatest factor contributing to the process of regional integration was port city integration with other ports.

Observing the relative impact of innovations in transportation technology, such as steamships and railroads, on the process of market integration in the Indian Ocean is observed in column 4, comparing the effects of integration via railroad–connected cities or via steamship–connected port cities. The results confirm the widely studied role of the Indian railways in regional market integration, showing a negative effect in reduced length of time to convergence across all specifications.[49] Despite the well known and widely studied role of the Indian railways, the results show that by expanding the geographic scope of analysis beyond the Indian subcontinent to look at the relative role of overseas integration, market integration via steamships was in fact a greater factor contributing to regional integration compared to railroads. While both are significant in reducing the length of time to reach equilibrium prices, the coefficient on *coast* is greater than that of *railroad* across all specifications, with the convergence time between port cities 91% shorter than between interior cities, and the time between railroad–connected cities only 35% shorter than non–railroad connected interior cities based on column 4 for transportation technology.[50]

The third question this paper has sought to address is whether or not there was an exceptional role played by the major colonial entrepot cities in driving the process of market integration in the Indian Ocean. The rise of major colonial entrepots has been widely studied based on their unique role in forward and backward linkages between the commodity exporting hinterland and the global economy, which has shown that restrictive colonial or import–substituting trade policies contributed to the emergence of highly centralised cities, which suggests their exceptional role in driving regional market integration.[51] Column 5 identifies specifically the colonial entrepot cities as they have been defined in the primary sources. *Entrepots* form a subset of coastal cities, rep-

48. Coast to interior bilateral pairs are those where one city is interior, denoted by a black circle in figure 4.12, and the other is either a port city or entrepot, denoted by a red square or blue triangle, respectively.

49. The *Rail* variable indicates all cities in which there was a railroad linking any two bilateral pairs of cities. For the period studied, only India and Burma had rail lines linking cities included in the dataset, however the Indian lines did not link to the Burmese lines. Within the India dataset, there are 6 cities in Eastern India that were only connected to the rest of the lines in India via Dacca after 1905. These cities are Hazaribagh, Midnapur, Purneah, Cachar, Syhet, and Ganjan.

50. Burgess and Donaldson, "Can openness mitigate the effects of weather shocks? Evidence from India's Famine Era"; Jacks, "What drove 19th century commodity market integration?"

51. Paul Krugman and Raul Livas Elizondo, "Trade policy and the Third World metropolis," *Journal of Development Economics* 49, no. 1 (1996): 137–150.

resenting 16 out of the total 31. These are the ports with the largest populations in each colony, which are also those that are explicitly referred to in the trade records as the 'chief port' distinguished from 'trade to all other ports'. From columns 5 and 6, *entrepot* shows that the primary cities served as the second largest factor driving regional integration, after *coast*, with *coast* reducing convergence time between cities by 103% relative to interior cities, and *entrepot* having an 83% lower convergence time. Hence in contrast to the extensive literature dedicated to studying the exceptional role of these highly centralised colonial Asian port cities, this paper finds that even if their economic functions may have been unique within the colonial economy, as drivers of regional market integration, they were not exceptionally integrated compared to any other port city less populous or less urbanised than the primary port. The smaller absolute value of the *entrepot* coefficient compared to *coast* in reduced convergence times demonstrates that simply being along the Indian Ocean was a greater contributing factor to regional integration rather than the size, plurality, or function of the port itself. Hence this finding supports the overseas orientation of the coastal communities of the Indian Ocean, but finds that the exceptional role of the major colonial entrepots as gateways linking the colonial hinterland and the global economy was less about their unique role as the primary port or colonial capital than simply about access to the Indian Ocean.[52]

Finally, column 6 shows the effect of the gold standard on the convergence time, which was a significant factor driving integration in the region, but had less of an effect compared to most other variables, reducing the convergence time by approximately 25%. This result is similar to other studies that have found the gold standard and other monetary regime variables to be one of the most significant factors contributing to market integration in this period, and corresponds to other recent empirical evidence demonstrating that monetary regimes were in fact strong factors influencing the direction of trade and the efficiency of markets.[53]

In considering the factors influencing Indian Ocean integration, those that are typically observed are all shown to have the general expected effect, with variables such as borders and distance increasing the convergence time, while railroads and the gold standard reduced it. What is unique about integration within the global periphery of colonial Asia is that overseas integration between port cities was the main factor driving the process of Indian Ocean integration. The fact that the two variables with the largest effect in contributing to the process of regional integration are those between overseas bilateral pairs, despite the effects of distance and the existence of borders, demonstrates that the Indian Ocean played a significant role in the economic orientation and

52. Huff, "Export-led Growth, Gateway Cities and Urban Systems Development in Pre-World War II Southeast Asia."
53. J. Ernesto Lopez-Cordova and Christopher Meissner, "Exchange-rate regimes and international trade: Evidence from the classical gold standard era," *American Economic Review* 93, no. 1 (2003): 344–353.

process of integration in the region, and that the coastal communities were indeed exceptional in their trade ties and networks overseas.[54]

In accounting for all potential variables shaping market integration that have been frequently identified in the Indian Ocean literature, this paper largely confirms the effect that such transoceanic networks had in contributing to Asian integration in the period of high imperialism. Modelled in this way, this paper shows that despite the effects of European colonialism on the creation of new political borders, the construction of colonial transportation infrastructure networks overland, and the creation of export–oriented colonial economies based on primary entrepot interactions with the colonial hinterland, the historical conceptualisation of Indian Ocean unity based around overseas ties continued to operate in the era of high imperialism, driving market integration in the region, and forming a distinct Indian Ocean littoral economy.

2.7 Volatility analysis

Building on the same method that has been used for analysis of half life convergence, relative price volatility from equation 2.5 is also used to generate measures of market efficiency between bilateral pairs of cities, which are used as data points in a modified gravity model framework. First, resulting coefficients of $V(P_{ij})$ calculated from equation 2.5 are shown in figure 2.7. As expected, volatility increases with distance, with the coefficient of 0.031 (0.001). Additionally, bilateral city pair price volatility is extensively clustered below 1 for most city pairs, with 758 observations out of the total 40,512 observations rising above 1.[55]

While distance is one of the key variables affecting price volatility between cities, there are several other determining factors. In order to fully and comparatively assess the impact of other key variables, estimates for $V(P_{ij})$ are subsequently introduced into a gravity model framework similar to the one used for the rate of convergence analysis, but adapted to reflect the difference in the metric being used. The re–estimated model is shown in equation 2.7:

$$V(P_{ij}) = \alpha_0 + \alpha_t + \alpha_i + \alpha_j + \beta_1 logDist_{ij} + \beta_2 logDist_{ij}^2 + \beta_4 Border_{ij} + Z_{ijt}\beta + \varepsilon_{ijt} \qquad (2.7)$$

54. Mitchener and Weidenmier, "Trade and Empire"; Jacks, "What drove 19th century commodity market integration?"

55. As previously noted in table 2.1, the dataset is unbalanced where not all price data is available in all years for all 85 cities. This results in some zero observations in the calculation of rates of convergence and volatility for bilateral pairs when the data is broken down into 11–year overlapping periods. When calculating price volatility between bilateral pairs of cities, there are 17,288 zero observations out of a total possible dataset of 57,800 leaving 40,512 total observations in the calculation of volatility.

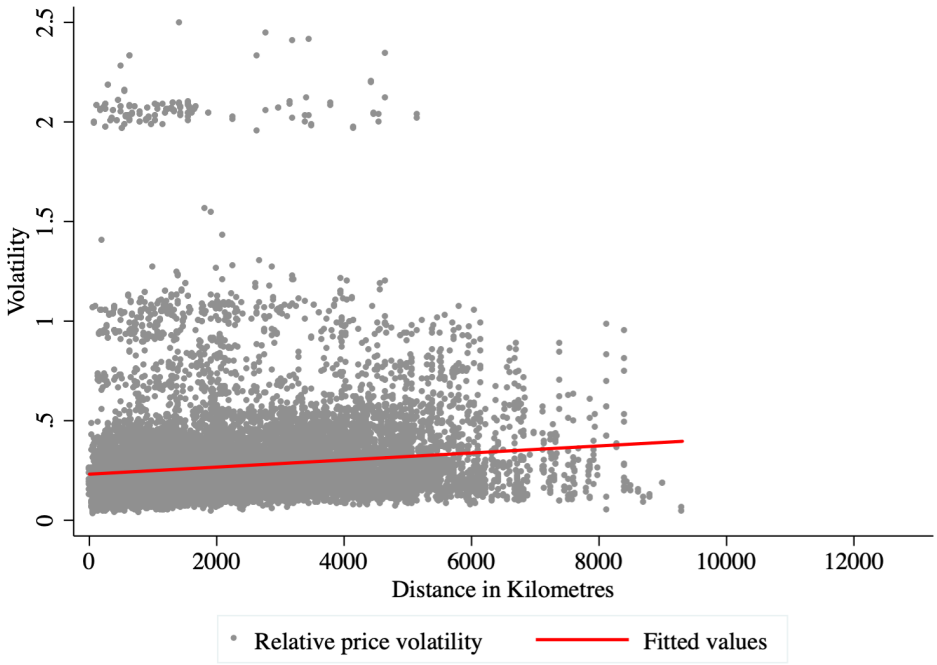


Figure 2.7: Relative price volatility between bilateral pairs against distance in kilometres

In Engel and Roger's original framework, the dependent variable equals the standard deviation of the first–differenced real exchange rate on the distance between cities i and j over a given time horizon. Similar to equation 2.6 modelling the factors driving half life rate of convergence, D_{ij} is the logged distance between cities, B_{ij} indicates a border between cities i and j. α_t is a set of time–period dummy variables for each of the 8 overlapping periods, to allow for an analysis of variables that change over time, such as the expansion of the regional railroad network, empires that adopted the gold standard at different times, and the growing centralisation of the primary entrepots. α_i and α_j represent a series of fixed effects that allow the relative price level to vary from city to city. This is done for several reasons. Firstly, there may be idiosyncratic measurement errors in some cities that make their prices more volatile on average. Second, volatility may be introduced by measurement error either due to the frequency of observation of prices, or the fact that for some cities, the market price is taken, and for others the unit price at the port derived from the quantity and value of rice imports is used. While this paper believes that the import price forms the closest approximation to market price as illustrated in figure 2.1, the use of one or the other is varied across all cities, but is consistently used over all years for each city. In order to control for potential measurement issues, city fixed effects for each city i and j are used for measures of volatility.[56] Third, city fixed effects allows for natural variability of that city. That is, there may

56. Engel and Rogers, "How Wide is the Border?"

be higher average volatility for Ottoman or Persian cities than for other cities in monsoon Asia, or higher variability for interior cities than for major coastal ports. Lastly, Z_{ijt} is a row vector of variables representing the same set of factors driving market integration in the region as those used in equation 2.6 for rate of convergence.[57] The set of variables are defined in the same way as those used in equation 2.6 in order to compare the relative magnitude of each Z_{ijt} variable across both measures of integration.

Results of equation 2.7 estimating the relative impact of the variables driving integration in the Indian Ocean are largely consistent with and confirm the results from previous analysis on convergence time. The results are shown in table 2.3. The standard gravity model measures including distance and the existence of a border significantly increase volatility, as shown by the significant and positive coefficients across all specifications. From column 1, a 10% increase in the distance between two cities leads to an approximately 0.5% increase in price volatility, and the existence of a border between two cities increases price volatility by 1%.

In addressing the factors that drove the process of Indian Ocean integration in terms of reducing relative price volatility according to overseas versus overland integration, the geographic variables from columns 2 and 3 show negative and significant coefficients indicating that the Indian Ocean ports contributed to 4.3% less volatility relative to two interior cities.[58] In addition, the $coast - interior$ variable shows a significant reduction in price volatility between coastal and interior cities, with 1.5% less volatility relative to interior city pairs. Between results from coefficients in columns 2 and 3, the relative impact of the geographic factors driving regional integration according to measures of volatility confirms previous results observed from measures of convergence time, which is that market integration in the Indian Ocean was primarily driven by coastal communities and port cities growing integration with other port cities overseas rather than port city integration with interior cities of the colonial hinterland.

Turning to the marginal impact of the two forms of transportation technology on regional integration, additional consistency with measures of convergence time finds that rail–connected cities significantly reduce volatility, however coefficients are smaller than either coastal or entrepot–connected cities, implying the greater role of steamships in driving integration in the region compared to railways. Consistency in the relative magnitude of factors in contributing to market in-

57. Federico, "How much do we know about market integration in Europe?"

58. In contrast to results in table 2.2 for half live convergence time where *river* was not a significant variable increasing integration, the effect of a *river* connecting pairs of cities does significantly reduce price volatility. Consistent with previous findings, coastal cities show a larger impact on reducing volatility than river–connected cities across all specifications, with price volatility reduced between two coastal cities by 4.3% relative to interior cities, whereas price volatility is only reduced by 1.5% for river–connected cities.

tegration across metrics confirms support for the weaker effect of the Indian railways compared to overseas integration, with railroad–connected cities having lower price volatility of 1.4% compared to 1.7% for coastal cities in column 4 of table 2.3, with the difference expanding to 2.1% versus 3.6% in column 6, respectively.

While the precise mode of shipping is not known in the case of overseas routes between coastal cities, the period was widely characterised by the increased use of steamships, which is accounted for by analysing volatility and convergence time coefficients in smaller sub–periods. Even if steamships were not widely used between all coastal cities, the period overall can be characterised by the increasing frequency of steam liner service and increased steamship traffic, to the point where steamships quickly became the primary method of shipping in the region by the end of the period.[59] Extensive studies have focused on analysing the role that Indian railways played in market integration of the Indian subcontinent, however by expanding the geographic scope of analysis beyond the subcontinent, as suggested in the historical literature on the Indian Ocean, analysis has shown that the port cities indeed contributed more to market integration in the region via overseas modes of transport rather than overland, even with the rapidly expanding Indian railways network.[60]

Addressing the third question set out in this paper concerning whether or not there was an exceptional role played by the major entrepots in driving Indian Ocean market integration, column 5 of table 2.3 exhibits the same ranking of the relative magnitude of variables as table 2.2 on convergence time, with the coefficient for *entrepot* having the second largest effect after *coast*. From table 2.3, *entrepot* is the second largest variable reducing price volatility by 3.3%, but nearly the same as *coast* at 3.4%. Although the coefficient on the marginal effect of *entrepot* is consistently smaller than *coast* across both measures of convergence time and volatility, the effect of both variables capturing forms of overseas integration are very similar. Such a similar effect of both *coast* and *entrepot* again suggests that the main driver of integration was determined primarily by access to the Indian Ocean, rather than the size or function of the particular port city. For the largest and fastest growing cities of the Indian Ocean in this period, although historians have extensively discussed their exceptional economic and social functions as gateways linking the colonial hinterland to the global economy, this paper finds that they were not uniquely drivers of regional integration in any exceptional way relative to other ports of the Indian Ocean. While the primary colonial entrepots may have emerged out of unique geographic first–nature advantages, consistent evidence

59. Amrith, *Crossing the Bay of Bengal: The Furies of Nature and the Fortunes of Migrants*, pp. 80 – 82.

60. Donaldson, "Railroads of the Raj: Estimating the Impact of Transportation Infrastructure"; Andrabi and Kuehlwein, "Railways and Price Convergence in British India."

Table 2.3: Equation 2.5 OLS Relative Price Volatility Results

Dep. var. $V(P_{j,k})$ price vol.	(1) Benchmark	(2) Geography	(3) Port Orient.	(4) Trans. Tech.	(5) Entrepot	(6) Gold
Log Distance	0.057***	0.050***	0.050***	0.049***	0.048***	0.060***
	(0.018)	(0.017)	(0.017)	(0.017)	(0.017)	(0.020)
Log Distance Squared	–0.003**	–0.002*	–0.002*	–0.002*	–0.002*	–0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Border	0.011***	0.010***	0.011***	0.002	0.002	0.020***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)
River		–0.015***	–0.015***	–0.013***	–0.014***	–0.016***
		(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Coast		–0.042**	–0.033***	–0.017***	–0.033***	–0.035***
		(0.020)	(0.008)	(0.005)	(0.008)	(0.008)
Coast–Interior			–0.015***	–0.007***	–0.015***	–0.016***
			(0.004)	(0.003)	(0.004)	(0.004)
Railroad				–0.014***	–0.014***	–0.021***
				(0.003)	(0.003)	(0.003)
Entrepot					–0.032***	–0.034***
					(0.008)	(0.009)
Gold						–0.036***
						(0.005)
Constant	–0.041	–0.007	0.021	0.015	0.033	0.006
	(0.062)	(0.060)	(0.060)	(0.060)	(0.060)	(0.069)
Time–period fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
City *i* fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
City *j* fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs	40512	40512	40512	40512	40512	40512
R2	0.337	0.337	0.338	0.338	0.338	0.339

Notes: Log distance is the logarithm of the direct circular distance between two cities in kilometres. Squared log distance is included to capture non–linear effects of distance. Fixed effects are used for each city pair *i* and *j* separately from equation 2.7 to allow for the naturally higher relative price volatility of cities in the sample. By 1900, all cities of the Indian subcontinent are connected by rail, but a separate line connected only the Burmese cities with each other, and not with the other cities of the subcontinent. *Entrepot* is an indicator for only the major ports of the Indian Ocean as identified in the British Consular Reports for that country. The cities included are Bombay, Madras, Calcutta, Chittagong, Dacca, Karachi, Surat, Bahrain, Basra, Bushire, Aden, Mogadishu, Rangoon, Singapore, Saigon, and Bangkok. Robust two–way clustered standard errors according to each city *i* and *j* from equation 2.7 are reported in parenthesis. *, **, and *** denote significance at the 10, 5 and 1 per cent level.

of market integration from measures of convergence time and volatility finds that they were not exceptional or primary drivers of regional market integration. Instead they derived their role in contributing to regional market integration in the same way as all other cities of the region: from access to the Indian Ocean.[61]

Lastly, while the gold standard had the smallest effect on reducing convergence time in table 2.2, it is the largest variable reducing price volatility by 3.7% when two cities are a part of countries that are on the gold standard, compared to two cities of the interior in column 6 of ta-

61. Masahisa Fujita and Tomoya Mori, "The role of ports in the making of major cities: Self-agglomeration and hub-effect," *Journal of Development Economics* 49, no. 1 (1996): 93–120.

ble 2.3. The magnitude and significance of the gold standard across both measures confirms its importance to Indian Ocean integration, as it has been similarly observed in other regions of the world.[62] The strength of the gold standard, and the difference in the relative magnitude compared to other variables highlights the difference in what each measure of integration is estimating in the relationship between bilateral pairs of cities. Being on the gold standard has the largest effect on volatility reduction, since its purpose was to ease the convertibility of currencies for trade between nations, hence making price changes between locations less volatile.[63] While the gold standard should facilitate trade, this does not necessarily mean that trade between pairs of cities actually increased. A more direct measure of the actual trading relationship, the frequency of trade in a particular commodity, and the exchange of information between bilateral pairs, would be the half life convergence time.[64] Hence, while the gold standard significantly contributed to the process of market integration across both measures, the difference in what each metric is estimating about the relationship between bilateral pairs of cities is what affects the difference in the relative magnitude of the gold standard according to convergence time or volatility.

Overall, the results from analysis on volatility demonstrate consistency in the relative factors contributing to market integration in the Indian Ocean when compared to table 2.2. Differences in the significance and the magnitude of variables can be seen as the result of differences in what volatility and convergence time are each respectively measuring. This is the most likely explanation for cases in which the relative magnitude of variables conflicts, such as the difference in the ranking of gold standard, and the significance of the effect of *river*. For the rest of the variables, where volatility and convergence time exhibit consistent results in relative magnitudes despite the difference in what each measure of market efficiency is evaluating, this can be seen as confirming indication of the impact that each variable had on the process of regional market integration in the period, especially for the variables that consistently have the largest effect. This is broadly true for all other variables of integration, which confirms that these factors were most likely the primary drivers of Indian Ocean integration.

62. Hisham Foad, "Europe without borders? The effect of the Euro on price convergence," *International Regional Science Review* 33, no. 1 (January 2010): 86–111; David C. Parsley and Shang-Jin Wei, "Convergence to the law of one price without trade barriers or currency fluctuations," *Quarterly Journal of Economics* 111, no. 4 (November 1996): 1211–1236.

63. Michael B. Devereux, Charles Engel, and Cedric Tille, "Exchange rate pass-through and the welfare effects of the Euro," *International Economic Review* 44, no. 1 (February 2003): 223–242.

64. Federico, "How much do we know about market integration in Europe?"

2.8 Time trends

The main analysis in this paper has comparatively assessed the relative impact of geographic, technological, and urbanisation factors on the growing regional integration of the Indian Ocean between 1870 to 1914 in 8 overlapping 11–year sub–periods. Results have identified some consistently strong variables that support the exceptional, overseas nature of the coastal cities of the Indian Ocean in relation to neighbouring interior cities in much closer proximity, as well as other factors that drove integration. To observe how these factors trend over time, equations 2.6 and 2.7 are further adapted to estimate the effects of each variable within the 8 sub–periods.

Using the time periods presented in table 2.1, time trends are extracted from each of the Z_{ijt} variables driving integration according to measures of convergence and volatility. Equations 2.6 and 2.7 are modified to observe the time–period coefficients on a subset of the data for each Z_{ijt} variable. Hence all other Z_{ijt} variables, as well as the other variables from the baseline model, are dropped so that all that remains are the city–pair fixed effects and the time dummies. The equation is modified when looking at volatility so that, rather than using the combined α_{ij} city–pair fixed effect, they are instead separated, assigning a fixed effect for each city i and city j. To observe the effect over time for each Z_{ijt} variable, city–pairs that are identified by each variable are extracted from the overall dataset, and a regression is run on the subset corresponding to each variable. The coefficients on each of the 8 time dummies subsequently capture the effect of each variable over time.[65] Results of the trends on each variable of convergence are shown in figure 2.8 and on each variable of volatility in figure 2.9.

Taking the zero y–axis as the first period corresponding to the years 1870 to 1880, the point estimates in the trend line show how each sub–period diverged relative to the first. Both figures overall exhibit a negative trend, demonstrating higher integration, however there are some sub–periods in which the effect is not significantly different from the first. Across plots under both figures 2.8 and 2.9 for convergence and volatility, several plots demonstrate a slight positive, but largely insignificant, increase in the trend for a few sub–periods before turning negative and significant in the final periods. Broad consistency of a slight increase in the middle of the trend line suggests that, although not always significantly different from the first, there was a slight process of market disintegration before a significant trend in regional market integration. The slight process of market disintegration in the middle of the trend could be related to the depression of the 1890s. Although the financial panic of 1893 mostly affected Europe and North America, the impacts of the

65. Due to collinearity of the 8 time dummies, the first period, corresponding to years 1870 to 1880 is omitted, and the trend estimated on the remaining 7 sub–periods.

depression could still have had ripple effects across the British Empire as the decline in trade and investment spread from the global core to the periphery. For example, British capital flows abroad declined by about 60% in 1893, and it was not until 1897 to 1898 that they resumed their earlier levels before the depression.[66] This timeline broadly corresponds to the general trend across plots under both measures of convergence and volatility, suggesting that there was a slight, if generally insignificant, effect of the panic of 1893 and the depression of the 1890s on the process of market integration in the global periphery of the Indian Ocean.

The potential effect of the panic of 1893 on market integration in the Indian Ocean is particularly evident in the case of overall convergence time trend in panel 2.8:A, where there is not significantly lower convergence until the final two sub–periods. However the volatility trend demonstrates a more distinct process of integration, despite a similar positive movement for the third and fourth sub–periods in the overall time trend in panel 2.9:A. The lack of significance between trends for convergence compared to volatility suggests a discrepancy in what each variable of integration is measuring. While regional price volatility can exhibit a decline simply as part of a general process of globalisation without any actual increase in trade, convergence time between bilateral pairs more directly establishes the actual trading relationship between pairs of cities.[67] As volatility shows significant within–period decline over time, and convergence does not, this suggests that the volatility trend is more reflective of a larger process of globalisation, whereas integration between actual trading cities according to convergence time is not observed until the final two periods, corresponding to the start of the twentieth century.

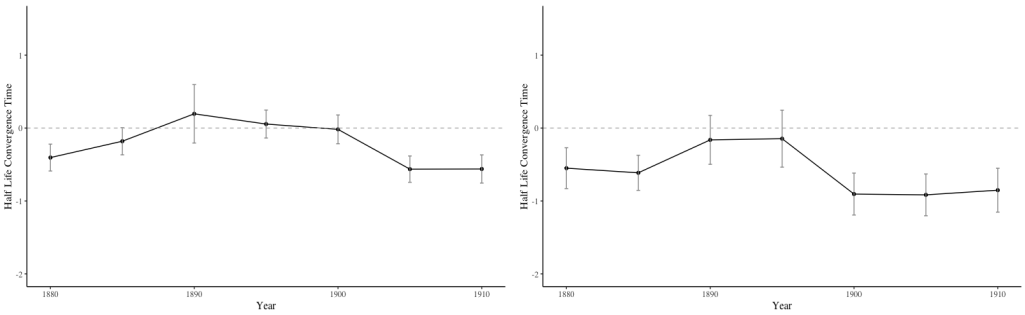
Taking the two measures of integration together, the only periods in which they are both consistently significant and negative are the final two. Hence the pure time trend for both measures suggest that there was a slower process of integration within the Indian Ocean compared to other studies that find a more sustained process of integration occurring globally during the period.[68] Although globalisation has been widely observed in this period based on integration between the global core and the periphery, by studying integration within the periphery, it demonstrates that what has been generally observed in relation to the global core was not equally true for regions within the periphery.[69]The remaining 7 panels in figures 2.8 and 2.9 take a subset of the data, identified by each variable of interest in addressing the three questions set out in this paper on the impacts of geography, transportation technology, and urbanisation variables, to observe how

66. Charles Hoffmann, *The Depression of the Nineties: An Economic History* (Westport, CT: Greenwood Publishing, 1970), pp. 193.

67. Federico, "How much do we know about market integration in Europe?"

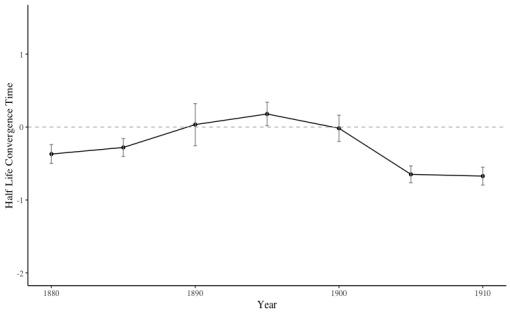
68. Jacks, "Intra and international commodity market integration in the Atlantic economy, 1800 - 1913."

69. Chilosi and Federico, "Early Globalisations: The integration of Asia in the world economy, 1800 - 1938."

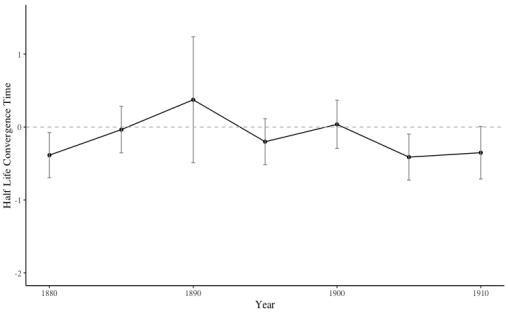


(a) Time

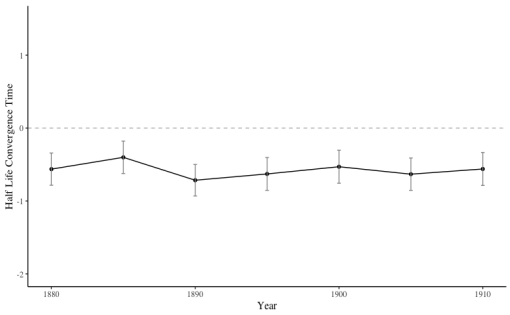
(b) Coast



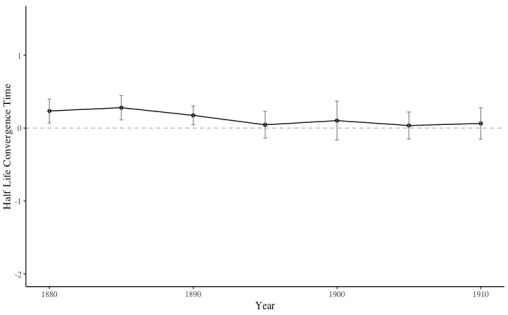
(c) Coast–interior



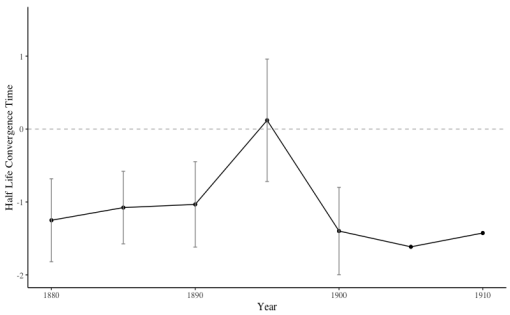
(d) Interior



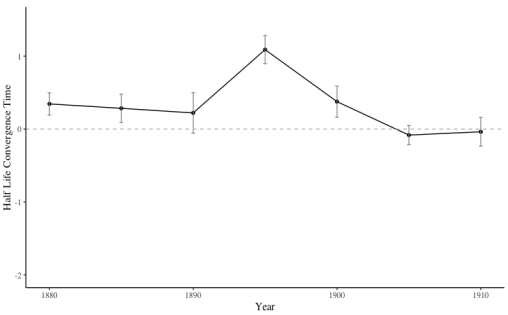
(e) Railroad



(f) River

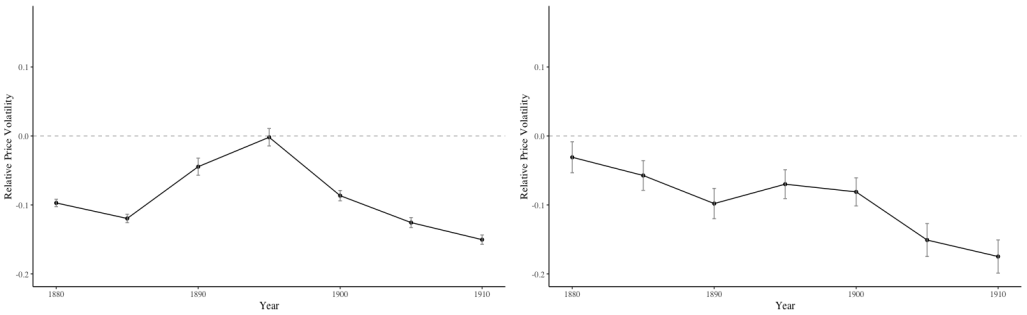


(g) Entrepot



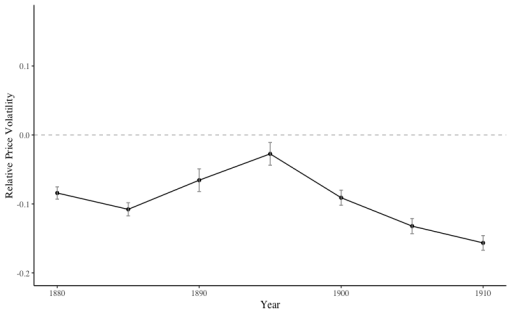
(h) Gold Standard

Figure 2.8: Half life convergence time trends of Z_{ijt} variables.

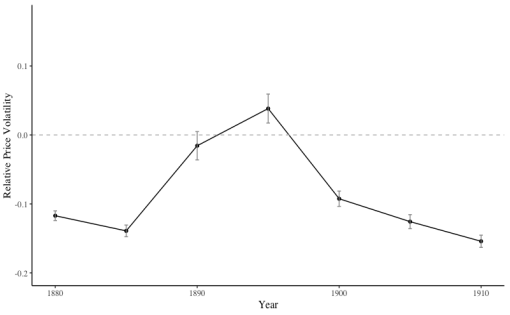


(a) Time

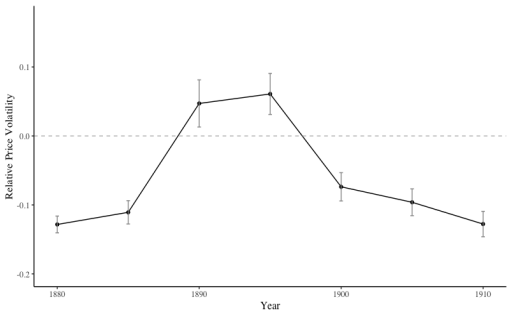
(b) Coast



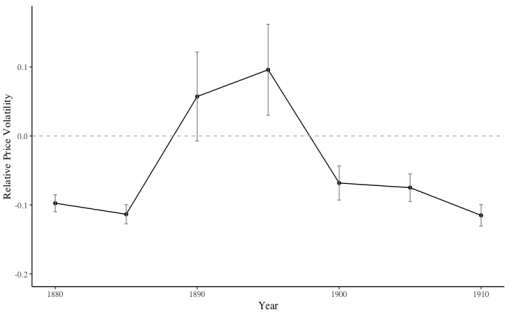
(c) Coast–interior



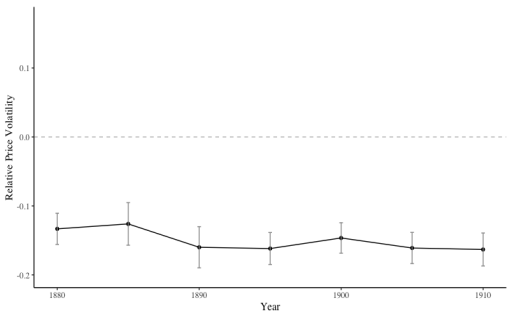
(d) Interior



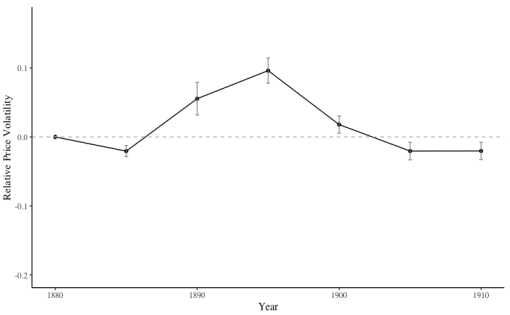
(e) Railroad



(f) River



(g) Entrepot



(h) Gold Standard

Figure 2.9: Volatility time trends of Z_{ijt} variables.

each contributed to integration over time. From the plots, there is significant variation in how each variable contributes to integration over time, but there is also overall consistency with the relative magnitude of coefficients from tables 2.2 and 2.3 and the time trends in figures 2.8 and 2.9.

Among the geographic variables assessing the relative economic orientation of Indian Ocean port cities, the *coast* and $coast - interior$ variables both demonstrate a negative trend when analysed under convergence and volatility, indicating that regional integration was driven by port cities, both with other port cities across the ocean, as well as between port cities and interior cities of the colonial hinterland. However the trend for both variables only shows a consistently greater effect on regional integration according to volatility, whereas the trend is not consistently significant under convergence. The similarity in the geographic variable trends compared to the pure time trend under both convergence and volatility suggests that the way in which integration in the region evolved according to geographic dimensions was similar to a broader process of globalisation. For example, although there was increased adoption of steamships within the Indian Ocean region, this was also a trend among trade routes globally.[70] Hence the trends on geographic dimensions do not convey a significantly different pattern over time than that observed on the pure time trend, since the Indian Ocean could have witnessed a process of integration that was a part of the global trend, or it could have been a part of expanding overseas trade either from increased steamship usage, from increased trade within and beyond the Indian Ocean, or both.

Despite the lack of consistent within–period significance, the downward trends for bilateral pairs where at least one city is a port city confirms the role of port cities in driving regional integration, and the greater impact that ports across the ocean had, rather than ports with other interior cities of the colonial hinterland. Consistent with previous results in tables 2.2 and 2.3 for convergence and volatility, *coast* city pairs have a greater effect in reducing convergence time and volatility, rather than $coast - interior$ city pairs. This is also observed for the coefficients in the last three sub–periods, which are the only sub–periods in which the geographic variables are significant under both convergence and volatility, demonstrating consistent evidence of regional integration between the two measures only in these latter three sub–periods. The more distinct trend and greater absolute value coefficients for *coast* compared to $coast - interior$ confirms that the port cities of colonial Asia were more economically oriented overseas rather than overland, and that integration between port cities across the ocean was the primary driver of integration in the region.

70. Andrew Pope, "British steamshipping and the Indian coastal trade, 1870 - 1915," *Indian Economic and Social History Review* 32, no. 1 (1995): 1–21.

Addressing the second question set out in this paper looking at the relative impact of forms of transportation technology, while railroad–connected city pairs consistently contribute to reduced within–period convergence time, this trend is not similarly observed under volatility. Discrepancy between the two measures again illustrates differences in what each variable is estimating. The construction of a railroad between two cities generally follows after trade has already been established to further facilitate it.[71] This would lead to more consistent reductions in convergence time rather than volatility, as price volatility would have less room for additional reductions since bilateral pairs of cities would already be trading, the existence of which would have already lead to lower volatility even before the establishment of a railroad. Even if there was an actual trading relationship between bilateral pairs that led to shorter convergence times for prices to reach equilibrium, the fact that the entire railway network was within British India could be a factor in naturally higher price volatility within the country, or could be due to the large area covered, contributing to variance in price shocks that are not common in time and space across the subcontinent. As a result of either of these potential issues leading to a naturally higher volatility, there could have been more consistently significant reductions in the convergence time trend for *railroad*, while not having the same effect on volatility.

Comparing this trend to variables of overseas integration, as proxies for steamship transportation technology, although the overall absolute value coefficients for *railroad* are smaller than either *coast* or *entrepot* city pairs in table 2.2, evidence from panel 2.8:E demonstrates that the within–period effect was more consistent over time than *coast*, most likely a result of the continually and steadily expanding railway network, whereas there was not any consistently contributing factor adding to the within–period effect for *coast* other than the potentially wider usage of steamships. Despite the consistency over time, the within–period effects of *railroad* are not as large in absolute value as that of *coast* or *entrepot* in the final three periods. The consistency in significance of the trend in the final sub–periods from the overall time trend in panel 2.8:A suggests that the impacts of steamships in driving integration between port cities of the Indian Ocean under *coast* and *entrepot* was related to the overall growing integration of the region as observed from the pure time trend. The greater absolute value coefficients for both *coast* and *entrepot* in the final three periods compared to *railroad*, and the similarity of the patterns to the overall time trend from figure 2.8 broadly confirms previous results on the overall greater effect of steamships in contributing to regional integration that was mostly driven by overseas integration.

71. Donaldson, "Railroads of the Raj: Estimating the Impact of Transportation Infrastructure"; Studer, "India and the Great Divergence: Assessing the Efficiency of Grain Markets in Eighteenth and Nineteenth Century India."

To illustrate how trends in the expansion of the rail network corresponds to measures of integration over time, figure 2.10 shows the percentage of total city pairs in the dataset that become connected to a railroad network in each period. From the figure, railroad expansion as a percentage of total city pairs in the dataset increased rapidly and linearly over the period. The existence of the Indian railways network pre–dated the beginning of the period of study in 1870. In 1853, Lord Dalhousie, head of the Government of India, outlined a plan for connecting India's five major provincial capitals of Bombay, Madras, Calcutta, Karachi, and Agra along direct routes. By 1869 all of the major trunk lines had been built. Between 1869 and 1880 railroad expansion had slowed significantly, but began expanding rapidly again after the 1880 Famine Commission recommended railroads as a means of future famine prevention.[72] Correspondingly in figure 2.10, there is not any noticeable change in the percentage of rail–connected cities between periods 1 and 2, corresponding to years 1870 to 1885, however from periods 3 to 8, the share of rail–connected cities continuously expanded until the outbreak of the First World War. The expansion of the rail network additionally corresponds to the stable and consistent trend of railroad–connected city pairs in reducing convergence time.

Addressing the third question of this paper looking at the exceptional role of the major colonial entrepots in driving Indian Ocean integration through their widely studied agglomeration and urbanisation effects, the trend for *entrepot* shows the largest absolute value within–period effect in driving integration over time under volatility and broadly under convergence, confirming the significance of the major entrepot cities to Indian Ocean integration. Although the overall coefficients on *entrepot* in tables 2.2 and 2.3 indicate that it had only the second and third largest effect on reducing convergence time and volatility respectively, the coefficients were very similar to *coast*. By comparison, the within–period effect of *coast* does not demonstrate a consistent or significant trend over time. If the lack of a distinctive trend on the geographic variables such as *coast* is due to lack of within–period changes occurring for all types of coastal cities, then the highly significant negative trends on *entrepot* are subsequently due to extensive within–period changes for the major entrepot cities. This suggests that the impact of entrepots on driving rapid regional market integration was related to a process of rapid centralisation of economic activity and growing urbanisation of the colonial entrepot due to first and second nature agglomeration.[73]

The period 1870 to 1914 is characterised by the integration of colonial Asia with the global

72. Donaldson, "Railroads of the Raj: Estimating the Impact of Transportation Infrastructure."

73. Paul Krugman, "First nature, second nature, and metropolitan location," *Journal of Regional Science* 33, no. 2 (1993): 129–144.

economy on the basis of vent–for–surplus model of economic growth.[74] Under this model, economic activity became focused around the primary entrepot cities that drove the colony's integration with the global economy. Primary ports therefore arose from first–nature geographic location advantages such as proximity to or centrality within an agricultural hinterland, and ease of access to other markets either via overseas or river transport. Second–nature advantages subsequently reinforce the concentration of economic activity as a form of feedback between the location of the primary city and the geography of demand and supply, agglomerating population and production close to or within the optimal location.[75] With this process of urban agglomeration in Asia typically associated with the period 1870 to 1914, the significant and largest magnitude within–period trends for *entrepot* city pairs is similarly demonstrative of the evolution of economic agglomeration at the primary entrepots.

However in a similar case as the *railroad* variable, which shows a steady and significant effect of within–period reductions to convergence time in panel 2.8:E, even though the within–period effect is greater compared to *coast*, the overall effect of each variable from tables 2.2 and 2.3 is consistently lower than *coast*. Hence while the trends in the within–period change over time may have been greater, demonstrating a greater added effect compared to the first period, Indian Ocean integration for the period overall was not primarily driven by the growing size of the railroad network or expanding economic centralisation at the primary port cities, but based on access to the ocean. Differences in results between tables 2.2 and 2.3 and the time trends in figures 2.8 and 2.9 suggest discrepancies in how each variable changes over time. The stable and significant within–period effect of *railroad* over time from panel 2.8:E corresponds to the steady expansion of the railroad network from figure 2.10. Likewise, while the degree of urbanisation and agglomeration at the major entrepot is not explicitly observed, the process of centralisation of economic activity at the colonial Asian entrepot in the period has been widely studied in the economic history literature.[76] Thus in both cases for *railroad* and *entrepot*, the significant within–period effects and the discrete trends over time are directly observed in figures 2.8 and 2.9. However in the case of *coast* there is not a clear process or trend over time that would be contributing to significant within–period changes for coastal cities other than the increased usage of steamships between ports of all sizes. Hence while *railroad* and *entrepot* show greater trends over time, they also show smaller absolute value coefficients across sub–periods compared to *coast*.

74. Huff, "Export-led Growth, Gateway Cities and Urban Systems Development in Pre-World War II Southeast Asia."
75. Krugman, "First nature, second nature, and metropolitan location."
76. Huff, *The Economic Growth of Singapore: Trade and Development in the Twentieth Century*; McGee, *The Southeast Asian City: A Social Geography of the Primate Cities of Southeast Asia*.

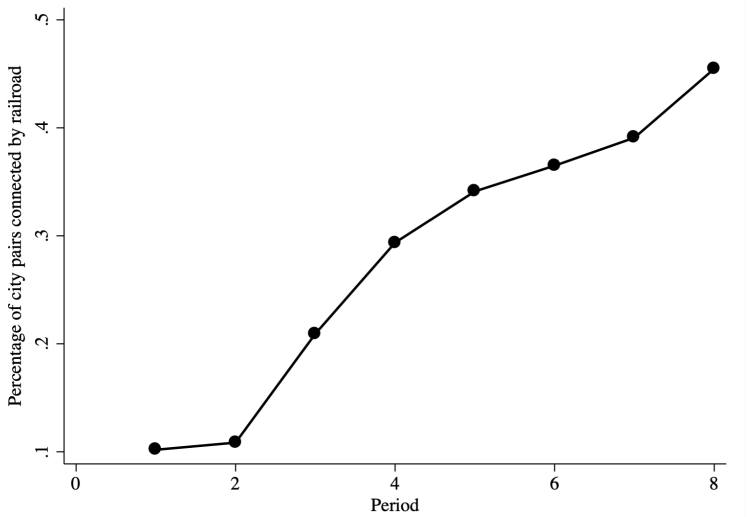


Figure 2.10: Percentage of total 7,225 city pairs in each period connected along the same railroad network

Other than evaluating the geographic, transportation, and urbanisation factors driving integration in the Indian Ocean, this paper has also addressed standard variables in studies of market integration, including monetary regime variables. In contrast to the magnitude and significance of the gold standard in reducing convergence time in table 2.2, and having the largest effect on reducing volatility in table 2.3, the pattern over time for the gold standard across both measures of integration is not significantly trending. Although adoption of the gold standard may have contributed to regional market integration overall, that it does not exhibit a trend within periods is indicative of the history of the gold standard in the region, and the fact that the inclusion of a variable measuring monetary policy changes on market integration is not a standard one. In typical models of arbitrage, the only role for monetary regimes such as the gold standard would be to ameliorate nominal exchange rate volatility, which would be largely absorbed by the *border* effect.[77] While all other variables of integration directly contribute to and facilitate trade between two locations, this is not true in the case of the gold standard. While the gold standard eases conversion of currencies between trading partners, it does not necessarily or automatically increase the actual trade between bilateral pairs, which would subsequently reduce convergence and volatility between two locations.

In addition, the history of the adoption of the gold standard for the Ottoman Empire and British India was a process that stretched over several years, and even then did not entirely penetrate all markets. Despite the Ottoman Empire's official adoption of the gold standard in 1880, silver continued to be accepted in unlimited amounts at a reduced rate, which essentially meant that both

77. Jacks, "What drove 19th century commodity market integration?"

gold and silver were recognised as legal tender.[78] In the case of British India, although the gold standard was officially adopted in 1893, it took 6 years until 1899 for the rupee to became fully convertible.[79] Thus for any individual period, the effect of *gold* on reducing convergence time or volatility would not be immediately apparent due to the discrepancy in the official adoption and usage of the gold standard, but only evident overall across the entire period of study.

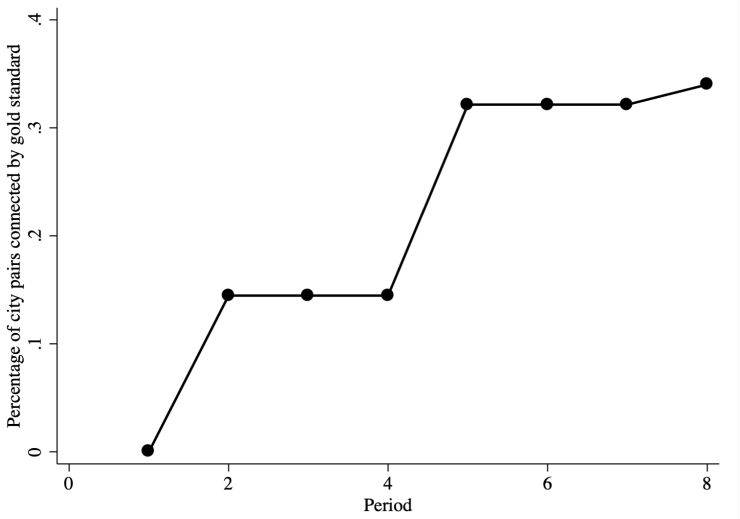


Figure 2.11: Percentage of total 7,225 city pairs in each period operating on the gold standard

Figure 2.11 illustrates the expansion in the percentage of city pairs out of the total dataset that become connected via the gold standard. As previously discussed, there are only three distinct points at which the percentage of city pairs connected via the gold standard changes, which correspond to the adoption of gold by the Ottoman Empire, British India, and the Straits Settlements. With the Ottoman Empire adopting the gold standard in 1880, this corresponds to period 2 based on table 2.1. The official year in which the Indian Rupee rose to the desired exchange value was in 1899, corresponding to period 5, which spanned the years 1890 to 1900, inclusive of the official adoption of the gold standard in 1893 until the rupee's rise to the official rate of 1 shilling and 4 pennies in 1899. Lastly, the Straits Settlements only became pegged to the British Pound in 1906 at a rate of 2 shillings and 4 pence per Straits dollar. Therefore implicitly, with the British Pound on the gold standard, the Straits Settlements also adopted the gold standard in 1906, corresponding to the final period in the dataset.

Although the trend in the expansion of gold standard–connected city pairs distinctly increases over the period, this is not matched by the trend on *gold* for either convergence or volatility. The

78. Ali Coskun Tuncer, "The Black Swan of the Gold Periphery: The Ottoman Empire during the Classical Gold Standard Era," *London School of Economics Working Papers*, no. 13 (March 2013): 1–38.
79. Cecco, *Money and Empire: The International Gold Standard, 1890 - 1914*, pp. 70 – 73.

trend is largely positive for most periods except the final two. Given the overall significance of *gold* in reducing price volatility and convergence time, and the variable's significant and negative effect only in the final two periods, this suggest that it was indeed an important factor in contributing to integration, but it was still only a lagged effect.

Collectively figures 2.8 and 2.9 confirm much of the evidence on the relative impact of variables driving the process of integration in the Indian Ocean seen previously in tables 2.2 and 2.3. The variables that were the greatest factors reducing convergence time and price volatility overall were also those that exhibited distinct negative trends. This is observed in the case of *entrepot* cities under both convergence time and volatility, and to a lesser extent *coast* under volatility. Where trends differ, in the case of *railroad*, it is most likely due to a difference in the measure of integration, and how the effect is captured over time, such as through an expanding railway network, or perhaps due to a naturally higher price volatility as a result of non–common price shocks. Separately, where overall magnitudes were low, even when significant, trends over time were either not significant, or did not exhibit a downward trend, as was the case with the *gold* and *river* variables.

2.9 Conclusion

This paper contributes to the history of market integration in Asia by focusing on integration within the Indian Ocean, a region that is uniquely characterised in the late nineteenth century by the nodal port city economy in which ports functioned as gateways through which the colony traded, linking the colonial hinterland to the global economy, and functioning as the foundation of its modern economic development under a vent-for-surplus model of growth.[80] With this in mind, this paper has sought to address three topics on market integration within the global periphery of colonial Asia: the process and role of the Indian Ocean port cities as factors contributing to regional integration, the relative impact of forms of transportation technology, and the exceptional role of the major colonial entrepots, as gateways linking the colonial hinterland to the global economy, in driving regional market integration.

In addressing these questions, this paper has approached integration according to a variety of measures including price ratios and price variation to assess the process of market integration according to the law of one price, and according to measures of equilibrium adjustment speed and relative price volatility to assess market efficiency. The two measures of market efficiency are subsequently analysed in a modified gravity model framework to identify the relative impact of the factors that contributed to market integration in the Indian Ocean. Consistency in the evidence

80. Huff, "Export-led Growth, Gateway Cities and Urban Systems Development in Pre-World War II Southeast Asia."

across measures and analysis provides confirmation firstly that port cities were key drivers to growing integration and were more integrated with other ports across the ocean rather than with cities of the colonial hinterland. Secondly, that despite the importance of technological developments in overland transport such as railroads and roads, overseas integration via steamships remained the main transportation innovation that contributed the most to regional integration. Third, that although extensive literature has focused on the unique social and economic role of the major colonial entrepots in this period, they were not any more integrated with other major ports than with minor ports of the Indian Ocean. Hence integration was primarily driven by access to the Indian Ocean rather than the size or function of the port itself.[81]

Within the literature on nineteenth century market integration, studies have typically focused on integration according to pre–defined national or continental units of analysis, rather than encompassing a larger oceanic region. This imposes a particular bias on certain factors of integration while overlooking others. This is particularly true in the case of the Indian Ocean, a region that has recently become the focus of extensive literature on the historical unities that spanned the ocean, but which were uniquely shared by the coastal communities. Historical analysis of market integration in Asia within colonial or national frameworks therefore overlook the much longer, shared history of these littoral communities as factors driving integration, and instead imposes a framework that biases an understanding of the history of economic integration and development in Asia. Hence the issue of how such geographic units of analysis are defined remains as important a topic of historical study as it is to studies of economic integration and economic geography in Asia.[82]

This paper has sought to address some of those issues by evaluating market integration outside of the traditionally defined regional or national boundaries. It has found that by expanding the geographic scope of integration beyond any artificially imposed political geography, that overseas networks of port cities mattered more to driving the process of market integration within the global periphery, rather than integration over land. This finding demonstrates that there is economic validity to the historical literature that has identified transoceanic networks and unities that connected a distinct maritime Indian Ocean society in comparison to colonial Asian societies as they are continentally defined. This paper offers quantitative support for the role of the Indian Ocean as a unifying factor in these traditionally separate regional histories, the exceptional economic orientation of the Indian ports in relation to the colonial interior, and the significance of the Indian Ocean not only as an historical, but also as an economic unit of analysis.

81. Frank Broeze, ed., *Brides of the Sea: Port Cities of Asia from the 16th - 20th Centuries* (University of Hawaii Press, 1989).

82. Braudel, *The Mediterranean and the Mediterranean World in the Age of Philip II*, pp. 35 – 38.

2.10 Appendix

SECTION 1

Main analysis of the variables driving market integration have employed a modified gravity model framework to estimate the effects of each factor of Indian Ocean integration. In this section, alternative methods to the gravity model estimation are used as a basis of comparison, and to ensure consistency in the results. Under both estimates of half life convergence time and relative price volatility, analysis has removed missing observations that arose from compiling the unbalanced time series, as illustrated in table 2.1 in order to ensure parameter stability. From table 2.1, there are several cities in which price data is not available in the earlier sub–periods. Hence in the process of sub–dividing measures of integration across 8 overlapping periods, there are several sub–periods in which price data for a given city i is not equally available in all years compared to all other cities j, resulting in missing or zero observations.

From bilateral city pair estimates on 85 cities across 8 sub–periods, there are a potential 57,800 observations. Of these potential observations there are 23,708 observations that are missing under estimates of convergence time. There are additionally 314 observations with a value less than 0, which is inconsistent with the measure of the length of time for prices between two locations to converge to equilibrium, which must be positive. This leaves 33,778 total observations for convergence time. Similarly, calculating relative price volatility in an unbalanced time series dataset results in missing observations between bilateral pairs of cities. There are 17,288 missing observations from the potential 57,800 leaving a dataset of 40,512.[83]

Several studies have evaluated the proper specification for the standard gravity model when dealing with zero values in the trade dataset. The typical treatment of zero values in the large majority of empirical studies, including in the main estimation of this paper, is to drop bilateral pairs with zero trade from the data set, and estimate the log linear form of the gravity model by OLS.[84] As an alternative, Silva and Tenreyro (2005) have proposed a poisson pseudo–maximum likelihood model to deal with heteroskedasticity and the extensive existence of zero values that typically appear in trade data.[85] Under poisson pseudo–maximum likelihood, zero values are included rather than omitted from the trade data, and weights are introduced to all observations in order to control for biases in observations with a large conditional mean, essentially controlling for biases that may

83. Due to differences in how convergence time and volatility are calculated, there is a different threshold for the number of observations needed between any ij bilateral pair within each sub–period. To calculate the standard deviation of the change in relative price volatility between locations, only two observations are needed. Under convergence time, the first stage regression of β_1 estimates for the speed of adjustment requires at least 4 observations to calculate an adjustment speed in each 11–year overlapping sub–period. Due to the different minimum number of observations required for each measure, the number of resulting bilateral pair observations between all 85 cities over 8 sub–periods is different for each measure. Since convergence time has a higher requirement for number of observations, there are less observations than under volatility.

84. J. Frankel, *Regional Trading Blocs in the World Economic System* (Washington DC: Institute for International Economics, 1997).

85. J. M. C. Santos Silva and Silvana Tenreyro, "The log of gravity," *The Review of Economics and Statistics* 88, no. 4 (November 2006): 641–658.

come from large countries which trade much more frequently than smaller countries which have lower trade volumes and less observations.

Additionally, a separate solution to the issue of zero values and missing observations in the trade data matrix is proposed by Helpman et al. (2008).[86] They have demonstrated that the presence of zero trade between bilateral pair can be an issue of sample selection bias. Therefore the sample from which the gravity function is estimated is not representative of the actual trading system, but only cases in which trade exists. Essentially, the problem of zero values in the trade matrix is an omitted variable bias. A proposed solution to this issue is the sample selection correction, proposed by Heckman (1979), and adapted to a model for international trade in a gravity framework by Helpman et al. (2008). Heckman's sample selection correction adapted for the gravity model of trade results in a two–step equation. In the first, a probit selection equation describes the relationship between the probability of trade and a set of explanatory variables. The probit estimates are then used to calculate the inverse Mill's ratio, which corresponds to the probability of a selection variable omitted from the equation. Given the probability selection, the second equation takes the consistent estimation of the log–linear equation, where the inclusion of the probit estimates solves the omitted variable bias and produces estimates that are consistent in the presence of non-random sample selection.

Given the extent of missing price data for individual cities from table 2.1, the presence of outliers, and the expansion of the dataset in a two–step modified gravity model procedure, the two alternative methods proposed by Silva and Tenreyro (2005) and Helpman et al. (2008) are employed, alongside the same fixed–effects model used in tables 2.2 and 2.3, as well as the same fixed–effects model including all zero and missing values. Results are compared in table 2.4 for measures of half–life convergence, and table 2.5 for measures of relative price volatility.

From table 2.4, the results from the fixed–effects OLS, the poisson pseudo–maximum likelihood and the Heckman sample selection estimator are all shown with the full set of variables from column 6 of table 2.2 on half life convergence time. Results show consistency in the relative magnitude of each variable within each model. The coefficients and significance of each variable vary slightly across the three methods, but a ranking of relative magnitudes overall demonstrates the same conclusions as that observed under the model used in the main section of the paper.

Cases in which coefficients change the ranking of variables of integration are observed for $railroad$ and $gold$. Although the main results in column 1 show $railroad$ having the third largest effect on integration after port cities, under methods in columns 3 and 4, $railroad$ has a smaller magnitude compared to $coast - interior$, suggesting that $railroad$ had less of an effect on regional integration than interior city integration with port cities. Although this does not change conclusions on the greater role of steamship transportation in Indian Ocean integration, it does affect the interpretation of interior city orientation, being either more integrated with coastal cities or other

86. Elhanan Helpman, Marc Melitz, and Yona Rubinstein, "Estimating trade flows: Trading partners and trading volumes," *Quarterly Journal of Economics* 123, no. 2 (May 2008): 441–487.

Table 2.4: Comparison of convergence time estimates under multiple methods

Indicator	(1) FE–1	(2) FE–2	(3) PPML	(4) Heckman
Log Distance	0.527*	0.222***	0.229***	0.750***
	(0.298)	(0.028)	(0.029)	(0.037)
Log Distance Squared	–0.042*	–0.018***	–0.019***	–0.052***
	(0.023)	(0.003)	(0.004)	(0.003)
Border	1.021***	0.561***	0.561***	0.992***
	(0.115)	(0.073)	(0.073)	(0.141)
River	–0.105	–0.016	0.019	–0.155
	(0.069)	(0.051)	(0.052)	(0.144)
Coast	–0.706***	–0.704***	–0.682***	–0.766***
	(0.092)	(0.076)	(0.064)	(0.126)
Coast to Interior	–0.313***	–0.329***	–0.301***	–0.351***
	(0.097)	(0.069)	(0.070)	(0.068)
Railroad	–0.336**	–0.135***	–0.129***	–0.362**
	(0.138)	(0.041)	(0.040)	(0.163)
Entrepot	–0.602***	–0.299***	–0.346***	–0.492***
	(0.144)	(0.086)	(0.083)	(0.190)
Gold	–0.225**	0.085*	0.092	–0.248**
	(0.104)	(0.047)	(0.049)	(0.114)
Constant	0.175	0.602***	0.434***	–2.926***
	(0.933)	(0.070)	(0.073)	(0.023)
Time–period fixed effects	Yes	Yes	Yes	Yes
City–pair fixed effects	Yes	Yes	Yes	Yes
Obs	33778	57800	57800	57800
R2	0.0221	0.0125	0.013	–

Notes: Column 1 refers to the same fixed–effects OLS model used in table 2.2. Column 2 uses the same fixed–effects model in equation 2.7 including all missing and zero observations. Column 3 is the poisson–pseudo maximum likelihood model. Negative convergence time observations are windsorised to zero. In column 4 under Heckman's correction for bias estimators, the full dataset with outlying and missing data are included but treated as no trade. *, **, and *** denote significance at the 10, 5 and 1 per cent level.

cities connected by railroad.

The effect of gold standard adoption is also more ambiguous from table 2.4, as it is neither consistently significant nor negative across models. In the original fixed–effect model in column 1, gold standard adoption is both significant and negative, which is similarly observed under Heckman's model in column 4. However under the fixed–effects model in column 2 and PPML in column 3, the coefficients are positive, indicating that it contributes to greater length of convergence time. The mixed results on the effect of monetary regimes suggests that it did not have a large impact on regional integration compared to geographic or transportation technology variables. Despite the mixed results on whether or not gold standard adoption significantly contributed to or detracted from integration in the Indian Ocean, the coefficient in the main results has one of the lowest absolute value effects, thus it was never a major factor to Indian Ocean integration.

Despite changes in the relative magnitude of factors of integration, the results from table 2.4 confirms conclusions made under fixed–effects model without missing observations in the main analysis with a similar magnitude and ranking of coefficients across all other models. While there are some differences, the conclusions made in this paper on the greater overseas orientation of port cities, the greater role of steamships compared to railroads, and the secondary importance of the major colonial entrepots as factors of integration are all confirmed when including missing observations.

SECTION 2

Previous analysis has introduced and compared results under a modified gravity equation that includes missing observations under the same fixed–effects model, PPML and Heckman's estimator under half life convergence time. The same analysis is repeated to compare analysis on measures of relative price volatility. Results from using volatility as the dependent variable in the modified gravity model equation are shown in table 2.5. Comparing variables of integration and their impact on volatility show similar consistency across all three models as shown under convergence, with consistent rankings of variables of integration and significance.

Variables in which the relative impacts are affected by changing magnitudes is observed on $railroad$, $entrepot$, and $gold$. Across the first three columns, the coefficient on $railroad$ is the third largest after $coast$ and $entrepot$. Only in the case of column 4 under Heckman's model is the $railroad$ coefficient lower than $coast - interior$, however the difference in magnitude is so small that differences in the ranking of variables does not convey any real changes in the overall findings. This generally confirms results from the previous appendix table 2.4 and from the main analysis of the greater role of steamships, or simply access to the Indian Ocean, in driving market integration in the region.

$Entrepot$ has the second largest effect on reducing price volatility under three of the four models after $coast$. However under PPML, $entrepot$ is actually the largest factor driving regional integration. While $entrepot$ is largest under PPML, the second–largest variable is $coast$, thus generally confirming that regardless of the size of the port, it was primarily access to the ocean that mattered for regional integration.

As previously observed under comparative models of convergence, analysis of volatility similarly shows discrepancies in the magnitude and significance of gold standard adoption. While it has the largest magnitude under the fixed–effects model without missing observations, the effect becomes relatively weaker under alternate models. By including missing observations under column 2, despite being negative and significant, it has the lowest magnitude effect of all variables of integration. This effect is similarly the second lowest, just above *river*, under models in columns 2 and 3. In the case of column 4, gold standard adoption has the weakest effect, and is not significant under Heckman's model.

The mixed evidence of the gold standard is similarly found when analysed under measures of

Table 2.5: Comparison of volatility estimates under multiple methods

Indicator	(1) FE–1	(2) FE–2	(3) PPML	(4) Heckman
Log Distance	0.060***	0.054***	0.840***	0.064***
	(0.020)	(0.006)	(0.028)	(0.003)
Log Distance Squared	–0.003**	–0.002***	–0.054***	–0.004***
	(0.001)	(0.0004)	(0.002)	(0.0003)
Border	0.020***	0.004	0.040**	0.014***
	(0.004)	(0.005)	(0.014)	(0.004)
River	–0.016***	–0.008**	–0.011	0.027***
	(0.003)	(0.004)	(0.022)	(0.005)
Coast	–0.035***	–0.039***	–0.136***	–0.094***
	(0.008)	(0.009)	(0.031)	(0.009)
Coast to Interior	–0.016***	–0.019***	–0.079***	–0.039***
	(0.004)	(0.005)	(0.016)	(0.004)
Railroad	–0.021***	–0.020***	–0.093***	–0.034***
	(0.003)	(0.003)	(0.012)	(0.003)
Entrepot	–0.034***	–0.033***	–0.164***	–0.053***
	(0.009)	(0.009)	(0.033)	(0.010)
Gold	–0.036***	–0.014***	–0.048***	0.004
	(0.005)	(0.004)	(0.012)	(0.003)
Constant	0.006	0.009	–4.623***	–0.305***
	(0.069)	(0.021)	(0.111)	(0.060)
Time–period fixed effects	Yes	Yes	Yes	Yes
City *i* fixed effects	Yes	Yes	Yes	Yes
City *j* fixed effects	Yes	Yes	Yes	Yes
Obs	40512	57800	57800	57800
R2	0.339	0.357	0.404	–

Notes: Column 1 illustrates the same results from the fixed–effects OLS model used in table 2.3. Column 2 uses the same fixed–effects model in equation 2.7 including all missing and zero observations, but negative measures of volatility are windsorised to zero. The poisson–pseudo maximum likelihood model is presented on the full relative volatility data set in column 3. Column 4 presents the full results under Heckman's correction for bias estimators. *, **, and *** denote significance at the 10, 5 and 1 per cent level.

half life convergence. Although there is extensive literature demonstrating how monetary regimes contribute to market integration, in the case of the Indian Ocean, gold standard adoption has a relatively weaker effect on contributing to market integration compared to natural geography or transportation technology variables.[87] Overall, comparative assessment of factors of market integration across measures of half life convergence and price volatility, and across four methods of gravity model analysis have yielded consistent results, with the main conclusions of this paper confirmed in tables 2.4 and 2.5.

SECTION 3

Previous robustness tests have compared various models for dealing with zero trade data in the second–stage gravity model. In this section, robustness of the model in the treatment of errors is

tested. In the second stage of the estimation, the output of the error correction model from equation 2.3 is regressed via OLS with time period and bilateral fixed effects for each ij pair in each time period t from equation 2.6. In table 2.6, the estimates of the preferred specification used in table 2.2 are compared with alternate results, which assume different structures of the error terms. The standard fixed–effects model is shown in column 1, and columns 2 – 4 estimates different structures to errors under various GLS models.

In column 2, a generalised least square model with fixed effects and controls for auto–correlation between panels is estimated. In this model, errors are auto–correlated between time–periods. Columns 3 and 4 estimate two alternative heteroskedastic error structures. Under GLS.1, heteroskedastic errors are examined within time panels t, and under GLS.2, heteroskedastic errors are examined within city pair ij panels. From column 3, given the expansion of the railroad network or gold standard adoption across panels, the trends on convergence times within each time panel from figure 2.8 could result in variations of the scale. Under GLS.2, heteroskedastic errors could be due to variations in the size and scale of cities and city–pairs. Although the indicator variable $entrepot$ is intended to capture such differences resulting from the size of cities, which has been shown throughout the analysis to be significant, variation in scale could also have an effect on the error structure.

Across alternate models of errors in table 2.6 results are largely consistent with the main results. Although there are some discrepancies in the relative magnitude and ranking of variables as drivers of integration, changes in variable rankings does not change the overall conclusions. $Coast - interior$ is significant and negative across models, but the relative magnitude alternates in ranking between the second largest after *coast* under columns 1 and 2, and third largest under columns 3 and 4. Although the ranking of the variables changes, it is still consistently weaker than *coast*, confirming that interior cities were more integrated with port cities than with other cities of the interior, however port cities were more integrated with each other across the Indian Ocean.

City pairs where both cities were major colonial entrepots show some discrepancy in the relative magnitude across models, being the second largest factor of integration under column 3, the third largest under columns 1 and 2, and being the smallest under column 4. Discrepancies in the relative impact of the major colonial entrepots confirms previous inferences made on the weaker effect of entrepot cities as factors of integration compared to integration of port cities generally, demonstrating that the size of or degree of economic centralisation at the port did not matter as much as a factor of regional integration as much as simply having access to the Indian Ocean.

Lastly, the only variable in which assumptions of the error structure actually affects variable significance is on gold standard adoption. Although generally weaker as a factor of integration compared to the primary variables of interest from the main table 2.2, the effect of *gold* shifts widely in terms of level of significance as well as whether or not it has a positive or negative effect

87. Jacks, "What drove 19th century commodity market integration?," Among 6 variables that positively contribute to market integration measured according to trade costs or adjustment speed, Jacks finds that gold standard adoption had either the highest or second highest impact.

Table 2.6: Time and city panel effects, with and without controls for auto–correlation on measures of half life convergence time

Indicator	FE–2	GLSAC	GLSFE (1)	GLS (2)
Log Distance	0.222***	0.211***	0.159***	0.121***
	(0.028)	(0.057)	(0.026)	(0.018)
Log Distance Squared	–0.018***	–0.016***	–0.009***	–0.007***
	(0.003)	(0.006)	(0.003)	(0.002)
Border	0.561***	0.557***	0.262***	0.178***
	(0.073)	(0.062)	(0.028)	(0.019)
River	–0.016	–0.017	0.094**	0.062**
	(0.051)	(0.086)	(0.039)	(0.028)
Coast	–0.704***	–0.703***	–0.571***	–0.389***
	(0.076)	(0.065)	(0.029)	(0.020)
Coast to Interior	–0.329***	–0.330***	–0.249***	–0.172***
	(0.069)	(0.041)	(0.018)	(0.014)
Railroad	–0.135***	–0.101*	–0.174***	–0.176***
	(0.041)	(0.056)	(0.026)	(0.018)
Entrepot	–0.299***	–0.297***	–0.282***	–0.156***
	(0.086)	(0.113)	(0.051)	(0.041)
Gold	0.085*	0.045	0.074***	–0.073***
	(0.047)	(0.052)	(0.023)	(0.016)
Constant	0.602***	0.599	0.586	0.209***
	(0.070)	(1.457)	(0.655)	(0.056)
Time–period fixed effects	Yes	Yes	Yes	Yes
City–pair fixed effects	Yes	Yes	Yes	Yes
Obs	57800	57800	57800	57800
R2	0.0125	–	–	–
Wald χ–squared	–	735.43	1678.53	1117.28
Prob > χ–squared	–	0.000	0.000	0.000

Notes: Column 1 illustrates the same results from the full fixed–effects model from column 2 of table 2.4 as a basis of comparison. Column 2–4 compare various methods for treating heteroskedastic errors other than by using time and city clustered fixed effects. Analysis uses the full dataset of 57800 observations including missing observations, of which there are 23,708. Negative observations are inconsistent with the length of time to half life convergence measure, so have been winsorized to zero, of which there are 314 observations. *, **, and *** denote significance at the 10, 5 and 1 per cent level.

on regional market integration. The uncertain evidence from 2.6 suggests that whichever effect gold standard adoption did have on integration, it was weak, or at least relatively weaker than the other geographic, transportation technology, or urbanisation factors of integration that have also been studied in contributing to Indian Ocean integration.

SECTION 4

Robustness tests on the treatment of error terms in the main model are repeated under measures of volatility in table 2.7. Estimates in column 1 are the baseline estimates from the full dataset of city i, city j, and time period fixed effects model used in table 2.5, column 2.

Under column 2 of table 2.7 the GLSAC model controls for auto–correlation of errors within

city panels. Columns 4 and 5, estimate two different heteroskedastic error structures on time and city panels, respectively. Under GLS.1, heteroskedastic errors are specified within time panels, and under GLS.2, they are specified within city panels.

Generally, results on the relative impact of factors driving market integration in the Indian Ocean are consistent across models, and consistent with the main results, although in some cases they contrast with the ranking of variable magnitudes from convergence time. In contrast to previous evidence from table 2.6 which finds that interior cities were more integrated with port cities rather than with railroad–connected cities, under measures of volatility railroad–connected cities contribute more to integration. *Railroad* is consistently the third largest factor driving market integration in the region, which contrasts with its ranking under measures of convergence time. Although *railroad* has the third largest effect on reducing relative price volatility under the set of models in table 2.7 this effect is still lower than *coast* or *entrepot*, which proxy for steamship–connected cities, both of which consistently demonstrate larger absolute values in coefficients across models, hence confirming the greater role of steamships relative to railroad transportation in integrating the region.

Additionally, as previously observed across robustness tests, results on *gold* show inconsistent and ambiguous results. *Gold* has the second largest coefficient in column 2, and the third largest in columns 1, 3, and 4, indicating that overall it had a much larger effect on integration compared to railroads, and compared to port city integration with the interior. That *gold* is also consistently lower than *coast* or *entrepot* also confirms the greater role played by simply having access to the Indian Ocean. Contrasting with evidence when modelling different error structures between convergence time and volatility highlights the difference in how each measure is evaluating integration. While convergence time assesses a direct trading relationship between two locations in the form of a rate or length of time to reach price equilibrium, changes in volatility could be due to a number of exogenous factors, and not necessarily related to the direct trading relationship between bilateral pairs of cities. Comparing results between the two measures of integration suggests that gold standard adoption significantly reduced volatility in prices between two locations that were on it, but it did not clearly contribute to an increase in trade between locations on the basis of gold standard adoption alone.

The results from additional estimation methods to control for the trend or autocorrelation in errors still upholds the main results of this paper that identifies a greater overseas orientation of the port cities of the Indian Ocean in comparison to integration with interior cities of the colonial hinterland in closer proximity, the greater role of overseas integration via steamship in comparison to overland via railroads, and that the Indian Ocean itself was the greatest factor of integration rather than the size or function of the port city within the colonial Indian Ocean economy.

Table 2.7: Time and city panel effects, with and without controls for auto–correlation on measures of relative price volatility

Indicator	FE–2	GLSAC	GLSFE (1)	GLS (2)
Log Distance	0.054***	0.058***	0.052***	0.052***
	(0.006)	(0.012)	(0.010)	(0.093)
Log Distance Squared	–0.002***	–0.003***	–0.002***	–0.002***
	(0.0004)	(0.001)	(0.001)	(0.001)
Border	0.004	0.017***	0.023***	0.013***
	(0.005)	(0.005)	(0.004)	(0.004)
River	–0.008**	–0.016***	–0.016***	–0.015***
	(0.004)	(0.005)	(0.004)	(0.004)
Coast	–0.039***	–0.035***	–0.046***	–0.037***
	(0.009)	(0.013)	(0.010)	(0.010)
Coast to Interior	–0.019***	–0.015**	–0.019***	–0.016***
	(0.005)	(0.006)	(0.005)	(0.005)
Railroad	–0.020***	–0.022***	–0.021***	–0.020***
	(0.003)	(0.004)	(0.003)	(0.003)
Entrepot	–0.033***	–0.034**	–0.041***	–0.035***
	(0.009)	(0.014)	(0.011)	(0.011)
Gold	–0.014***	–0.034***	–0.040***	–0.023***
	(0.004)	(0.004)	(0.004)	(0.004)
Constant	0.009	0.008	0.049	0.038
	(0.021)	(0.045)	(0.037)	(0.035)
Time–period fixed effects	Yes	Yes	Yes	Yes
City *i* fixed effects	Yes	Yes	Yes	Yes
City *j* fixed effects	Yes	Yes	Yes	Yes
Obs	57800	57800	57800	57800
R2	0.357	–	–	–
Wald χ–squared	40278.85	20773.09	18320.67	21794.86
Prob > χ–squared	0.000	0.000	0.000	0.000

Notes: Column 1 illustrates the same results from the full fixed–effects model from column 2 of table 2.5 as a basis of comparison. Column 2–4 compare various methods for treating heteroskedastic errors other than by using time and city clustered fixed effects. Analysis uses the full dataset of 57800 observations including missing observations, of which there are 17,288. *, **, and *** denote significance at the 10, 5 and 1 per cent level.

2.11 Bibliography

primary sources

Annual Report of the Department of Agriculture, Bombay Presidency. Annual Series. Department of Agriculture, 1900 - 1914.

Annual Report on the Administration of the Bengal Presidency. Report of Administration. Bengal Secretariat Office, 1870 - 1915.

Annual Statement of Sea-borne Trade and Navigation with Foreign Countries and Indian Ports. Annual Series. Calcutta: Bengal Secretariat Office, 1870 - 1931.

Diplomatic and Consular Reports on Trade and Finance. Annual Series. Persia: Foreign Office, 1870 - 1914.

Diplomatic and Consular Reports on Trade and Finance. Annual Series. Egypt: Foreign Office, 1870 - 1914.

Diplomatic and Consular Reports on Trade and Finance. Annual Series. Turkey: Foreign Office, 1870 - 1914.

Report on the Administration of the Bombay Presidency. Annual Series 45 Volumes. Government Central Press, 1877 - 1922.

Review of the Trade of India. East India Reports, Annual Series. House of Commons Parliamentary Papers, 1880 - 1916.

Statistical Abstract for the United Kingdom. Annual Series. Statistical Department, Board of Trade, 1860 - 1940.

Statistical Abstract relating to British India from 1875/6 to 1884/5. Annual Series 20. Eyre and Spottiswoode, London: House of Commons Parliamentary Papers, 1886.

Statistical Abstract relating to British India from 1877/8 to 1886/7. Annual Series 22. Eyre and Spottiswoode, London: House of Commons Parliamentary Papers, 1888.

Statistical Abstract relating to British India from 1881/2 to 1889/90. Annual Series 25. Eyre and Spottiswoode, London: House of Commons Parliamentary Papers, 1891.

Statistical Abstract relating to British India from 1885/6 to 1894/5. Annual Series 30. Eyre and Spottiswoode, London: House of Commons Parliamentary Papers, 1896.

Statistical Abstract relating to British India from 1888/89 to 1897/98. Annual Series 33. Stationary Office, Wyman and Sons, London: House of Commons Parliamentary Papers, 1899.

Statistical Abstract relating to British India from 1892/3 to 1901/2. Annual Series 37. Stationary Office, Wyman and Sons, London: House of Commons Parliamentary Papers, 1903.

Statistical Abstract relating to British India from 1895/96 to 1904/05. Annual Series 40. Stationary Office, Wyman and Sons, London: House of Commons Parliamentary Papers, 1906.

Statistical Abstract relating to British India from 1903/04 to 1912/13. Annual Series 48. Stationary Office, Eyre and Spottiswoode, London: House of Commons Parliamentary Papers, 1915.

Statistical Abstract relating to British India from 1912/13 to 1921/22. Annual Series 57. Stationary Office, London: House of Commons Parliamentary Papers, 1925.

Statistical Tables Relating to British Colonies. Annual Series. House of Commons Parliamentary Papers, 1870 - 1914.

The Several British Self-Governing Dominions, Colonies, Possessions, and Protectorates. Report of Trade, Annual Series. House of Commons Parliamentary Papers, 1860 - 1940.

Trade and Finance in the Bengal Presidency. Report of Trade. Bengal Secretariat Office, 1850 - 1914.

Amrith, Sunil S. *Crossing the Bay of Bengal: The Furies of Nature and the Fortunes of Migrants*. Harvard University Press, 2013.

Andrabi, Tahir, and Michael Kuehlwein. "Railways and Price Convergence in British India." *The Journal of Economic History* 70, no. 2 (June 2010): 351–377.

Bahmani-Oskooee, Mohsen. "History of the Rial and Foreign Exchange Policy in Iran." *Iranian Economic Review* 10, no. 14 (Fall 2005): 1–20.

Bateman, Victoria N. "The Evolution of Markets in Early Modern Europe, 1350 - 1800: A Study in Grain Prices." *Oxford Discussion Papers*, no. 350 (2007): 1–66.

Bose, Sugata. *A Hundred Horizons: The Indian Ocean in the Age of Global Empire*. London: Harvard University Press, 2006.

Braudel, Fernand. *The Mediterranean and the Mediterranean World in the Age of Philip II*. University of California Press, 1995.

Broeze, Frank, ed. *Brides of the Sea: Port Cities of Asia from the 16th - 20th Centuries*. University of Hawaii Press, 1989.

Brown, Ian. *Burma's Economy in the Twentieth Century*. Cambridge: Cambridge University Press, 2013.

Burgess, Robin, and Dave Donaldson. "Can openness mitigate the effects of weather shocks? Evidence from India's Famine Era." *American Economic Review* 100, no. 2 (May 2010): 449–453.

Cecco, Marcello de. *Money and Empire: The International Gold Standard, 1890 - 1914*. Oxford: Basil Blackwell, 1974.

Chaudhuri, K. N. *Asia before Europe : Economy and Civilisation of the Indian Ocean from the Rise of Islam to 1750*. Cambridge University Press, 1990.

———. *Trade and Civilisation in the Indian Ocean : An Economic History from the Rise of Islam to 1750*. Cambridge University Press, 1985.

Chilosi, David, and Giovanni Federico. "Early Globalisations: The integration of Asia in the world economy, 1800 - 1938." *Explorations in Economic History* 57, no. 1 (2015): 1–18.

Coclanis, Peter A. "Distant Thunder: The Creation of a World Market in Rice and the Transformation it Wrought." *American Historical Review* 98, no. 4 (1993): 1050–1078.

Cotton, H. J. S. "The Rice Trade in Bengal." *Calcutta Review* 58 (1874): 171–188.

Devereux, Michael B., Charles Engel, and Cedric Tille. "Exchange rate pass-through and the welfare effects of the Euro." *International Economic Review* 44, no. 1 (February 2003): 223–242.

Donaldson, Dave. "Railroads of the Raj: Estimating the Impact of Transportation Infrastructure." *LSE Asia Research Centre Working Papers*, no. 41 (2010): 1–54.

Engel, Charles, and John H. Rogers. "How Wide is the Border?" *American Economic Review* 86, no. 5 (1996): 1112–1125.

Fan, C. Simon, and Xiangdong Wei. "The law of one price: Evidence from the Transitional Economy of China." *Review of Economics and Statistics* 88, no. 4 (2006): 682–697.

Fatas, Antonio, and Ilian Mihov. "Policy Volatility, Institutions, and Economic Growth." *Review of Economics and Statistics* 95, no. 2 (May 2013): 362–376.

Federico, Giovanni. "How much do we know about market integration in Europe?" *Economic History Review* 65, no. 2 (2012): 470–497.

Fenske, James, and Namrata Kala. "Linguistic Distance and Market Integration in India." *Centre for Competitive Advantages in the Global Economy Working Papers*, no. 331 (May 2017): 1–33.

Ferguson, Niall, and Moritz Schularick. "The Empire Effect: The Determinants of Country Risk in the First Age of Globalisation, 1880 - 1913." *The Journal of Economic History* 66, no. 2 (June 2006): 283–312.

Foad, Hisham. "Europe without borders? The effect of the Euro on price convergence." *International Regional Science Review* 33, no. 1 (January 2010): 86–111.

Frankel, J. *Regional Trading Blocs in the World Economic System*. Washington DC: Institute for International Economics, 1997.

Fujita, Masahisa, and Tomoya Mori. "The role of ports in the making of major cities: Self-agglomeration and hub-effect." *Journal of Development Economics* 49, no. 1 (1996): 93–120.

Furnivall, John S. *Colonial Policy and Practice: A Comparative Study of Burma and Netherlands India*. Cambridge University Press, 1948.

Giovanni, Julian di, and Andrei A. Levchenko. "Trade Openness and Volatility." *Review of Economics and Statistics* 91, no. 3 (2009): 558–585.

Hall, Kenneth R., ed. *Secondary Cities and Urban Networking in the Indian Ocean Realm, 1400 - 1800*. Lexington Books, 2008.

Havinden, Michael A., and David Meredith. *Colonialism and Development: Britain and its Tropical Colonies, 1850 - 1960*. London: Routledge, 1993.

Helpman, Elhanan, Marc Melitz, and Yona Rubinstein. "Estimating trade flows: Trading partners and trading volumes." *Quarterly Journal of Economics* 123, no. 2 (May 2008): 441–487.

Hoffmann, Charles. *The Depression of the Nineties: An Economic History*. Westport, CT: Greenwood Publishing, 1970.

Huenemann, Ralph W. "The Dragon and the Iron Horse: The Economics of Railroads in China, 1876 - 1937."

Huff, Gregg. "Export-led Growth, Gateway Cities and Urban Systems Development in Pre-World War II Southeast Asia." *Journal of Development Studies* 48, no. 10 (August 2012): 1431–1452.

Huff, W. G. *The Economic Growth of Singapore: Trade and Development in the Twentieth Century*. Cambridge University Press, 1994.

Hynes, William, David S. Jacks, and Kevin H. O'Rourke. "Commodity market disintegration in the intwerwar period." *European Review of Economic History* 16 (January 2012): 119–143.

Ingram, James C. *Economic Change in Thailand, 1850 - 1970*. Stanford, CA: Stanford University Press, 1971.

Ivanova, Vera. "Grain Prices in the Russian Empire: Did convergence come by train?" *National Research University Higher School of Economics Working Papers*, 2017, 1–28.

Jacks, David S. "Defying Gravity: The Imperial Economic Conference and the Reorientation of Canadian Trade." *Explorations in Economic History* 53 (2014): 19–39.

———. "Intra and international commodity market integration in the Atlantic economy, 1800 - 1913." *Explorations in Economic History* 42 (2003): 381–413.

———. "What drove 19th century commodity market integration?" *Explorations in Economic History* 43 (2006): 383–412.

Jacks, David S., Kevin H. O'Rourke, and Jeffrey G. Williamson. "Commodity price volatility and world market integration since 1700." *Review of Economics and Statistics* 93, no. 3 (2011): 800–813.

Koren, Miklos, and Silvana Tenreyro. "Volatility and Development." *Quarterly Journal of Economics* 122, no. 1 (February 2007): 243–287.

Krugman, Paul. "First nature, second nature, and metropolitan location." *Journal of Regional Science* 33, no. 2 (1993): 129–144.

Krugman, Paul, and Raul Livas Elizondo. "Trade policy and the Third World metropolis." *Journal of Development Economics* 49, no. 1 (1996): 137–150.

Latham, A. J. H., and Larry Neal. “The International Market in Rice and Wheat, 1868 - 1914.” *Economic History Review* 36, no. 2 (1983): 260–280.

Lopez-Cordova, J. Ernesto, and Christopher Meissner. “Exchange-rate regimes and international trade: Evidence from the classical gold standard era.” *American Economic Review* 93, no. 1 (2003): 344–353.

McGee, T. G. *The Southeast Asian City: A Social Geography of the Primate Cities of Southeast Asia*. London: G. Bell / Sons, 1967.

Mitchener, Kris James, and Marc Weidenmier. “Trade and Empire.” *Economic Journal* 118, no. 533 (November 2008): 1805–1834.

O’Rourke, Kevin H., and Jeffrey G. Williamson. “When did globalisation begin?” *European Review of Economic History* 1, no. 6 (2002): 23–50.

Pamuk, Sevket. *A Monetary History of the Ottoman Empire*. Cambridge: Cambridge University Press, 2000.

———. “The Ottoman Empire in the "Great Depression" of 1873 - 1896.” *Journal of Economic History* 44, no. 1 (March 1984): 107–118.

Parsley, David C., and Shang-Jin Wei. “Convergence to the law of one price without trade barriers or currency fluctuations.” *Quarterly Journal of Economics* 111, no. 4 (November 1996): 1211–1236.

Pope, Andrew. “British steamshipping and the Indian coastal trade, 1870 - 1915.” *Indian Economic and Social History Review* 32, no. 1 (1995): 1–21.

Roy, Tirthankar. *The Economic History of India*. Oxford University Press, 2011.

Schendel, Willem Van. *Three Deltas: Accumulation and Poverty in Rural Burma, Bengal, and South India*. New Delhi: Sage, 1991.

Shiue, Carol H., and Wolfgang Keller. “Markets in China and Europe on the Eve of the Industrial Revolution.” *NBER Working Papers*, no. 10778 (2004): 1–48.

Silva, J. M. C. Santos, and Silvana Tenreyro. “The log of gravity.” *The Review of Economics and Statistics* 88, no. 4 (November 2006): 641–658.

Srivastava, Hari Shanker. *The history of Indian famines and development of famine policy, 1858 - 1918*. Agra: Sri Ram Mehra, 1968.

Strauss, Frederick, and Louis H. Bean. *Gross Farm Income and Indices of Farm Production and Prices in the United States, 1869 - 1937*. Technical Bulletin 703. Washington DC: US Department of Agriculture, Bureau of Agricultural Economics, 1940.

Studer, Roman. “India and the Great Divergence: Assessing the Efficiency of Grain Markets in Eighteenth and Nineteenth Century India.” *Journal of Economic History* 68, no. 2 (2008): 393–437.

Taylor, A. M. “Potential pitfalls for the purchasing-power-parity puzzle? Sampling and specification biases in mean-reversion tests of the law of one price.” *Econometrica* 69 (2001): 473–498.

Tuncer, Ali Coskun. “The Black Swan of the Gold Periphery: The Ottoman Empire during the Classical Gold Standard Era.” *London School of Economics Working Papers*, no. 13 (March 2013): 1–38.

Tuncer, Coskun. “Monetary sovereignty during the classical gold standard era: the Ottoman Empire and Europe, 1880 - 1913.” *LSE Economic History Working Papers* 165, no. 12 (July 2012): 1–39.

Wickizer, V. D., and M. K. Bennet. *The Rice Economy of Monsoon Asia*. Stanford University Press, 1941.

Williamson, Jeffrey G. *Trade and Poverty: When the Third World Fell Behind*. Cambridge: MIT Press, 2011.

Willis, H. Parker. “The Gold Standard in India.” *Journal of Political Economy* 7, no. 4 (September 1899): 551–553.

Chapter 3

The Middle East in the Global Periphery of Maritime Worlds:

The Role of Geography, Technology, and Urbanisation, 1870 – 1914

Chapter Abstract

The first period of globalisation is characterised by an unprecedented expansion in global trade, driven by a sharp decline in the cost of trading, and the opening of several regions of the global periphery to new markets. While the impact on trade costs and trade flows along long–distance routes between the European core and the Asian periphery is well known, how trade developed within the global periphery of the Middle East through the Suez Canal has not been assessed. This paper comparatively evaluates trade within the Middle East compared to trade between Europe and Asia in the first period of globalisation. Using an originally compiled dataset of prices for 5 commodities between origin and destination ports across Europe, the Middle East, and the Indian Ocean, this paper finds firstly that market integration between the two Middle Eastern maritime regions of the Persian Gulf and the Eastern Mediterranean was not as evident as integration observed between port cities of Europe and Asia at greater distances. Second, the lack of market integration between the two maritime regions of the Middle East is similarly demonstrated by higher trade costs and lower trade flows compared to trade routes between Europe and Asia. Third, such differences in trade costs and trade flows between maritime regions of the Middle East could be related to changing routes of shipping lines that took advantage of the Suez Canal to travel directly between ports of Europe and Asia, entirely bypassing the traditional transshipment routes through the ports of Egypt and the Levant. Consequently, where the Middle East was previously central to trade between Europe and Asia, the transport revolution that brought about the first era of globalisation actually made the Middle East geographically isolated, less integrated, and less able to benefit from the economic opportunities of the period.

3.1 Introduction

Historical scholarship modelling maritime 'worlds' based on forms of geographic, social, cultural, and economic unities across transnational seascapes has largely been dedicated to studies of the Mediterranean and the Indian Ocean. Ever since Fernand Braudel's *La Méditerranée* in 1949, and K.N. Chaudhuri's *Trade and Civilisation in the Indian Ocean* in 1985, the literature on both maritime worlds has proliferated, creating new and dedicated fields of research. As the fields have

moved beyond their foundational works, a consensus amongst scholars on the extent and boundaries of both maritime worlds has become temporally and spatially fixed.[1]

At the same time that the historical literature on the unities of the Mediterranean and Indian Ocean has become more well–defined, regional unities as they are continentally conceptualised have become increasingly problematised.[2] While the eastern boundary of the Mediterranean and the western boundary of the Indian Ocean remain fixed from a maritime world perspective, the Middle East as an organising principle has come under increasing scrutiny. It can be argued that the countries of Western Asia and North Africa that have been treated singularly on the map as the Middle East neither constitute a continental landmass nor are they sufficiently bound together by any unifying characteristics. It is despite historical political and cultural changes that the concept of a singular region of the Middle East remains, however the precise unifying structure and boundaries still lack definition.

Although the contours of a generalised Middle Eastern region are ambiguous, there are more easily recognisable sub–regions that have been primarily identified based on population agglomeration, climactically uniform zones, and indeed the seas. This would include the Egyptian delta and the Eastern Mediterranean, unified through a long history of interaction with a set of core cities along the Mediterranean coast, and an agricultural hinterland stretching down into the Sudan along the Nile.[3] Separately there is the Iranian plateau, which extends from Central to Southwestern Asia, and shares historic ties through empires, conquests, and the caravan trade. Due to the vast, uninhabited deserts of the Arabian peninsula, the costal communities of the Eastern Mediterranean, the Arabian Sea, the Red Sea, and the Persian Gulf have shared more in common with each other via the smaller navigable seas than across the deserts that have typically been synonymous with the region.[4] In most fields, therefore, it is the extent of interaction and natural geography across these seas that characterises the most recognisable features of the Middle East. It is these more recognisable maritime sub–regions of the Eastern Mediterranean on the one hand, and the Persian Gulf and Arabian Sea on the other, that are used in this paper as the most narrow and restrictive definition of the Middle East as a singular region whose boundaries are demarcated by the seas to

1. Nile Green, "Maritime worlds and global history: Comparing the Mediterranean and Indian Ocean through Barcelona and Bombay," *History Compass* 11, no. 7 (2013): 513–523; Andre Wink, "From the Mediterranean to the Indian Ocean: Medieval history in geographic perspective," *Comparative Studies in Society and History* 44, no. 3 (2002): 416–445.

2. Michael E. Bonine, Abbas Amanat, and Michael Ezekiel Gasper, *Is there a Middle East? The evolution of a geopolitical concept* (Palo Alto, CA: Stanford University Press, 2011).

3. Roger Owen, *The Middle East in the World Economy, 1800 - 1914* (London: Methuen, 1987), pp. 10.

4. Charles P. Issawi, *The Economic History of Iran: 1800 - 1914* (Chicago, IL: University of Chicago Press, 1971), pp. 47.

the east and west.[5]

Hence what remains unique about the Middle East in general, and the two maritime sub–regions in particular within the field of maritime history is how the region lies at, and functions as the barrier between the Mediterranean and Indian Ocean worlds, yet at the same time, the Middle East as a unifying principle also exists as a singular, continentally–bound region of study. Therefore given the region's ambiguous and fluid boundaries despite scholars' attempts to define it, this paper asks which geographic framework is more applicable to a historical understanding of the region?

While the spatial boundaries of the Mediterranean and Indian Ocean worlds intersect in a restrictive definition of the Middle East between the Eastern Mediterranean and the Persian Gulf and Red Seas, the temporal boundaries of both maritime worlds are traditionally considered to end according to various historical events or processes.[6] Historians treat these breaks, occurring at various points in early modern history, but definitively by the 19th century, as the moment when all the deep structural elements underlying the unities of both the Mediterranean and the Indian Ocean history for millennia – the monsoons, the currents, and the land barriers – were finally "overcome by steamship and steam trains in the service of European power and capital; the seas become embedded in a truly global economy and for the first time production, as opposed to trade, is affected."[7] In the transition away from the traditional millennia–old history of the seas, a global economy organised around an industrialising core of Europe, and a commodity producing periphery of Asia emerges. Therefore this paper is focused precisely on the period in which those traditional ties that united maritime worlds are considered to have been reorganised according to an industrial European core and an agricultural Asian periphery. As Asian trade was reoriented towards Europe, this also restructured trade within the global periphery, in which the Middle East could have been organised either around trade with Europe, trade between the two maritime regions, or economically unified as a singular territorially–bound sub–continental region.

The period 1870 to 1914 is often considered the peak of an international economic order de-

5. While historically the region has been highly associated with Islam, the legal notion of the *dar al-Islam* was never fully transposed into a sustained geopolitical boundary due to the inability of Islam to operate as a unifying principle, perhaps as early as the sixteenth century. The existence and autonomy of several sixteenth century territorial empires including the Ottoman, Safavid, Mughal, and Uzbek empires were recognised in the historical Persian and Turkish works as "guarded domains," *mamalik-i mahrusa*, of which such divisions were retained throughout the European imperial period. (Bonine, Amanat, and Gasper, *Is there a Middle East? The evolution of a geopolitical concept*, pp. 2)

6. Michael N. Pearson, *The Indian Ocean: Seas in History* (London: Routledge, 2003), Such as European colonialism of the southern and eastern Mediterranean, or the arrival of European merchants in the Indian Ocean in the 16th century, "from around the middle of the eighteenth century a long process began which led over the next hundred years to a very dramatic change in the history of the ocean and its peoples... government policy and technological advances combined to undercut millennia–old indigenous maritime activity, with naval force always available as a back–up." – pp. 190.

7. Sugata Bose, *A Hundred Horizons: The Indian Ocean in the Age of Global Empire* (Cambridge, MA: Harvard University Press, 2006), pp. 273.

fined by the core–periphery framework characterised by liberal trade policies, and rapid manufacturing–led economic growth in the global core, linked to markets and resources of the global periphery via the transport revolution in steamships and railways.[8] Fundamental to the transportation revolution and the divergence between the core and periphery was the opening of the Suez Canal in 1869 that reduced the travel time on long–distance routes between Europe and Asia, such as London and Bombay by two–thirds compared to travel around the Cape route.[9]

The Suez Canal aroused great political, cultural, and economic expectations for the advantages such a route would bring by linking together Europe and Asia. Politically, the creation of a new route was seen as a strategic extension of European colonial power in the 19th century that more directly linked European colonisers to their overseas colonies in Asia. Culturally, it united two distinct maritime worlds that were finally connected in a new era of modernity and globalisation.[10] Economically, the Canal was expected to help European powers access new sources of raw material, and to connect European empires to markets for exports of manufactured goods to support their rapidly industrialising economies. Indeed the economic opportunities of the Canal route were seen as, "the equivalent of the acquisition of a second India for Britain."[11]

The opening of the Suez Canal created a singularly unique moment in history when two distinct maritime worlds suddenly became connected, functioning as both a bridge between worlds, a link within the Middle East, and as an extension of core–periphery modes of production. The study of overseas trade costs and trade flows from ports of the Indian Ocean or the Persian Gulf, through the Suez Canal, to either the peripheral region of the Eastern Mediterranean, or to the global core of Europe, provides a relative assessment of the degree to which the Middle East integrated between

8. Jeffrey G. Williamson, "Globalisation and the Great Divergence: Terms of trade booms and volatility in the poor periphery, 1782 - 1913," *National Bureau of Economic Research Working Paper Series* 13841 (2008): 1–51.

9. Increased access to trade between Europe and Asia resulted in a decline in the cotton price–spread between Liverpool and Bombay from 57 percent in 1873 to 20 percent in 1913, and the jute price–spread between London and Calcutta declining from 35 to 4 percent. (Kevin H. O'Rourke and Jeffrey G. Williamson, "When did globalisation begin?," *European Review of Economic History* 6 [2002]: pp. 38)

10. Although the expectations of the Suez Canal were primarily seen as a fulfilment of European domination and integration of a peripheral Asian economy into an industrialising European one, the Canal was also believed to be an opportunity for all peoples of the East. For the peripheral economies of Asia, the Canal was expected to, "stimulate cattle–breeding in Abyssinia, horse–breeding in Arabia, corn–cultivation in the Yemen and rice cultivation in Mesopotamia, pearl–fishing in the Persian Gulf, and whale–fishing in the South Seas. The establishment of direct contact with the raw silk market of China would revive the French silk industry from its depression after the silkworm epidemic of 1853–4. The new route would open up the Indian Ocean to the fishermen of the Mediterranean. Above all, it would enlarge the entrepot trade of port cities on either side of the Canal from Bombay, Aden, Suez, Marseilles, Lyons, and Trieste." (D. A. Farnie, *East and West of Suez: The Suez Canal in History* [Oxford, England: Clarendon Press, 1969], Georgi–Dufour, 182, Arles–Dufour a Dufour–Feronce, 27 Septembre 1856.) The emphasis placed on the potential growth in entrepot trade for major port cities of the Mediterranean and the Indian Ocean underscores how merchants and traders conceptualised European and Asian trade according to maritime geography, and how the Suez Canal provided a link between the two. Yet the economic opportunities of the Canal for Asia were based on their continued and expanded export of staple commodities.

11. Ibid., D. Urquhart, *Progress of Russia in the West, North and South...* (London, Truebner, 1853), pp. 423, 'The Canal of Suez'.

the two maritime worlds, and also whether or not such a framework of the Mediterranean and the Indian Ocean continued to operate in the era of high imperialism, a period that historians traditionally consider the end of maritime world history.

Within historical models of maritime 'worlds', and an economic geography framework of core and periphery regions, this paper addresses the question of the economic orientation of the Middle East as either being a singular, continentally–defined region or two distinct regions oriented around the seas by evaluating trade within and between the Middle East's two maritime regions of the Persian Gulf and Eastern Mediterranean between 1870 and 1914. The relative orientation and conceptual framing of the Middle East in terms of regional histories is assessed by core and periphery trade, with statistics collected from a set of five commodities that were traded across Europe, the Eastern Mediterranean, the Persian Gulf, and the Indian Ocean, where the trade route via the Suez Canal is directly observed in the archival trade record. This paper addresses first the process and trends in market integration within and between the Middle East's two maritime regions. Second, it evaluates whether or not the port cities of the Eastern Mediterranean and the Persian Gulf were more integrated with each other as a singular subcontinental region, or separately integrated as part of two distinct maritime worlds by assessing relative trade costs and trade flows according to different regional routes through the Suez Canal. Third, in explaining the relative economic orientation of the Middle East in the period after the opening of the Suez Canal, this paper explores the history of particular commodity trades across the Middle East, and the history of shipping companies operating within and between maritime worlds.

This paper will first discuss the history of transportation infrastructure and trade routes in the Middle East prior to and during the period of study in section 3.2. Section 3.3 will discuss the data and sources. Section 3.4 and 3.5 presents a preliminary analysis of market integration in the Middle East according to price correlation and price ratios respectively. Formal analysis of relative trade costs according to regional trade routes is conducted in section 3.6. Trends in regional trade costs over time are presented in section 3.7. Trade flows for the 5 commodities are presented in section 3.8. Section 3.9 and 3.10 discuss additional inferences on market integration in the Middle East in the case of the Persian tobacco trade, and the history of Middle Eastern shipping. Section 3.11 concludes.

3.2 Transportation infrastructure and trade routes in the Middle East

The history of trade and transportation in the Middle East demonstrates the limited potential for regional integration overland before the nineteenth century. Trade was mostly confined to overseas

routes along the coasts or overland by caravan as the region did not have extensive navigable river networks connecting major cities, and the railroad network that did exist was significantly underdeveloped relative to other regions of the world.[12] Historically, transport by sea had always been much cheaper than by land. Due to the region's natural geography, the long distances between cities, and the vast stretches of deserts and mountains, banditry and marauding along major overland highway routes was common, thus making overseas routes the preferred mode of trading.[13] With the expanded use of steamships in the second half of the nineteenth century, the dominant role of overseas compared to overland travel continued to grow.[14]

Traditionally and throughout the nineteenth century, overland trade in the Middle East was conducted by caravan. Even with the more widespread use of steamship, and increased railroad development, the caravan trade remained the primary mode of transport from Middle Eastern port cities to the interior, and between the Persian Gulf and the Mediterranean. However caravan routes were often unreliable, with very high transport costs, and departures at irregular intervals only when there was enough merchandise to fill carrying capacity. Caravan routes were also very hazardous, as they were highly susceptible to banditry as cited by a British merchant at the Persian Gulf port of Bunder Abbas in 1906, "during the months of October to December the caravan routes were infested with robbers, and as a result the caravan trade between Bunder Abbas and Seistan became practically paralysed, and transport was more difficult to obtain. Towards the end of the year the position somewhat improved, but at their best the caravan routes are never entirely free from marauders."[15] Similar issues persisted for any trade route from a port city to the interior.[16] This implies a highly fragmented interior market compared to coastal ports, since steamship transport offered more regular service and was unencumbered by pirating.

For most overseas trade, it moved either through shipping companies that operated at regular intervals between a series of ports, or through tramp shipping that operated at irregular intervals. While tramp shipping was the predominant method of overseas shipping for most of the nineteenth century, liner shipping rapidly grew in the shipping market toward the end of the century driven by the rapid expansion in international trade, the opening of the Suez Canal, and the increased adoption of the steamship. Liner shipping became increasingly competitive firstly through acquir-

12. Charles P. Issawi, *An Economic History of the Middle East and North Africa* (New York: Columbia University Press, 1982), pp. 52.

13. Roger Owen and Sevket Pamuk, *A History of Middle East Economies in the Twentieth Century* (London: I. B. Tauris, 1998), pp. 1 – 17.

14. Issawi, *An Economic History of the Middle East and North Africa*, pp. 44.

15. *Trade and Commerce of Bunder Abbas and Lingah.* Annual Series. Diplomatic and Consular Reports, 3858 (1906). pp. 491.

16. *Trade and Commerce of Bahrain.* Annual Series. Diplomatic and Consular Reports, no. 4602 (1910). pp. 420 – 421.

ing regular mail service contracts along regional routes. For example, the British India Steam Navigation Company first operated as a mail service between Calcutta and Rangoon, then slowly expanding its services across the Bay of Bengal and subsequently most of the coastal trade of India. Second, as shipping conferences and shipping companies grew in regional trades, their size and strength enabled them, once firmly entrenched, to maintain a controlling share of the trade within certain coastal areas at the expense of other tramp shipping.[17] Even with the rapid growth in liner shipping, the distinction in the types of cargoes carried by liner or tramp was not as prevalent as it would later become in the twentieth century. In this period, liner ships carried tramp cargoes and *vice–versa*.[18] While tramp shipping was not localised in terms of routes or ports, regional markets played an increasingly important role in the organisation and competition of liner shipping at the expense of tramp shipping. Hence the history of liner shipping companies operating in regional markets provides an indication, although only partial, of trade within and between the Mediterranean and the Indian Ocean worlds.

For example, trade through the Persian Gulf was a part of a larger Arabian Sea trade largely controlled through shipping companies that regularly serviced routes between Bombay and Basra. In 1889, the British India Steam Navigation Company had six ships in service, leaving from either Bombay or Basra once a week, and touching at Karachi, Gwadur, Muscat, Jask, Bunder Abbas, Lingah, Bahrian, Bushire, Fao, and Mohammerah, a journey of 1,970 miles in a fortnight.[19] The widespread adoption of the steamship, and the regular service of shipping companies to several port cities across large distances contributed to regional market integration of the Persian Gulf with the wider Arabian Sea.[20] There were additional steam navigation companies that operated out of either ports of Basra or Bombay, "officered by Englishmen, but owned and controlled by native merchants and working on a cheaper scale, sailing at regular intervals between Bombay and the Gulf ports as far as Busrah."[21] Separately, the Ocean Steamship Company established in 1865, known as the Blue Funnel Line, was based in Liverpool and specialised in the Southeast Asia trade. The size and scale required to operate liner companies generally meant that liners had larger tonnage vessels than tramp ships. It also meant that they organised themselves into

17. Andrew Pope, "British steamshipping and the Indian coastal trade, 1870 - 1915," *Indian Economic and Social History Review* 32, no. 1 (1995): 1–21.

18. Gelina Harlaftis and Ioannis Theotokast, "The Handbook of Maritime Economics and Business," chap. Maritime business during the twentieth century: Continuity and change, ed. Costas Th. Grammenos, vol. 2, 1 (London: Lloyd's List, 2010), Generally, liner shipping carried cargoes of finished and or semi–finished manufactured goods, and tramp shipping carried bulk cargoes like coal, ore, and grain.

19. Issawi, *The Economic History of Iran: 1800 - 1914*, pp. 166.

20. Luigi Pascali, "The Wind of Change: Maritime Technology, Trade, and Economic Development," *Barcelona Graduate School of Economics Working Paper Series*, no. 764 (June 2014): 1–39.

21. Curzon, Persia, 2: 467, in Ibid.

shipping conferences to divide the shipping market based on maritime regions.[22] These practices contributed to the growth in market share of liner shipping so that by 1910 there were 65 liner companies that owned 45% of the British fleet, and the vast majority of tonnage as a result of their larger ships.[23] Hence the arrangement of steam navigation companies and their liner services that traded between and linked a series of ports would suggest that, regardless of the organisation of tramp shipping that also operated in the region, maritime areas such as the Persian Gulf should be a well–integrated with the larger Arabian Sea and Indian Ocean, since steamers either moved into or out of the Gulf with regular service across the Indian Ocean.

Similarly, the trade of Egypt and the Levant was monopolised by a set of shipping conferences that operated in ports across the Mediterranean. Most conferences were run by European companies that called at a string of ports along the southern coast of Anatolia, the Eastern Mediterranean, and Egypt before returning to Europe. As late as 1906, most steam services circulated the Mediterranean without crossing the Suez Canal. The primary British service to the Eastern Mediterranean was the *Prince Line* that, "still monopolises nearly the whole of the British import and export trade...touching at different ports on the Syrian coast."[24] Aside from the British line that ran routes between London and the ports of the Eastern Mediterranean, other countries ran nationalised lines as well, controlling nearly the entire trade between Eastern Mediterranean ports. The *Deutsche Levante Line* ran once a month, touching all major ports of Syria and Egypt before returning to Hamburg.[25]

Among all types of Mediterranean shipping lines, there was no regular liner service that touched at the ports of the Eastern Mediterranean and which continued on to the Red Sea and wider Indian Ocean. Despite the widespread usage of steamships that passed through the Suez Canal in the period, most of these services ran between major ports of Europe and Asia, without servicing minor ports of the Middle East along the way. By 1897, there were only three services that regularly served ports of the Red Sea and were based out of Port Said on the Mediterranean. These services did not carry on to other ports of the Mediterranean, but only ended at Port Said after passing

22. Saif I. Shah Mohammed and Jeffrey G. Williamson, "Freight rates and productivity gains in British tramp shipping, 1869 - 1950," *National Bureau of Economic Research Working Paper Series*, no. 9531 (February 2003): "Where tramp ships would have to compete with larger liner vessels, it seems that larger ships were always chosen. Voyage charter parties did not stipulate fixed routes or schedules for hired tramp vessels. This implies that there was no premium for speed in the tramp shipping business ... clearly, ship owners would lean toward size rather than speed, as the data confirm for the other routes." pp. 24.

23. Harlaftis and Theotokast, "The Handbook of Maritime Economics and Business."

24. Diplomatic and Consular Reports of Turkey, *Trade and Commerce of Beirut and the Coast of Syria* no. 2662 Annual Series (1906), pp. 3.

25. Diplomatic and Consular Reports of Turkey, *Trade and Commerce of Beirut and the Coast of Syria* no. 3798 Annual Series (1901), pp. 840.

through the Canal.[26] Although there were extensive liner services operating within the Mediterranean or Indian Ocean, the lack of regular services operating through the Suez Canal does not necessarily mean that there was less shipping between the two, as this could have been taken up by tramp shipping. However even if this were the case, the irregular nature, and lack of a primary port from which tramp shipping base operations out of, suggests that it was not as likely to contribute to integration compared to the regularity of liner services.

In addition to steamship routes around the Middle East, there was a steady expansion of the rail network. Railroad development in the region was limited, lagging behind that of other parts of the colonial periphery. In 1890, only Egypt and Turkey had railway networks, and even those networks were centred around the population centres of the Mediterranean and Western Anatolia. Railway lines were constructed to link the population centres with the agricultural hinterland, such as the Sudan for Egypt, or the Izmir region for Turkey, rather than strategically linking global trade networks. While there were ambitious plans to create a route connecting the Eastern Mediterranean to the Persian Gulf along the Baghdad Railway, this railroad was not completed until 1940.

By 1914, several more territories of the Ottoman Empire did have railways, including Iraq and Lebanon, however the network was small. In the case of Iraq, the railroads amounted to only 132 kilometres, but this was only a partially developed section of the planned Baghdad railway that did not connect to any other city, and was not in use. In Lebanon there was a rail line connecting Damascus, Beirut and Haifa. Separately, Aleppo was eventually connected to Baghdad and Istanbul, but not until 1912. The expansion of Middle Eastern railways is illustrated in table 3.1. The table shows that the adoption of railways was slow across the region, with few countries having railroads as late as 1914.

On the Persian Gulf side of the Middle East, there was even less railroad development. By 1913, there were no cities around the Persian Gulf that had any rail lines, with Persia receiving its first only in 1938, centred around Tehran, rather than the Gulf coast. The absence of railways in Persia proved to be an obstacle to any other form of foreign investment as well, as the vice president of the Anglo–Persian Oil Company stated in 1911, "the chief need of Persia, which today occupies a position I believe unique in being the only highly civilised country un–served by this absolute necessity of modern life is railways." [27]

Even with the limited railroad developments that did exist across the Middle East, they were still far from effective modes of trade. The completed Beirut–Damascus–Muzayrib line that linked

26. Diplomatic and Consular Reports of Egypt, *Trade and Commerce of Port Said and Suez* no. 2170 Annual Series (1897), pp. 14 – 15.

27. Speech at Persian Dinner at the Savoy, July 1911, FO 371/1186, in Issawi, *The Economic History of Iran*, pp. 152.

Table 3.1: Length of railway lines for countries and territories of the Middle East (in kilometres)

Country	1890	1914	1939	1948
Egypt	1,797	4,314	5,606	6,092
Sudan		2,396	3,206	3,242
Arabian Peninsula				
Persia		200	1,700	3,180
Iraq		132	1,304	1,555
Jordan			332	332
Palestine/Israel			1,188	1,225
Lebanon			232	423
Syria			854	867
Turkey	1,443	3,400	7,324	7,634

Notes: EHME; EHT; EHI; Hecker 1914; League of Nations, *Statistical Yearbook*; United Nations 1951; *Statesman's Yearbook*, various issues; *Guide Bleu*. various countries. C. P. Issawi, *An Economic History of the Middle East and North Africa*, pp. 54.

the major cities of Syria had to declare itself bankrupt in 1900 due to lack of fees collected on usage. Issues with railway service in the Middle East were mostly due to the lack of uniform gauges, as they were contracted by different companies from different nations, thus requiring transshipment of merchandise between different lines, making them less effective at integrating the region. Aside from financial issues with Middle Eastern railways, one of the longest railroads in the region, the Hijaz railway, connecting Damascus to Medina, was not explicitly built for any economic purpose. Constructed by Sultan Abd al–Hamid, the line was intended to service military, religious, and political purposes, with little trade being facilitated by the railway.[28]

Railroad lines and shipping services remained fragmented across the Middle East, however it was still cheaper to ship overseas rather than overland between the Mediterranean and the Persian Gulf. For most of the nineteenth century prior to the opening of the Suez Canal several shipping companies, such as the Peninsular and Oriental Company, operated two distinct services in the Mediterranean and the Red Sea. The British government gave a monopoly contract to the P&O company on the extremely valuable and important mail service between India and London, deeming the route via Egypt as the cheapest and fastest.[29] These two distinct fleets were based at Alexandria and Suez, with the two port cities connected via the caravan route, using camels and donkeys. As the volume of cargoes, mails, and passengers rapidly increased, the only way to speed up transit was to switch to dromedaries and mules.[30] Thus throughout the late nineteenth and

28. Issawi, *An Economic History of the Middle East and North Africa*, pp. 55 – 57.

29. Freda Harcourt, *Flagships of Imperialism: The PO Company and the politics of empire froms its origins to 1867* (Manchester: Manchester University Press, July 2013), pp. 86.

30. Freda Harcourt, "The high road to India: The PO Company and the Suez Canal, 1840 - 1874," *International Journal of Maritime History* 22, no. 2 (December 2010): "Surprisingly, the oldest means of conveyance - camels, dromedaries

early twentieth centuries it continued to be cheaper and more efficient to trade between the Eastern Mediterranean and the Persian Gulf via overseas routes through Egypt rather than over land.[31]

Due to the lack of railways linking the Eastern Mediterranean with the Persian Gulf, the role of the steamship in overseas trade was central to driving Middle Eastern market integration. Yet the historical record of steamship services to ports of the Middle East went along either Mediterranean routes or Persian Gulf and Indian Ocean routes, without extensively traveling between the two. Although the steamship was central to global integration between Europe and the periphery, there were fewer services that operated exclusively within the periphery. Where there were services, they operated out of a major colonial entrepot, which would subsequently be connected to Europe. Discussing the trade of Bombay and Karachi, it was characterised as, "largely an interchange of goods between Europe on the one hand, and the East African and Persian littoral on the other, Bombay and Karachi being the emporia of trade...the tendency to trade (with those regions) *via* the ports on the west coast of India has become more and more marked."[32] As previously discussed on the Arabian Sea trade, Bombay served as the main entrepot for regions as far as the Persian Gulf, and the port city was integrated with Europe via direct national shipping services with all European powers. Yet even if Europe did run direct services with ports of the Persian Gulf rather than via Bombay, this would still leave little indication of the degree to which the littoral of the Eastern Mediterranean and the Persian Gulf were integrated with each other.

The history of railroad development and steamship services offers an indication of the level of economic integration during the period. The Eastern Mediterranean had a more extensive railway network linking several cities, which was almost entirely financed by European colonial empires. In contrast, in the Persian Gulf and Arabian Sea, railroad development was non–existent, and hence the region relied on overseas trade. The planned Baghdad railway saw the economic potential of linking the Mediterranean to the Persian Gulf, but the inability of it to be completed prior to the outbreak of World War I suggests that there were low levels of integration between the two maritime regions.

The overland trade route through the Fertile Crescent had been in operation since antiquity, relying on caravans operating at irregular intervals between ports on either the eastern or western coasts of the Middle East. Throughout most of the region's history the caravan route remained the only route linking the two maritime regions. While it was crucial to trade across the Middle East,

---

and donkeys - were the fastest and cheapest. Driven by their Bedouin owners at a steady three miles per hour, with no need to stop en route, these animals reached the port in either direction in about twenty–four hours. The upshot was that mails were kept waiting at the outward port until all passengers and goods came aboard." pp. 39.

31. Issawi, *An Economic History of the Middle East and North Africa*, pp. 47.

32. Review of the Trade of India (London: House of Commons Parliamentary Papers, 1900 – 01), pp. 15 – 16.

the late nineteenth century forces of modernisation and innovations in transportation technology were integrating the rest of the world via steamship and railroad at a rapid pace.[33] In the absence of any railroad across the region, the only modern innovation in transportation infrastructure linking together the Middle East was the Suez Canal. Therefore to evaluate market integration in the Middle East in the first period of globalisation, this paper focuses on overseas trade between ports along either of the two maritime regions of the Middle East that had historically been separated by the narrow Sinai Peninsula, but had suddenly become connected via the Suez Canal.

3.3 Commodity trades through the Suez Canal

Evidence of market integration between Europe and Asia has been demonstrated by observing freight rates, travel times, or price gaps between port cities such as Marseille and Calcutta, or Trieste and Bombay.[34] In a similar manner, trade price data for a set of five commodities has been collected for ports of origin in the Indian Ocean and Persian Gulf, to ports of destination in Europe and the Mediterranean. By observing the direct import and export price for each of five commodities, the trade cost between bilateral pairs of cities is directly observed. By subsequently comparing the trade costs for each commodity along each route between city pairs, a relative measure of trade costs according to different geographies determines the extent and process of market integration in the global periphery of the Middle East between the two maritime regions, in comparison to integration along more long–distance routes between the European core and the Asian periphery.

Trade price data has been collected for a set of five commodities where the precise origin, destination, and overseas route through the Suez Canal is directly observed between 1870 to 1914. This is done for a set of staple commodities that are produced across the Indian Ocean, and imported to ports in the Eastern Mediterranean and Europe. Trade prices and quantities for indigo, rice, Persian tobacco, pepper, and tea are recorded for cities of the Eastern Mediterranean and the Arabian Sea, as well as the trade of those commodities to major European ports and capitals from port cities of the Indian Ocean. Matched price data has been collected from a variety of European sources including British, French, and Dutch archives. British and Indian trade data is collected from the *Statement of Trade and Navigation of the Presidency of Bengal* and the *Presidency of Bombay*. Trade data from British India other than the presidencies has also been collected the *Statistical Abstracts for British India*. Import data to the United Kingdom has been collected from the *Statistical Abstracts for the United Kingdom*. Import price data for individual cities of the Ottoman

33. David S. Jacks, "What drove 19th century commodity market integration?," *Explorations in Economic History* 43 (July 2006): 383–412.

34. Farnie, *East and West of Suez: The Suez Canal in History*, pp. 97 - 108.

Empire, Persia and Egypt have been collected from the British *Diplomatic and Consular Reports*, the French *Tableau Général du Commerce Extérieur*, and the Dutch *Ministerie van Buitenlandse Zaken*.[35]

In analysing trade patterns within the colonial periphery, European sources for consular districts of the Middle East are used to observe trade within and between smaller ports and minor trading centres that are not typically included in analysis of market integration for global trade in comparison to trade between major trading centres of Europe and Asia. As minor ports, the construction of annual price series is more reliable with European sources.[36] Import and export price data for the five commodities has been matched from 14 origin cities of the Indian Ocean to 25 destination cities of Europe and the Eastern Mediterranean, with the trade route for each of the five commodities directly observed as passing through the Suez Canal. Figure 3.1 shows the distribution of origin and destination cities on either side of the Suez Canal with all cities of origin for any of the five commodities in red circles, and all destination cities in blue squares.[37]

Although this paper introduces a novel dataset of trade within and between smaller ports and minor trading centres of the Middle East, there is a potential bias in the reporting of trade statistics at these ports. Since trade statistics for the five commodities come from European sources, biases may arise in the size and extent of the export of each commodity between regions of the global periphery including trades between the colonial Indian Ocean, the Persian Gulf, and the Eastern Mediterranean. Thus the five commodities may be more representative of trade from colonies of the Indian Ocean to destinations in Europe, rather than representative of trade between the Eastern Mediterranean and the Indian Ocean. For example, rice was produced and traded across the Indian Ocean and the Persian Gulf, and in many cases several colonies of monsoon Asia entirely depended on imported rice.[39] However rice was not produced nor consumed as widely in the Eastern Mediterranean, but it was imported in large quantities across Europe.[40]

35. British and French archival reports have been used to collect price series for port cities of the Ottoman Empire, Persia, and Egypt. Dutch archival reports have been used for trade between Dutch Indonesia and the Netherlands, where trade in particular commodities is directly observed to pass through the Suez Canal.

36. Charles Issawi, *The Economic History of the Middle East, 1800 - 1914: A Book of Readings* (Chicago, IL: University of Chicago Press, 1966), pp. 30 - 31.

37. For some cities, such as Smyrna for small set of years, it also includes the city from which indigo was shipped, which was Calcutta. This import price in the city can be compared to the export price of indigo from Calcutta. The annual series of the *Statement of Trade and Navigation of the Presidency of Bengal* includes detailed reports on the exports from the port of Calcutta and the destinations by city or country. In several cases, the precise value and quantity of indigo exported from Calcutta also detail the destination port, which is true in the case of the Ottoman Empire, while in the case of Persia the reports will specify Persian Gulf ports.

38. Red circle origin cities of the Persian Gulf for Persian tombac and rice also function as blue square destination cities for certain commodities traded across the Arabian Sea, such as for indigo, pepper, and black tea.

39. Paul H. Kratoska, "The British Empire and the Southeast Asian rice crisis of 1919 - 1921," *Modern Asian Studies* 24, no. 1 (1990): 115–146.

40. Rice continued to be a reliable import into all of the ports of the Eastern Mediterranean and Anatolia, however it



Figure 3.1: Map of origin and destination trade locations around the Eastern Mediterranean and the Persian Gulf [38]

Alternatively, trades of the other four commodities; pepper, indigo, tea, and Persian tobacco, were already well–established across the Middle East and Indian Ocean prior to the nineteenth century, and in some cases dating back to the ancient silk road. Although pepper was widely in demand across the Middle East and Europe in the first period of globalisation, the pepper trade through the Middle East continued to operate along historical pathways overland, with the western terminus of the Indian Ocean pepper trade being at the port of Aden. From Aden, pepper was transhipped onward via the Red Sea or caravan routes into the Hijaz. The pepper trade from Aden to other cities of the Middle East could subsequently have been in the hands of local merchants, in which case it may have been under reported in the European records.[41] The same is true for indigo. Although widely traded across the Indian Ocean for use in the dying of textiles, medicine, and as a cosmetic, it is also a commodity with a long history across the Middle East. Yemen has historically been a regional centre for the cultivation, dye production, and textile industry of indigo, and was widely distributed across the Ottoman Empire along the overland route from Basra

was not produced at all, nor widely consumed. Reports from the *British Diplomatic and Consular Reports* for Palestine in 1912 state that the harvested grains, whether for local consumption or export, were barley, wheat, and millet. Although rice was regularly imported, it was not nearly as sizeable of an import for ports of the Eastern Mediterranean as it was for ports of Europe. Further discussion of trade flows for the selected commodities is discussed in section 3.8 Regional Trade Flows. Further discussion on biases in the selection of commodities is discussed in section 3.9 The Persian Tobacco Trade.

41. Sebastian R. Prange, "'Measuring by the bushel': Reweighing the Indian Ocean pepper trade," *Historical Research* 84, no. 224 (May 2011): 212–235.

through Baghdad, to the cities of the Levant.[42]

The tea trade in the Middle East dates back to the ancient silk road, with widespread demand and consumption across the region having been largely integrated into Middle Eastern cultures prior to the arrival of Europeans. Thus tea continued to be shipped by the overland caravan route throughout the first period of globalisation, even as it was also carried in large quantities overseas by European shipping companies. Finally the only commodity in the dataset for which it is known to be specifically traded within the Middle East between the Persian Gulf and the Eastern Mediterranean is Persian tobacco. The reporting of a commodity that was specifically traded within the Middle East and not imported to Europe suggests that reliance on European trade statistics were not entirely limited to trades that were of interest to their empires. However it does highlight the limitations of assessing the full scope of the commodity trades across the region, as the commodity is only reported at ports of the Levant after the opening of the Suez Canal, despite the Persian tobacco trade long predating the nineteenth century.[43] Hence a reliance on European sources, as well as differences in the trading relationship within the global periphery versus trade from the periphery to the core, could bias analysis of trade costs on the basis of these five commodities due to a lack of representativeness of the true extent of trade within the global periphery.

Despite this potential bias in European trade records, the use of trade and consular reports from all three countries with far–flung empires across the Indian Ocean is broadly representative of trade between Europe and Asia, as well as global trade. During the period the vast majority of ocean–going global shipping by tonnage was done by Europeans. 47.8% was British shipping, and 35.9% was owned by other countries of Western Europe. Only 16.4% of shipping tonnage was not owned by Europeans.[44] For most trade within and between the Ottoman Empire and Egypt, nearly all of the trade was in the hands of British, German, and French shipping companies.[45] Additionally, in the two decades before the First World War, British shipyards constructed over 60 percent of global tonnage.[46] World shipping was centred on Europe, both in terms of shipping companies, and in terms of the shipbuilding industry. There is a potential bias in relying on European sources for analysis of trade within and between the Middle East, as European trade records were mostly interested in trades that were of interest to them, or at least conducted by shipping companies of

42. Halil Inalcik, "Bursa and the commerce of the Levant," *Journal of the Economic and Social History of the Orient* 3, no. 2 (August 1960): pp. 117 - 154; Jenny Balfour-Paul, *Indigo in the Arab World* (London: Routledge, 1997).

43. Further discussion on the history of the Persian tobacco trade is in section 3.9 The Persian Tobacco Trade.

44. Jari Ojala and Stig Tenold, "Maritime trade and merchant shipping: The shipping/trade ratio since the 1870s," *The International Journal of Maritime History* 29, no. 4 (2017): 838–854.

45. Issawi, *The Economic History of the Middle East, 1800 - 1914: A Book of Readings*, pp. 31.

46. Sidney Pollard, "British and world shipbuilding, 1890 - 1914: A study in comparative costs," *Journal of Economic History* 17, no. 3 (September 1957): 426–444.

their nationality when reporting trade statistics for consular districts in the Middle East. However given the extent of European leadership in international ocean–going shipping, and the fact that over two–thirds of the value of total import and export trade was with Europe, European shipping agents and their record of trade statistics for the consular port cities and districts of Asia and the Middle East are considered highly accurate and representative for constructing a dataset of a network of international trade.

Despite potential biases in the reporting of trade data by relying on European sources for Middle Eastern cities, the selection of five broadly homogenous commodities to derive trade costs contributes to the greater representativeness of prices to the overall markets of the Middle East. In order to produce reliable results in deriving and analysing overseas trade costs, the price series should meet three conditions according to Federico (2012). First, prices for trade costs should refer to pairs of markets which were actually trading. Since trade records for imports and exports at each port city cite the specific destination port, the trade costs for city pairs along either the Mediterranean or the Indian Ocean reflect the direct trade cost of that commodity. Second, each price series should refer to a specific quality of a good. The use of narrow set of five commodities is intended to capture primary products that do not differ in quality in order to ensure representativeness of the sample, and as a means of limiting the potential biases arising from the use of European sources. Third, the commodities should be representative of the actual trade flow.[47] The five commodities included in the dataset, for indigo, rice, tobacco, pepper, and tea are primary products, but were widely distributed across both the Middle East and Europe as representative of actual trade flows from east to west, and so that they can be comparatively assessed to determine market integration in the first period of globalisation.

3.4 Price correlations of Middle Eastern trade, 1870 – 1914

As a first and preliminary look at the data to observe the overall process of market integration in the Middle East, the import unit price of rice is collected from a set of port cities representing various types of geographies between bilateral pairs of cities. Rice was locally grown in Persia, Egypt, and Iraq, and was widely circulated around the region.[48] Consumption in Jerusalem and the port of Jaffa, for example, illustrates that the primary grain import was rice, and that the main

47. David Chilosi and Giovanni Federico, "Early Globalisations: The integration of Asia in the world economy, 1800 - 1938," *Explorations in Economic History* 57, no. 1 (2015): 1–18.

48. "The quality is not such as can compete with Indian and Burmese as an article of food, though large quantities have been exported to Gulf ports and India for this purpose." *Diplomatic and Consular Reports on Trade and Finance of Turkey: Report of the Trade of Baghdad and Bussorah*, (Foreign Office, London: 1894), pp. 7.

source of rice was Egypt, supplying 70 per cent to the region, with India providing 30 per cent.[49] Additionally, for the entire series across all markets, rice is the grain with the highest bulk to value ratio. Therefore as the most consistently traded inter–regional commodity, it offers a baseline representation of inter–regional integration.[50]

Rice is also an effective commodity to look at for integration, as it was not just harvested and traded within the region, but imported in large quantities across the Indian Ocean from British India and Burma. By observing and matching the precise origin of rice exports from India or Burma and comparing it to the destination ports of the Middle East, it also provides a relative measure of trade costs within and between regions of Asia. Analysis of rice has the additional benefit of direct observation of the route through which the commodity was traded to compare trade costs across the Middle East, as cited from a Bombay summary of overseas trade, "a large portion of the exports to Europe consists of uncleaned rice, and the principal destinations going west of the Suez Canal of all qualities of rice were to the United Kingdom...in the eastern side of the Canal trade, nothing but ordinary fluctuations are noticeable in regard to Arabia, Africa, and Mauritius."[51] Similar evidence can be found that describes the rice export trade as being shipped via overseas routes, and that the overseas pathway went via the Suez Canal.

Correlation coefficients for several cities characterising a wide geographic representation of the region is shown in table 3.2. The table shows how price correlations have evolved over time through three 15–year periods, cities that show an increasing coefficient over the three sub–periods are those that are integrating, while those that either are not increasing or are decreasing suggest market divergence. However there is still extensive information that is overlooked in using price correlation as a measure of integration, since on the one hand there can be spurious correlation between locations that do not actually trade, but are subject to the same exogenous shocks, and on the other, two locations can have converging prices, while demonstrating opposite movements

49. *Diplomatic and Consular Reports on Trade and Finance of Turkey: Report of the Trade of Jerusalem*. Annual Series. Foreign Office no. 4222, 1908

50. While wheat was extensively grown across the Middle East, much of it was exported to Europe. Therefore although it is possible to similarly analyse the wheat price from trade data, there are a number of issues that make wheat a less accurate measure than using rice as an imported grain. Firstly, as a locally grown grain, wheat is exclusively exported, meaning that it is irregularly recorded depending on the size of export. Secondly, prices are a less accurate approximation for the local market since the export price will be significantly affected by the global price. As most Middle Eastern grain production was exported to Europe, using the export price for all cities of the Middle East is more reflective of European demand rather than local demand, and would significantly affect interpretations of market integration. Thirdly, since wheat is consumed locally, the price at which it can be exported profitably varies entirely on the global price and the local harvest. The local harvest significantly affects the availability of a continuous series of wheat data, as there are numerous years of city–level data in which there were no exports of wheat recorded, since it could not be profitably exported as the local price would be too high to be exported in cases of a bad harvest. Therefore an alternative and common base grain is rice, which was grown in several parts of the region as well as traded internationally.

51. *Review of the Trade of India* (London, East India Trade, 1905), pp. 23 – 24.

Table 3.2: Correlation coefficients of rice prices for cities of the Middle East

City Pair	1870 – 1885	1885 – 1900	1900 – 1914	Overall
(a) Damascus – Aleppo	0.335	**0.612**	0.211	**0.607**
	(0.463)	(0.012)	(0.489)	(0.000)
(b) Bahrain – Basra	–0.281	**0.572**	**0.634**	**0.667**
	(0.719)	(0.033)	(0.015)	(0.000)
(c) Alexandria – Bushire	–0.536	–0.205	–0.279	**–0.369**
	(0.215)	(0.446)	(0.334)	(0.045)
(d) Jerusalem – Aden	0.600	0.692	**0.502**	**0.950**
	(0.195)	(0.195)	(0.068)	(0.000)
(e) Smyrna – Jeddah	0.197	**0.637**	**–0.647**	**0.356**
	(0.561)	(0.008)	(0.023)	(0.031)
(f) Aleppo – Basra	0.865	–0.277	0.359	**–0.439**
	(0.135)	(0.338)	(0.207)	(0.022)

Notes: Figures in bold denotes statistical significance. *P* values reported in parenthesis.

over time, thus appearing entirely uncorrelated.[52] Nevertheless for markets that are integrated, that actively trade with each other, and both have the same information status, there should be some degree of price correlation, particularly for markets that are in close proximity.

Table 3.2 is intended to portray a balanced relationship between cities representing all types of geography. Row A shows correlation of prices for pairs of cities along the coast of the Eastern Mediterranean and row B shows two port cities on the Persian Gulf coast. Moving across columns over time demonstrates a gradual process of increasing price correlation for both maritime regions, with similar levels of correlation for the price series overall of approximately 0.6. As a point of comparison, rows C through F show pairs of cities across the two maritime regions of the Middle East, with one city on the Indian Ocean side, and the other on the Mediterranean side. In two of the four rows, the overall correlation is significant and negative, showing economic divergence over time. In contrast rows D and E show a positive and increasingly significant price correlation, a trend that is more similar to bilateral pairs that lie within the same maritime region, and did not require passage through the Suez Canal.

The overall picture of price correlations for port cities of the Middle East does not give a clear impression of a uniform process of regional integration. Relationships between sets of cities within empires, and based on different geographies provides no clear pattern of integration. The only

52. Giovanni Federico, "How much do we know about market integration in Europe?," *Economic History Review* 65, no. 2 (2012): 470–497.

Table 3.3: Correlation coefficients of rice prices for cities of the Arabian Sea and Indian Ocean

City Pair	1870 – 1885	1885 – 1900	1900 – 1914	Overall
(a) Jeddah – Basra	0.314 (0.265)	**0.426** (0.096)	**0.635** (0.002)	**0.480** (0.015)
(b) Basra – Bombay	0.309 (0.275)	**0.434** (0.093)	**0.771** (0.000)	**0.790** (0.000)
(c) Bushire – Calcutta	**0.488** (0.092)	**0.473** (0.041)	**0.663** (0.000)	**0.667** (0.000)
(d) Alexandria – Rangoon	**0.750** (0.000)	**0.707** (0.000)	**0.346** (0.071)	**0.485** (0.002)
(e) Baghdad – Calcutta	–0.009 (0.784)	0.207 (0.334)	**0.538** (0.041)	**0.236** (0.096)
(f) Bombay – Madras	**0.820** (0.000)	**0.577** (0.003)	**0.895** (0.000)	**0.804** (0.000)

Notes: Figures in bold denotes statistical significance. *P* values reported in parenthesis.

evidence of integration is that observed between port cities within the same maritime region, which are also those in the closest geographic proximity to one another. For pairs of cities connected via the Suez Canal, the evidence of integration is mixed, with some bilateral pairs showing increased positive correlation and others showing significant negative correlation.

To provide a basis of comparison to table 3.2, table 3.3 shows correlations of rice prices in port cities of the Middle East with ports across the Indian Ocean. In contrast to the lack of trends observed in table 3.2, correlations for pairs of cities across the Indian Ocean broadly show increasing coefficients and significance over time.

From table 3.3, row A shows the correlation of two port cities along the Arabian Sea coast. Rows B to E show city pairs across the Arabian Sea or the Indian Ocean. Row F shows two cities of the Indian subcontinent as a basis of comparison for correlation coefficients between overseas city pairs. Alexandria and Rangoon in row D is the pair with the greatest distance between cities among all pairs in tables 3.2 and 3.3, which is not just characterised by traversing the greatest distance, but also by requiring the passage through the Suez Canal. The evidence from row D, as well as the correlations for city pairs overall in table 3.3 contrast with correlation coefficients for cities of the Middle East shown in table 3.2. Coefficients are higher and generally show a positive trend over time, which is what would be expected for the first period of globalisation. Additionally, most city pairs in table 3.3 are significant while they are mostly insignificant in table 3.2. However even for

city pairs that are not significant or positively correlated in earlier periods across the Arabian Sea, they become so by the third period, rather than only being positively correlated over the whole series.

While price correlations provide an initial indication of greater Arabian Sea integration compared to Middle Eastern integration, the metric is imprecise, and inferences are difficult. What is interesting is how correlation is evident between markets at very close distances such as those within the Eastern Mediterranean or Persian Gulf, such as rows B and E of table 3.2, and how correlation is high at far greater distances between cities across the Arabian Sea, which are all city pairs in table 3.3. However for those at intermediate distances between either maritime region of the Middle East, there is not consistent evidence of positive correlation.

3.5 Middle Eastern trade price ratios

Correlation of rice prices provides an initial indication of market integration within the Eastern Mediterranean, and separately within the Persian Gulf as distinctly integrated maritime units, but it does not give clear evidence of a process of integration between the two regions. However price correlations provide only one measure of integration, and is illustrative rather than conclusive. To provide an alternative measure, this section looks at the import/export price ratio between origin and destination ports for all five commodities. A decline in the international dispersion of commodity price gaps over time, or the commodity price trend, is the most direct and irrefutable evidence that integration is taking place.[53] However limitations of using price gaps to measure integration in the Middle East are that it can only be measured between two cities, and the relationship between any two cities can involve several other variables that affect the level of integration which are not observed.

Trends are illustrated as the import to export price ratio for commodities where the prices have been matched from the port of origin in the Indian Ocean or Persian Gulf to a destination port in the Eastern Mediterranean or Europe, where the precise trade route of the commodity is known to pass through the Suez Canal. In general, for all commodities traded from the Indian Ocean to the Mediterranean, merchants reported that, "the natural tendency of the Canal is to create a direct trade between the Mediterranean countries and the East."[54] Trade records state that Indian trade to the Mediterranean went entirely through the Suez Canal, "India also trades with

53. O'Rourke and Williamson, "When did globalisation begin?"

54. M. Rathbone and T. H. Farrer, *Memorandum and Tables relative to the trade between the United Kingdom and the East: Memorandum on trade between the United Kingdom and the East through the Suez Canal*, House of Commons Parliamentary Papers (Board of Trade, December 1882), pp. 7.

other countries, such as those of the Mediterranean including France, Austria, and Italy, through the Canal. The Canal trade is thus a large part of the Indian foreign trade."[55] Therefore with the majority of India's trade passing via the Canal, and in several cases the trade route of a particular commodity is directly observed as passing through it, analysis of trade costs via the import/export price ratio from the Indian Ocean to the Eastern Mediterranean and Europe generally captures the cost of trading through the Suez Canal.[56] In the case of rice shipped from Burma, records indicate that the precise route taken was through the Suez Canal, as "milled rice could not withstand the dampness of ships' holds for the duration of the long haul around Africa...the eventual practice by 1880 of shipping milled rice by steamer via the Suez Canal operated to shift the processing industry back to Burma, so that rice milling developed into an expanding enterprise."[57]

With all commodity trades identified as passing through the Suez Canal, it is expected that trade price ratios for all commodities along any route should decline over time. This is because, other than the fixed cost of distance between the port of origin and destination, variable costs are also incurred on trade price ratios in the form of Canal duties. From the opening of the Canal in 1869 until 1914, the fees levied for Canal passage, measured in pounds Sterling per ton of cargo, exhibit periodic declines.[58] Additionally, at the same time as the fees charged for Canal passage were being reduced, the dimensions and capacity of the Canal were constantly expanding in order to allow for more ships of any size, thus increasing the volume of trade passing through it.[59] Hence the expectation of trade costs for routes connected by the Canal is that they should decline, if for no other reason, then simply as a result of declining Suez Canal duties.

Figure 3.2 shows the price ratio of rice from the port of origin in Rangoon to various destination ports. First, all city pairs other than the London/Rangoon price ratio demonstrate larger differences and higher price variance at the beginning of the period compared to the end. Overall the highest average price ratio for Alexandria is 2.8, with a variance of 6.815, followed by Beirut with an average price ratio of 1.9, variance 0.208, then Bushire average 1.54 variance 0.283, and lastly London with a price ratio of 1.29 variance 0.04. Second the London/Rangoon price ratio is generally the smallest, but does not demonstrate a declining trend over time, with an OLS regression on the London – Rangoon price ratio over time of –0.001, though not significant.[60] A

55. Rathbone and Farrer, *Memorandum and Tables relative to the trade between the United Kingdom and the East: Memorandum on trade between the United Kingdom and the East through the Suez Canal*, pp. 7.

56. Total trade value of Indian exports via the Suez Canal versus any other route show the majority of trade passing through the Canal, from the *Statistical Abstracts of British India*

57. Siok-Hwa Cheng, *The Rice Industry of Burma, 1852 - 1940* (Kuala Lumpur: University of Malaya Press, 1968), pp. 8.

58. See appendix section 4 figure 3.17.

59. See appendix section 4 figure 3.16.

60. The model used for this, and similar regressions for price ratios over time is simply $P_{import}/P_{export} = \beta_0 + t + \varepsilon$

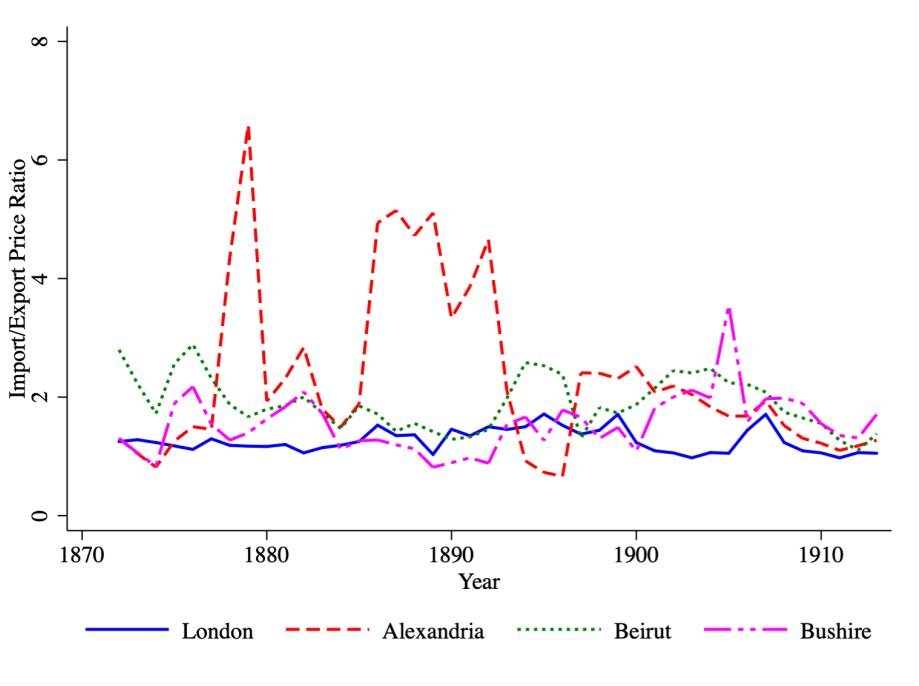


Figure 3.2: Import/Export price ratio for rice from Rangoon to various destinations

similar, though larger price ratio level observed between Bushire and Rangoon, with a time trend of –0.031***. This city pair is the shortest in distance, and is entirely within the Indian Ocean. Considering that the London/Rangoon price ratio is the greatest in distance and requires passage through the Suez Canal, it would be expected that this should be higher than the Bushire/Rangoon one. The similar levels for both trade routes suggests that Rangoon was just as integrated with ports of the Indian Ocean as it was with London and Europe at a far greater distances.

There are two port cities of the Middle East in figure 3.2 that are connected to Rangoon via the Canal, which are Beirut and Alexandria. Although they both show a convergence over time with a time trend coefficient of –0.009* for Beirut and –0.068** for Alexandria, the price ratio for both cities are higher than between the destination cities of London or Bushire. Given the London/Rangoon and Bushire/Rangoon price ratio, it would be expected that the price ratio for Beirut and Alexandria would be somewhere between the other two as a result of distance, however this is not the case, which suggests that there was less integration between the two coastal regions of the Middle East compared to major port cities of Europe and Asia at greater distances.

Figure 3.3 illustrates the price ratio for a similar geographic representation of cities for the tea trade. From the archival record, tea, along with pepper, is similarly observed as trading through the Suez Canal, "a well–informed correspondent, a shipowner, to whom application was made on

and is illustrative of whether or not a convergence trend is present and significant.

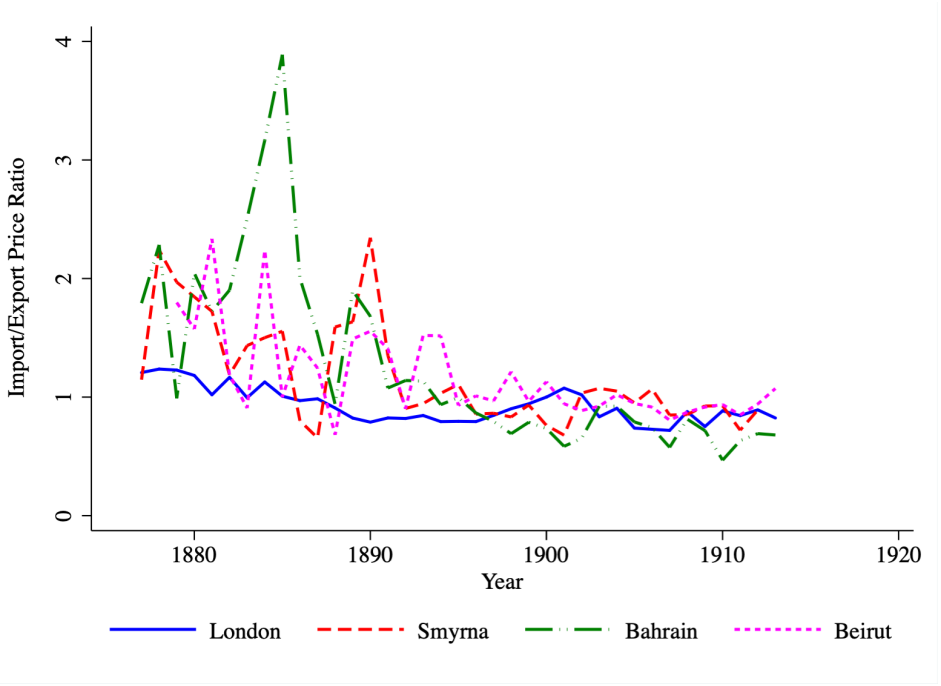


Figure 3.3: Import/Export price ratio for tea from Bombay to various destinations

the subject, states specifically, as regards British India, that coffee, pepper, wheat, and tea all come through the Canal."[61] Similar to trends in the price ratio for rice, tea shows an overall process of convergence. The trends for all city pairs indicates a process of integration between the eastern and western maritime regions of the Middle East, but that this occurred later than it did for integration between Europe and Asia. Even though the price ratio trends converge, they are higher for Smyrna and Beirut to Bombay, compared to London to Bombay over the period.[62]

Figure 3.4 illustrates the price ratio trends for pepper. In contrast to previous trends on rice and tea, pepper does not demonstrate convergence between the port of origin of Batavia and various destinations. However consistent with previous evidence, the price gap is smallest and the variance lowest between Batavia and European ports at the greatest distances, with an average price ratio and variance for London of 1.39 and 0.208, and Amsterdam of 1.283 and 0.014 respectively.[63] Price ratios between ports of the Indian Ocean are small with low levels of variance, nearly as low as that for trade with Europe, with an average price ratio of 1.604 and a variance of 0.449 over the period for Bahrain.[64] However price ratios from Batavia to ports of the Eastern Mediterranean

61. Rathbone and Farrer, *Memorandum and Tables relative to the trade between the United Kingdom and the East: Memorandum on trade between the United Kingdom and the East through the Suez Canal*, pp. 4.

62. Time trends for the four price gaps are:
London: –0.009***, Smyrna: –0.019***, Bahrain: –0.052***, Beirut: –0.003.
Overall price gap means: London: 0.927, Smyrna: 1.04, Bahrain: 1.262, Beirut: 1.027.
Overall price gap variance: London: 0.022, Smyrna: 0.141, Bahrain: 0.602, Beirut: 0.137.

63. Time trends are: London: –0.001, Amsterdam: –0.007***.

64. Time trend for Bahrain: –0.020*

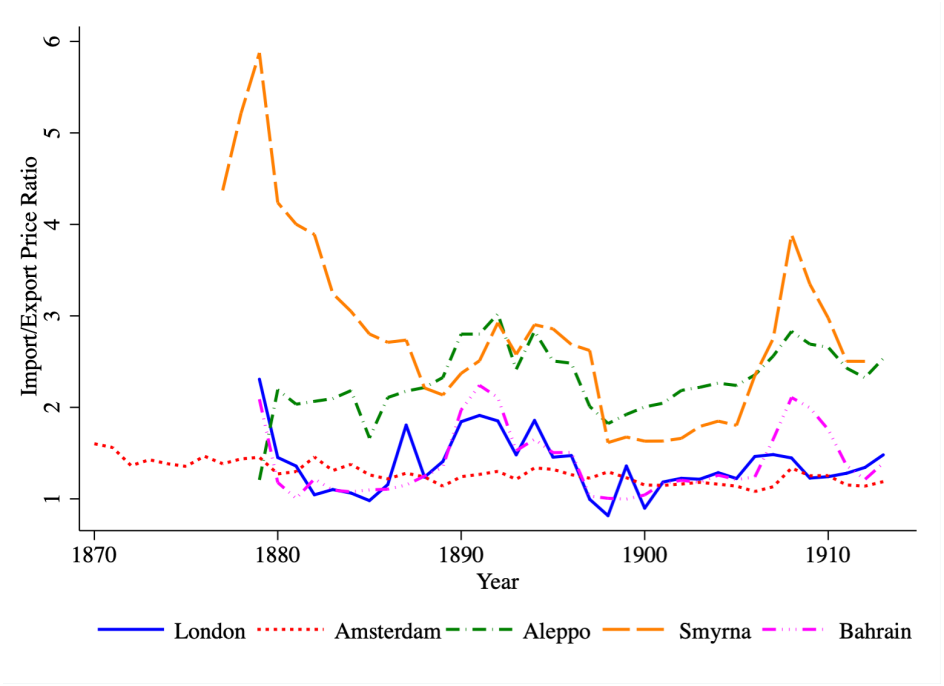


Figure 3.4: Import/Export price ratio for pepper from Batavia to various destinations

are the highest. In the case of Aleppo/Batavia, the trend does not demonstrate convergence, but instead moves in the opposite direction of divergence with a time coefficient of 0.017**.[65] The Smyrna/Batavia price gap does not significantly decline over time with a time trend of 0.006, and the price ratio is much larger than that of European ports, and remains so over the period with an overall average price ratio of 3.83 and a variance of 1.011.

Trends from indigo in figure 3.5 are similar to pepper, which does not demonstrate a distinct process of convergence across city pairs. For the two cities of the Eastern Mediterranean, the Aleppo/Calcutta price ratio shows increasing divergence, with a time coefficient of 0.019***, while Smyrna/Calcutta converges with a coefficient of –0.036***.[66] In contrast, the London/Calcutta price ratio is the lowest and least volatile over the entire period, with a mean ratio of 1.09 and a variance of 0.092.[67] For Basra/Calcutta, the only route that does not require passage through the Suez Canal, the price ratio is greater than that of London/Calcutta for nearly the entire period, with an overall average price ratio of 1.56 and a variance of 0.546.[68]

Finally, figure 3.6 shows the price ratio for Persian tobacco, or *tombac* as it is sometimes referred to in the archival records. *Tombac*, or *Isfahani Ajami*, is a tobacco plant that comes uniquely from the region and city of Isfahan in southern Persia, and was in high demand and uniquely

65. Average for Aleppo: 2.314, variance: 0.374.
66. Aleppo average price ratio: 1.78, variance: 0.097. Smyrna average price gap: 1.38, variance: 0.346.
67. London time trend coefficient: –0.005.
68. Basra time trend coefficient: –0.018*.

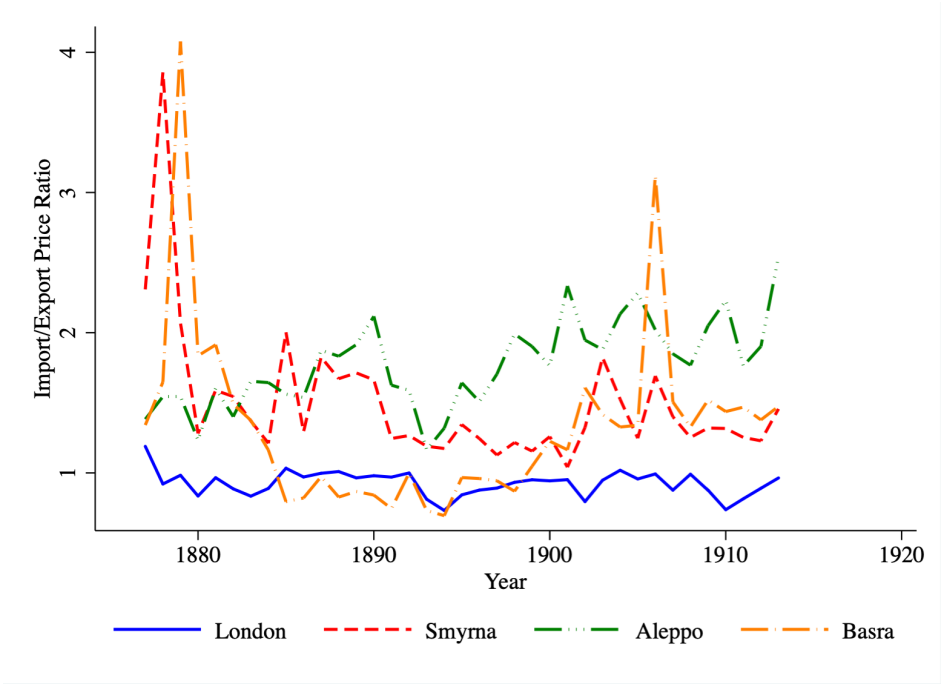


Figure 3.5: Import/Export price ratio for indigo from Calcutta to various destinations

consumed in the Middle East for use in hookah, "Ispahan is the great centre of the 'tumbeki' cultivation, a class of tobacco practically unknown in the United Kingdom, as it is not adapted for use either in the form of cigarettes or of pipe tobacco, but is consumed exclusively in the Persian *kaliun* or the Turkish *narghille* (water–pipe). Though in more or less general use all over Asia Minor and Egypt, the Ispahan product is for the most part consumed on the Mediterranean littoral. Smyrna, with its dependencies, is an important consumer, but Beirut and Syria generally come first."[69] From the trade records across Middle Eastern port cities, Persian tobacco was the only commodity traded uniquely within the Middle East, as the region has been defined in this paper, which has been precisely matched from its origin in Isfahan to the several destinations along the Mediterranean littoral to estimate direct overseas trade costs between the two maritime regions.[70]

In addition to knowing the precise origin and destination of the *tombac* trade, records also state the precise route that was taken in the commodity's shipment from Persia to the Eastern Mediterranean. Although there is a long history of the commodity being extremely popular across the

69. Diplomatic and Consular Reports, *Trade of Ispahan and Yezd*, no. 3923 Annual Series (1906, London), pp. 567 – 569.

70. "In 1897 the hire for carriage from Bushire to Ispahan (mules and camels) ruled high throughout the year. This especially applies between Bushire and Shiraz...generally rates were high and there were periods when transport was very scarce, consequently stocks accumulated at Bushire and Shiraz." However there was a small degree of trade that did proceed all the way from Ispahan to London, "There is every reason to hope that the opening of the road from Ahwaz to Ispahan, which should be completed during the coming summer, will improve matters in every way. Goods can now be insured from London to Ispahan and vice versa at Lloyd's by this new route." *Diplomatic and Consular Reports on the Trade of Ispahan and District* no. 2260 Annual Series (1897 – 1899), pp. 372.

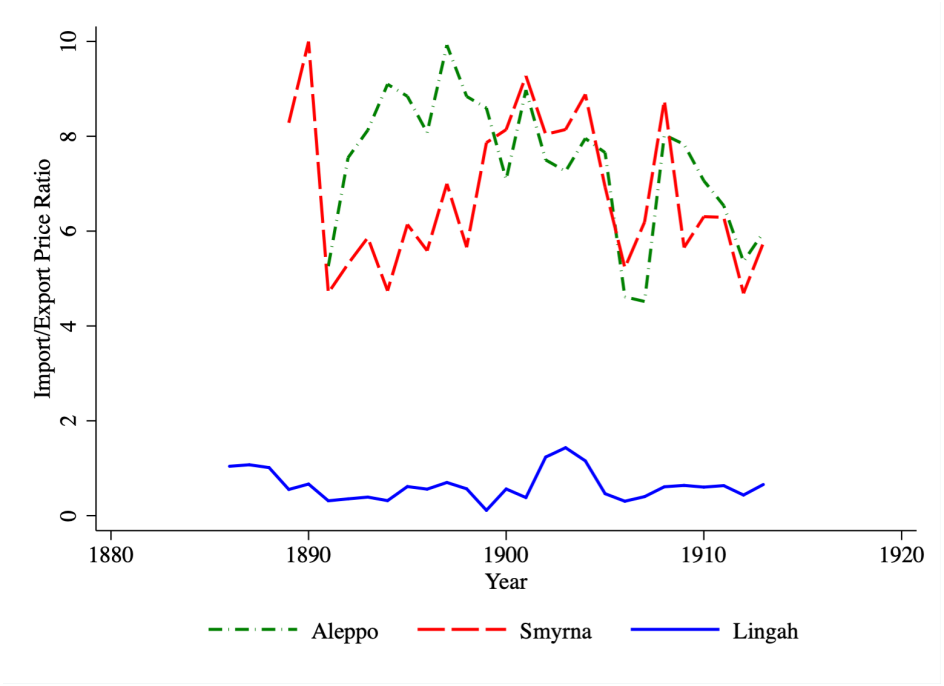


Figure 3.6: Import/Export price ratio for Persian tobacco from Bushire to various destinations

Middle East, *tombac*'s appearance in the trade records of the late nineteenth century is a result of being largely distributed by European enterprises, particularly the French *Société du Tombac*, which was a major purchaser of Isfahani tobacco. From the society's records, the precise pathway of the good is known to be shipped overseas from ports of the Persian Gulf, traveling through the Suez Canal to ports of the Eastern Mediterranean, where it was in high demand across France's colonial possessions. Correspondence from the *Société* in 1893 describes the method of trading in *tombac*, "Le port de transit du tombac est par Buschire, et il passe par le canal de Suez pour se répandre dans la Turquie d'Europe et d'Asie. Le tombac, dont la consommation est assez considérable, est surtout fumé par la population des côtes et par les marins. Nos populations d'Algérie et de Tunisie fument aussi beaucoup le narghilé."[71] While there were several other European shipping companies that handled *tombac*, the *Société du Tombac* was the largest, as the British report lamented in 1906, "owing to various reasons, there have been practically no buyers in the market other than the *Société du Tombac*, which has thus been able to withstand the demand of the growers for higher prices."[72]

Observing the origin and destination of *tombac* traded through the Canal illustrates the direct

71. M. le Vicomte Georges de Zogheb and Simon Philippart, *Petite Revue Financière: Le Journal des Débats*, technical report (Paris: Sociéte du Tombac, December 1893), "The port of transit for *tombac* is by Buschire, and it goes through the Suez Canal where it is spread across European Turkey and Asia. *Tombac*, whose consumption is quite considerable, is mostly smoked by the peoples of the coasts and by sailors. Our Algerian and Tunisian populations also smoke a lot from the narghile."

72. Diplomatic and Consular Reports, *Trade of Ispahan and Yezd*, no. 3923 Annual Series (1906, London), pp. 195.

trade costs and degree of integration associated with overseas trade between the Persian Gulf and the Eastern Mediterranean. The trends in figure 3.6 confirms similar patterns observed with the other four commodities. The price ratio is lowest for trade between Lingah/Bushire, two ports of the Persian Gulf, compared to price ratios between ports connected via the Suez Canal.[73] There is extensive annual variation in the price ratio for Aleppo and Smyrna, though both demonstrate similar movements that are distinct from the Lingah/Bushire trend. The time trend for the Aleppo/Bushire price ratio demonstrates a converging price trend, however it is not significant, with a coefficient of –0.343. Demonstrating even less supporting evidence of Middle Eastern integration, the Smyrna/Bushire trend is positive, though insignificant with a coefficient of 0.073. Evidence from Persian tobacco as a commodity specifically traded between the Middle East's two maritime regions does not demonstrate any evidence that integration is taking place in a period despite the availability of the Suez Canal route.[74]

Consistent patterns across all five commodity price ratios provide preliminary inferences of the process of market integration in the Middle East. First, the price ratio is always lowest between ports of the Indian Ocean and Europe, which are city pairs that are the furthest apart by distance, and which incurred an additional fee for passage through the Suez Canal. Second, price ratios between city pairs within the Indian Ocean are similar to those for city pairs from the Indian Ocean to Europe, despite the fact that passage through the Suez Canal was not required within the Indian Ocean, and that distances between Indian Ocean city pairs were much closer. Third, of all types of bilateral pairs across all five commodities, price ratios between the Persian Gulf and the Eastern Mediterranean were the highest over the period, and in some cases show divergence over time. Consistent evidence from analysis of price ratios across commodities and routes demonstrates preliminary evidence that the Middle East was not as integrated between the two maritime regions of the Eastern Mediterranean and the Persian Gulf compared to integration within Asia across the Indian Ocean, or between Europe and Asia through the Suez Canal.

3.6 Regional trade routes and trade costs

Analysis of price ratios between bilateral pairs of port cities from the Indian Ocean or Persian Gulf through the Suez Canal to destination ports of Europe or the Eastern Mediterranean suggest that trade costs varied based on whether or not the destination region was the global core of Europe or

73. For Lingah, the average price ratio is: 0.785, variance: 0.345.
For Smyrna, average price ratio: 12.105, variance: 25.182.
For Aleppo: 9.282, variance: 65.992.

74. The coefficient on the Lingah/Bushire time trend is: 0.006.

the global periphery of the Eastern Mediterranean, rather than simply being a function of distance or transportation costs. If this initial evidence is significantly observed across a broader set of city pairs clustered according to trade routes between geographic regions, rather than on a bilateral case by case basis, then it would demonstrate that the Middle East, between the two maritime regions of the Eastern Mediterranean and the Persian Gulf, experienced less market integration in the first period of globalisation than that witnessed at a global level on major trade routes between Europe and Asia. In order to determine whether or not trade costs generally varied according to regional routes depending on whether or not the destination region was in the global core or periphery, the following equation is used:

$$\begin{aligned} lnTC^{k}_{ijt} = \alpha + \beta_{1,t} + \beta^{k}_{2,t} lnD_{ij} + [\gamma^{k}_{1,t}(IO-IO)] + [\gamma^{k}_{2,t}(IO-EM)] + [\gamma^{k}_{3,t}(IO-EU)] \\ + [\gamma^{k}_{4,t}(PG-EM)] + [\gamma^{k}_{5,t}(PG-EU)] + [\gamma^{k}_{6,t}(PG-IO)] + [\gamma^{k}_{7,t}(EM-EU)] \\ + [\gamma^{k}_{8,t}(EU-EU)] + [\gamma^{k}_{9,t}(PG-PG)] + [\gamma^{k}_{10,t}(EM-EM)] + \varepsilon^{k}_{ijt} \end{aligned} \tag{3.1}$$

TC is the trade cost or import/export price ratio between any bilateral pair of cities ij in year t for one of five commodities k. $\beta_{1,t}$ is a time fixed effect. lnD is the log of distance between each bilateral city pair ij, with a separate distance coefficient $\beta_{2,t}$ given for every year t for each commodity k. The remaining 10 variables of the equation are dummy variables indicating the trade route for each bilateral pair. For any combination of ij city pairs, there are 4 different regions that any city lies in: either the Indian Ocean, the Persian Gulf, the Eastern Mediterranean, or Europe. With 4 regions there are 10 combinations of ij city pairs, which are each shown as a dummy variable in equation 3.1. IO refers to ports of the Indian Ocean, but does not include ports of the Persian Gulf or the Arabian Peninsula. PG refers to ports of the Persian Gulf and those along the Arabian Peninsula, essentially Middle Eastern ports east of the Suez Canal. EM refers to ports of the Eastern Mediterranean to capture Middle Eastern ports west of the Canal, and EU indicates any port city of Western Europe. With all combinations of bilateral city pairs identified in equation 3.1, the relative cost of trading along each of the 10 regional trade routes is estimated in relation to bilateral city pairs that lie within the Indian Ocean, $IO-IO$, thus omitting $\gamma^{k}_{1,t}(IO-IO)$ in the equation. Figure 3.7 illustrates how the trade price series collected from the previous figure 4.12 for each city is broken down on the basis of the four regions.

Table 3.4 shows the results of equation 3.1 regressed separately for each of the nine commodities shown in rows 1 – 9. The coefficients represent the marginal difference in the cost of trading



Figure 3.7: Map of ij cities according to regional trade routes IO, PG, EM, EU

each commodity relative to the cost within the Indian Ocean, or $IO-IO$ city pairs. Since all ij pairs that are within $IO-IO$, within the Persian Gulf $PG-PG$, or between $PG-IO$ do not require passage through the Suez Canal, and are the closest in distance relative to trading from IO to any other region through the Canal, it would normally be expected that trade between any bilateral pairs along IO or PG should be the cheapest route. However as previously demonstrated when looking at price ratios in the previous section 3.5, this is not always the case, as price ratios between European and Asian ports are generally smaller or near the same level as those within the Indian Ocean. If trade costs were cheapest within the Indian Ocean, as normally expected, and trade routes between regions significantly determined trade costs, then the relative cost of trading along all other regional routes at greater distances and through the Suez Canal should be higher, represented by a significant positive increase in the coefficient for any route other than ij city pairs within IO. Similarly, any other ij pair that does not require passage through the Suez Canal should be cheaper than any pairs that do, since the Canal imposes a standardised added trade cost in the form of transit fees issued in per ton of cargo.

From table 3.4 coefficients are broadly consistent with preliminary evidence from previous analysis of price gaps and price correlations, but not entirely consistent with expectations that trade within the Indian Ocean should be cheapest. The primary variables of interest are the first four trade routes in table 3.4: from the Indian Ocean to either the Eastern Mediterranean or Europe, $IO-EM$ and $IO-EU$, and from the Persian Gulf to either the Eastern Mediterranean or Europe,

$PG-EM$ and $PG-EU$. Of these, $IO-EU$ identifies the major long–distance routes between major colonial port cities of the Indian Ocean and major European ports, and $PG-EM$ indicates trade routes from the Persian Gulf to the Eastern Mediterranean, which captures the cost of trading through the Suez Canal between the two maritime regions of the Middle East.

Comparing routes from either IO or PG to EM in rows 1 and 3 is consistently positive across commodities, which is what would typically be expected since $IO-IO$ routes are generally in closer distance and do not require passage through the Suez Canal, hence the marginal effect of routes through the Canal to EM are more expensive relative to $IO-IO$ routes. For example, from the table, the cost of shipping tea from a port in the Indian Ocean to the Eastern Mediterranean is 91% more than shipping tea within the Indian Ocean. For a good such as pepper, the difference in trade cost from trading within the Indian Ocean to trading from the Indian Ocean to the Eastern Mediterranean is 13% greater.

What is exceptional for trade through the Suez Canal is the coefficients on trade from either IO or PG to destinations in Europe in rows 2 and 4. First, for the $IO-EU$ trade route, significant and negative coefficients across columns confirm that it was cheaper to trade on more long–distance routes between Europe and the Indian Ocean, $IO-EU$, compared to any other route within the Indian Ocean. This is surprising considering that $IO-EU$ routes are the furthest apart, therefore as a function of distance alone they are expected to be the most expensive.[75] Second, they incur an added cost as a result of Suez Canal passage, which would have been equally applied to $IO-EU$ routes as well as $IO-EM$ routes, imposing a uniform increase in transportation costs. Although Suez Canal trade costs decline over time, they always incur an additional cost measured in per ton of cargo. Yet only the $IO-EM$ route shows a significant increase in trade cost relative to trade within the Indian Ocean. While the cost of shipping tea through the Suez Canal along the $IO-EM$ route is 91% greater than the cost of shipping tea within the Indian Ocean, to ship tea to Europe is instead 91% cheaper. Although this is consistent with previous evidence that has observed distinctly cheaper trade costs for routes between European empires and colonial ports, results are surprising considering the general consistency of all other variables which confirm higher trade costs through the Canal and at greater distances.

Additionally, in comparison to the $IO-EU$ route, the $PG-EU$ route is not consistently negative across commodities. Trade from the Persian Gulf to Europe is only significantly cheaper for tea. It is not cheaper for pepper and indigo, and shows no significant difference in trade cost for

75. Anne-Celia Disdier and Keith Head, "The Puzzling Persistence of the Distance Effect on Bilateral Trade," *The Review of Economics and Statistics* 90, no. 1 (February 2008): 37–48.

Table 3.4: Marginal trade costs for 9 regional trade routes

	City Pair	(1) Rice	(2) Tea	(3) Pepper	(4) Indigo	(5) Tobacco
1	$IO-EM$	1.581***	0.649***	0.120*	0.786***	–
		(0.065)	(0.091)	(0.062)	(0.048)	–
2	$IO-EU$	–0.868***	–0.647***	–0.288***	–0.123**	–
		(0.144)	(0.168)	(0.081)	(0.063)	–
3	$PG-EM$	0.636***	0.392***	0.429***	0.951***	0.649***
		(0.090)	(0.096)	(0.072)	(0.065)	(0.010)
4	$PG-EU$	0.018	–0.407***	0.234**	0.777***	–
		(0.132)	(0.129)	(0.092)	(0.075)	–
5	$PG-IO$	0.098	–0.077	0.212**	0.562***	–
		(0.099)	(0.115)	(0.099)	(0.051)	–
6	$EM-EU$	0.312***	–0.281**	–0.815***	0.356***	–
		(0.082)	(0.119)	(0.111)	(0.084)	–
7	$EU-EU$	–0.092	0.622***	–0.310	0.457***	–
		(0.130)	(0.204)	(0.211)	(0.098)	–
8	$PG-PG$	–1.182***	–0.148	0.667***	0.870***	–
		(0.177)	(0.115)	(0.125)	(0.126)	–
9	$EM-EM$	0.379**	0.671***	–0.423***	1.020***	0.194***
		(0.132)	(0.100)	(0.122)	(0.091)	(0.011)
	Constant	7.038***	–2.352**	–1.666*	0.196	6.036***
		(0.826)	(1.090)	(0.901)	(0.428)	(0.087)
	Year fixed effects	Yes	Yes	Yes	Yes	Yes
	Year x Dist fixed effects	Yes	Yes	Yes	Yes	Yes
	Obs	2654	2332	2000	5275	662
	R–squared	0.210	0.095	0.192	0.204	0.854

Notes: Dependent variable is the log price ratio of commodity k shown in columns 1 – 5, between city pair ij. Each of the 9 dummy variables shown refers to the 10 regional trade routes from equation 3.1 with the indicator variable for the $IO-IO$ route being the omitted category. Coefficients for $IO-EM$, $IO-EU$, $PG-EU$, $PG-IO$, $EM-EU$, and $EU-EU$, are omitted for tobacco, since tobacco was a commodity that was uniquely traded from the Persian Gulf, and distributed to the Eastern Mediterranean. $PG-PG$ is the omitted category for tobacco column 5. Heteroskedastic robust standard errors clustered at each year are reported in parenthesis. *** indicates statistical significance different from zero at the 1 per cent level; ** indicates the 5 per cent level; and * indicates 10 per cent level.

rice relative to the cost of trading rice within the Indian Ocean. Since trade from the Persian Gulf is not entirely distinct from trade of the Indian Ocean, because the route did not involve passage through the Suez Canal, the trade cost coefficients on the $PG-EU$ route indicate that lower costs from regions of the global periphery were not cheaper simply as a result of the destination being in the global core of Europe, although this may have played a part. Instead it suggests that there were also specific features to the $IO-EU$ route that made it consistently cheaper than $IO-IO$ trade. From figure 3.7 showing which origin and destination ports are assigned to which region, differences between ports of the Persian Gulf compared to ports of the Indian Ocean are firstly that IO ports are almost entirely part of the British Empire, with the exception of Batavia being a part of the Netherlands. In either case, all ports of the Indian Ocean are controlled by European empires. In contrast, ports of the Persian Gulf are either part of the Persian or Ottoman Empires, with Aden being the only port that is part of British India. Likewise several studies have established that colonial ties during this period played a significant role in increasing the amount of bilateral trade.[76] Secondly, aside from colonial ties, the ports of the Indian Ocean were more populous cities, and were major entrepots, compared to those of the Persian Gulf. Hence comparing evidence between $IO-EU$ and $PG-EU$ suggests that two additional factors contributing to cheaper costs on more long distance routes other than whether or not the destination region was to the global core, are colonial ties and the size of importer and exporter cities, both of which likely contributed to cheaper trade costs from the Indian Ocean to Europe compared to any other route in this period.

Despite evidence from the $PG-EU$ route demonstrating that trade to the global core of Europe was not the only factor determining the relatively cheaper trade costs on more long–distance routes through the Suez Canal, comparing PG trade to either EU or EM in rows 3 and 4 of table 3.4 also shows that it was consistently cheaper to trade to the global core of Europe rather than within the global periphery of the Eastern Mediterranean. In the case of pepper, $PG-EM$ trade was 54% more costly than trading pepper within the Indian Ocean, whereas it was only 26% more expensive to Europe. Likewise, for the $PG-EU$ indigo trade, it was 19% cheaper compared to the $PG-EM$ trade route, although all $PG-EM$ importer/exporter bilateral pairs are in closer proximity than those to Europe. Although the $PG-EU$ route is not consistently negative, evidence between trade from the Persian Gulf or Indian Ocean to Europe confirms that trade from either region of the global periphery to the global core was cheaper than trading within the global periphery to the Eastern Mediterranean, even if the routes were closer in distance. Hence while trade from the

76. Kris James Mitchener and Marc Weidenmier, "Trade and Empire," *The Economic Journal* 118, no. 533 (November 2008): 1805–1834.

periphery to the global core of Europe does not consistently show that the route is cheaper than trade within Indian Ocean, it does consistently show that it was cheaper to Europe compared to the Eastern Mediterranean through the Canal. Therefore while the destination region was certainly not the only factor affecting trade costs, comparative evidence suggests that the destination region mattered.

The remaining routes in table 3.4 capture a mix of marginal trade cost effects varying based on the commodity. As previously discussed, since import and export prices of commodities in table 3.4 have been directly matched between ports of origin in the Persian Gulf or Indian Ocean, with ports of destination in the Eastern Mediterranean or Europe, the actual observed trade routes are those that have been identified in rows 1 through 4 of table 3.4. The remaining 5 rows capture only import prices of commodities, such as $EM-EU$, $EU-EU$, and $EM-EM$, or only export prices, such as $PG-IO$ and $PG-PG$, as previously illustrated in figure 3.1 showing where import and export prices of the 5 commodities have been collected. Hence the subsequent coefficients on these routes capture the difference in import prices or the difference in export prices within or between regions, though not necessarily the actual cost of trading the commodities, since the actual trade along these routes is not explicitly observed, which is the case for the first 4 trade route variables in table 3.4. Hence coefficients on these 5 variables fluctuate relative to $IO-IO$ trade, without demonstrating a clear or consistent pattern across commodities. Indeed amongst all 9 trade routes, only $IO-EU$, $IO-EM$, and $PG-EM$ routes show consistently significant marginal effects, either positive or negative. Consistency in the marginal effects across commodities confirms evidence of the relative trade costs for various routes. This is the case for explicitly observed trade routes in rows 1 through 3 of table 3.4, however coefficients are entirely inconsistent in the case of routes identified in rows 5 through 9.

Results from table 3.4 confirms more generally what has been observed specifically for individual trade routes and commodities in previous sections; that it was cheaper to trade from the global periphery of the Indian Ocean to the global core of Europe compared to any other route within the periphery. Additionally, by breaking down trade routes into 4 regions, comparisons between trade from either IO or PG to Europe through the Canal show that it was always cheaper than trading from the global periphery of IO or PG to the Eastern Mediterranean, despite all destinations of the Eastern Mediterranean being in closer proximity, but within the global periphery compared to destinations of Europe. While previous analysis has measured Middle Eastern market integration according to price correlation and price ratios along individual routes, trade cost analysis according to broader regional routes illustrates how the two maritime regions of the Middle East traded

and integrated in different ways; that the port cities along the Middle East's two maritime regions were not as well integrated with each other across the landmass and in closer proximity, compared to integration along more long–distance routes between Europe and Asia in the first period of globalisation.

3.7 Price gap trends

Results in table 3.4 show the marginal effect in trade costs between maritime regions of the global core and periphery over the entire period 1870 to 1914. However marginal effects have not taken into account any trend in trade costs over time. Given evidence from the previous section analysing price ratio trends for all five commodities, although price ratios from the Indian Ocean to Europe are the lowest, there is also a general trend of commodity price convergence observed across most other trade routes, if not in the years immediately following the opening of the Suez Canal, then to some extent by the end of period. Additionally, between 1870 to 1914 the Suez Canal Company had at several points reduced the cost for shipping goods through the Canal, which should also have an effect on reducing trade costs over time.[77]

Therefore to observe how the marginal effect of regional trade costs evolved over time, equation 3.1 is re–estimated on three 15 year sub–periods, corresponding to the years 1870 to 1885, 1885 to 1900, and from 1900 to 1914. For each of the 3 sub–periods, equation 3.1 is calculated on each of the 4 commodities that were traded across all 4 regions.[78] For each of the 4 commodities, trends in the marginal trade cost coefficients across 3 sub–periods are observed on the 4 primary trade routes of interest. The routes of interest are those between regions connected via the Suez Canal, and where the explicit import and export price between origin and destination is directly observed. This is the case for routes from origins in the Indian Ocean or the Persian Gulf, to destinations in either the Eastern Mediterranean or Europe, corresponding to rows 1 through 4 in table 3.4. Trends of the four routes are separated into two plots in figure 3.8 based on the region of origin being either *IO* or *PG*. Solid blue lines refer to destinations of the Eastern Mediterranean, and dashed red lines refer to destinations of Europe. The three points in the trend line are simply plotted as a standard 10–year difference between each sub–period: 1880 for the first period, 1890 for the second, and 1900 for the third. However the three points do not necessarily refer to those years, but instead

77. See appendix section 4, figure 3.17 for the trend in the fees levied for passage measured in Sterling per ton of cargo.

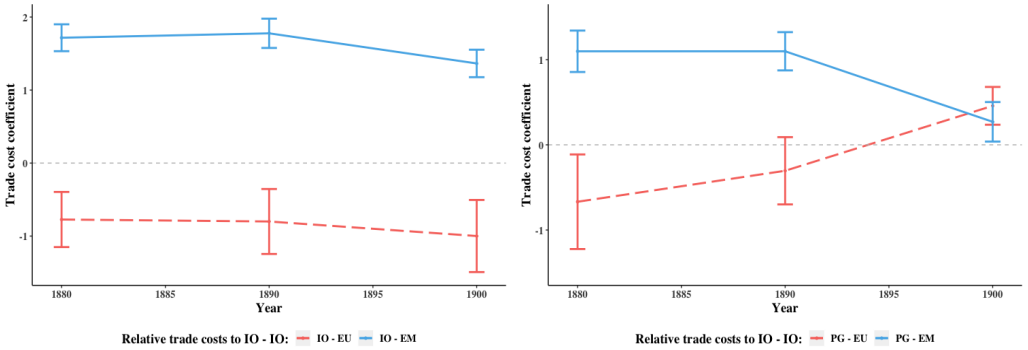
78. Trade of Persian tobacco was uniquely traded between the two maritime regions of the Middle East: from the Persian Gulf to the Eastern Mediterranean. Hence there is no data to compare the route with those that included the Indian Ocean or Europe. Further discussion of the marginal trade cost trend for Persian tobacco is continued in section 9.

are simply illustrative of the sub–period, and the approximate time difference between the three, in order to observe the trend in marginal trade costs over time.

As the procedure for calculating trade cost trends over time removes several observations based on the commodity, the region of destination, the region of origin, and a more narrow timeframe, the reduction in the number of observations leads to less accuracy in the coefficients for each sub–period. Subsequently from the plots in figure 3.8, several of the confidence intervals for trends approach, if not slightly overlap with, the zero y–axis for insignificance of the trade cost coefficient. Therefore in order to reduce the number of observations for sub–periods without losing accuracy in the significance of the coefficients, while still being able to observe trends over time, sub–periods are limited to three non–overlapping timeframes in order to clearly demonstrate broad trends over the entire period 1870 to 1914. Additionally, as the cost of passage through the Suez Canal only declines over the period from appendix figure 3.17, trends in figure 3.8 are only meant to illustrate whether or not there was a decline in the cost of trading between regions connected by the Canal, and how trends compared based on regional routes, rather than observing fluctuations in the trade cost pattern over the period.

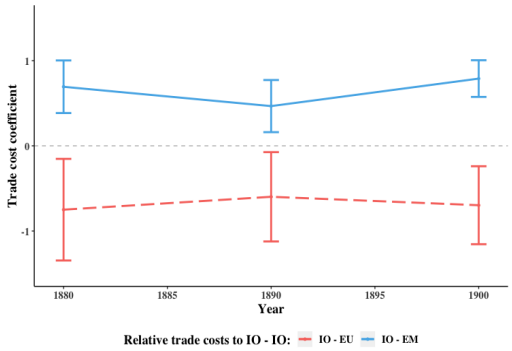
From figure 3.8, trends generally confirm evidence from table 3.4 of a persistence in lower costs along more long–distance routes between Europe and Asia, and higher trade costs between the two maritime regions of the Middle East at relatively closer distances over time. However figure 3.8 illustrates some important trends. Firstly, for all trade originating from the Indian Ocean, the $IO-EU$ route is consistently cheaper than trade to the Eastern Mediterranean, without demonstrating any distinct convergence across commodities. Across all four commodities, there is not a distinct or clear process of convergence in the trade cost trends between $IO-EU$ and $IO-EM$.

Second, in contrast to trade costs from the Indian Ocean, trends from the Persian Gulf do show a distinct process of convergence between destinations of Europe and the Eastern Mediterranean. Trade costs for rice and tea from the Persian Gulf converge over the three periods between destinations of Europe and the Eastern Mediterranean to have a similar marginal increase relative to $IO-IO$ trade. Although there is not a clear convergence trend observed for pepper and indigo from the Persian Gulf, the marginal effects of trade costs to each destination region are closer to each other than those from IO to either EU or EM. The trends for trade from PG to either EU or EM demonstrate that there was a process of integration between the two maritime regions of the Middle East, but that this process was lagged compared to integration between the Persian Gulf and Europe. That all marginal effects of the $PG-EU$ route are cheaper in the first sub–period compared to $PG-EM$ routes suggests that the Suez Canal contributed to reducing trade costs and

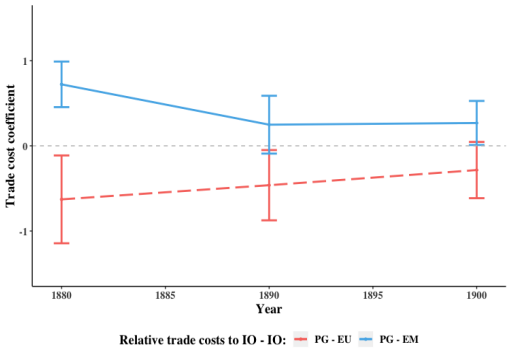


(a) Rice, *IO* origin

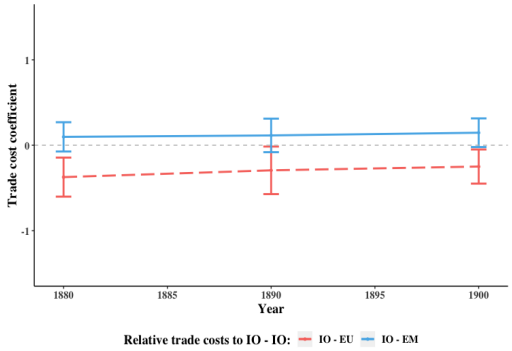
(b) Rice, *PG* origin



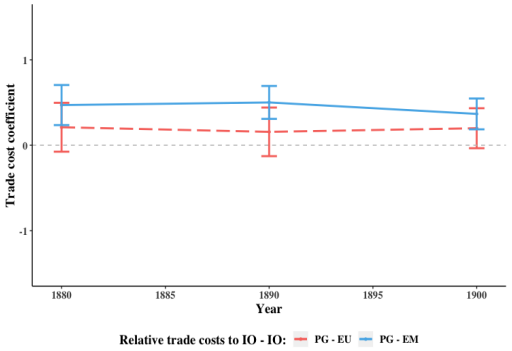
(c) Tea, *IO* origin



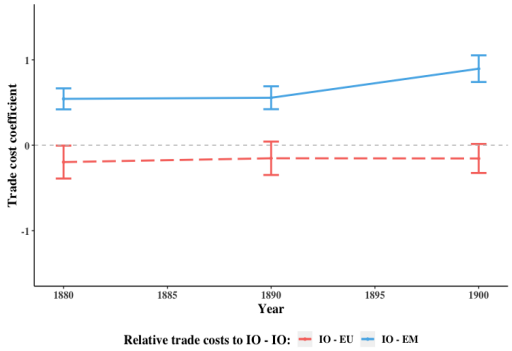
(d) Tea, *PG* origin



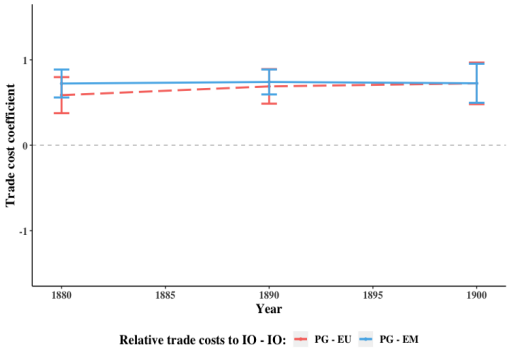
(e) Pepper, *IO* origin



(f) Pepper, *PG* origin



(g) Indigo, *IO* origin



(h) Indigo, *PG* origin

Figure 3.8: Regional trade route trends in 15–year sub–periods for 4 commodities traded across all 4 regions.

increasing integration firstly from the global periphery to the global core, and then belatedly for trade within the periphery, as the marginal increase in trade costs for $PG-EU$ does not converge with the Eastern Mediterranean until the final sub–period.

Third, even with convergence observed along Persian Gulf routes for rice and tea, consistency across all 8 panels of figure 3.8 confirms that it was cheaper to trade from the global periphery of the Indian Ocean or the Persian Gulf to the global core of Europe through the Suez Canal, whereas it was more costly to trade within the periphery, from IO or PG to the Eastern Mediterranean. For IO or PG origins, all panels show that the trade cost trends to EU destinations are lower, if not negative, compared to EM destinations. Consistently cheaper marginal trade cost effects from IO and PG origins to destinations of EU suggest that there is a role played by the destination region being the global core of Europe rather than being in the global periphery through the Suez Canal, rather than which region of the global periphery it was exported from.

Fourth, to compare long–distance routes between major ports from the periphery to the core, and short–distance routes between smaller ports of the Middle East within the global periphery, comparisons in trend lines from $IO-EU$ to $PG-ME$ illustrate the degree to which the Suez Canal contributed to reducing trade costs along major and minor routes. While $PG-EM$ routes converge with $PG-EU$ trade to Europe, this convergence is not similarly observed across panels. However $IO-EU$ is consistently negative in sub–periods across commodities, without demonstrating any distinct change relative to $IO-IO$ routes. Similarly, $PG-EM$ routes are consistently positive in sub–periods and across commodities, but demonstrate a degree of convergence to the $IO-IO$ zero y–axis line for rice and tea. However for both routes, $IO-EU$ remains consistently negative, and $PG-EM$ consistently positive. In neither case does either $IO-EU$ or $PG-EM$ cross the zero y–axis over time, thus confirming that trade through the Suez Canal in the first period of globalisation was cheaper and had a greater impact on reducing trade costs along major routes between Europe and Asia, and less of an effect on reducing trade costs for minor routes within the global periphery.

Overall, trends in figure 3.8 demonstrate general confirmation of previous results from table 3.4, but illustrate some important processes of integration over time. Firstly, it is always cheaper to trade from any region of the global periphery to the global core through the Canal. Secondly, despite this difference in trade cost according to regional destination, there is some evidence of convergence occurring within the global periphery of the Middle East for rice and tea, but this process of integration occurred belatedly after the opening of the Canal relative to the degree of integration observed between Europe and Asia from the beginning of the Canal's opening. Thirdly, while there is some evidence of convergence along certain routes, there is no broad process of

convergence or change over time between the cheaper, but more long–distance $IO-EU$ routes, and the more costly, but closer $PG-EM$ routes. This suggests that the Suez Canal route initially contributed more to integration between European colonial empires and their colonies in Asia, and only belatedly, and to a much lesser degree did the Canal route contribute to integration within the global periphery of the Middle East's two maritime regions.

3.8 Regional trade flows

Trends on the marginal trade cost coefficients and price ratios between regions suggest that integration occurred firstly between the European core and the Asian periphery, and then belatedly, and only for certain commodities, was there integration between regions of the global periphery connected by the Suez Canal. Trends have identified a convergence in the marginal effect of trade costs between $PG-EM$ and $PG-EU$ routes for 2 of the 4 commodities by the final sub–period, whereas trade costs remained persistently low for the $IO-EU$ route over the entire period. This suggests a lag and an incomplete process of integration within the global periphery compared to integration between the core and the periphery through the Suez Canal. To further evaluate whether integration between the two maritime regions of the Middle East lagged behind integration between Europe and Asia through the Canal, trade flows for the same commodities from origins in the Indian Ocean or Persian Gulf to destinations in either Europe or the Eastern Mediterranean are compared.[79] Data on the total value of exports, rather than the unit value, for each of the 4 commodities traded across all 4 regions is comparatively evaluated as shown in figure 3.9.[80] Although trade values depend on prices, all commodity trades are matched from a unique origin to various destinations. Hence any changes in the commodity price should be consistently observed across all destinations, thus allowing a comparison in trade flow trends over time. Even if this were not the case, it is still indicative of the relative imbalance in trade costs and integration within the global periphery compared to costs and integration between the core and the periphery.[81]

Overall trade flows from the Indian Ocean to Europe exhibit distinctly different patterns compared to trade to the Eastern Mediterranean. For all commodities to Europe, trade flows generally

79. David S. Jacks, Christopher M. Meissner, and Dennis Novy, "Trade Booms, Trade Busts, and Trade Costs," *Journal of International Economics* 1, no. 83 (2011): Trade flows have been calculated using total nominal value of exports in several studies of the gravity model to international trade. James E. Anderson, "A Theoretical Foundation for the Gravity Equation," *American Economic Review* 69, no. 1 (March 1979): 106–116; Vincent J. Geraci and Wilfried Prewo, "Bilateral Trade Flows and Transport Costs," *The Review of Economics and Statistics* 59, no. 1 (February 1977): 67–74; Dave Donaldson, "Railroads of the Raj: Estimating the Impact of Transportation Infrastructure," *LSE Asia Research Centre Working Papers* 41 (March 2010): 1–54.

80. Figures and analysis of trade flows for Persian tobacco are continued separately in section 9.

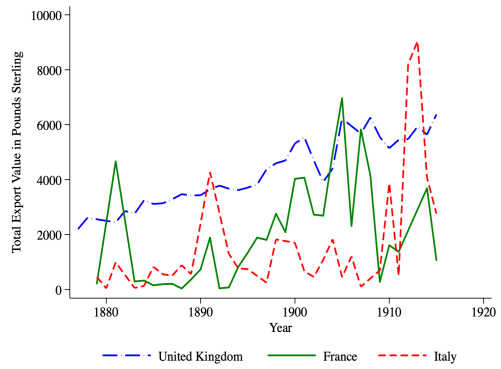
81. Although trade volume provides a better assessment of trade flows without issues of price increases, volumes of the 5 commodities are not consistently reported either over time or to all destinations in the trade record.

show a stable and steady increase over time. Whereas annual changes in trade flows are highly varied to the Eastern Mediterranean without a general pattern that is consistent across commodities. Trade to the Eastern Mediterranean does not demonstrate a stable pattern of growth, but only rapid expansion at the tail end of the period, and in some cases a decline in trade. In the case of tea and rice, there is no evidence of an expansion of trade to any ports of the Eastern Mediterranean in the decades immediately following the opening of the Canal. It is only after 1900 that all ports show rapid growth in the import of tea from Bombay and rice from Rangoon. The rapid growth of imports after 1900 suggests that it was not just due to the particular bilateral relations between the Eastern Mediterranean ports and Indian Ocean ports, but a general pattern for the region as a whole.

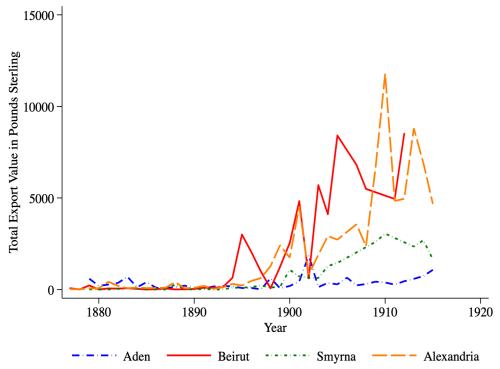
Additionally the trade flow trends on rice and tea are consistent with the marginal trade cost trends for the same commodities between $PG-EU$ and $PG-EM$ from figure 3.8, which show a rapid convergence in the marginal effect of both routes in the third sub–period, corresponding to the years after 1900. The expansion of flows in figure 3.9 and the reduction of trade costs in figure 3.8 suggests a relationship between trade costs and trade flows. The consistency in the trends in corresponding years, despite the fact that unit costs of rice and tea analysed in table 3.4 have been collected from different sources than the trade flow data for Bombay and Rangoon, presents confirming evidence that opportunities for trade through the Suez Canal came belatedly for routes within the global periphery, while routes from the periphery to the core witnessed lower trade costs earlier in the period.[82]

In contrast to the trends on tea and rice to the Eastern Mediterranean, pepper shows early trade growth from the mid–1870s, suggesting that opportunities for trade within the global periphery via the Canal were available, but had not been fully utilised for some commodities until decades later. Although pepper exports show a much earlier expansion to the Eastern Mediterranean compared to other commodities, this trend is not sustained, and by the mid–1900s, exports appear to have collapsed to several ports, which is an inverse trend to what has been observed for rice and tea, but is consistent with evidence of price divergence observed on some bilateral price ratios for pairs of cities in the previous figure 3.4.

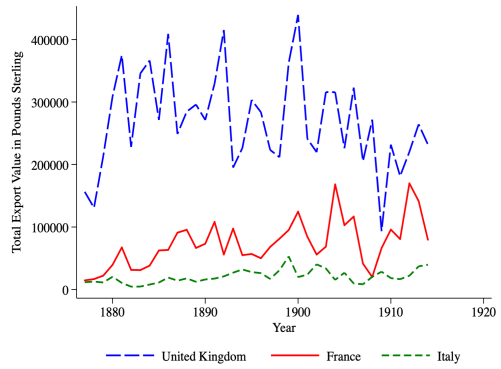
82. As previously discussed, unit import and export prices for the 5 commodities from each port of the Middle East have been collected from the British *Diplomatic and Consular Reports* and the French *Tableau Général du Commerce Extérieur*. Data from these sources has been exclusively used for the $PG-EM$ routes featured in panels 3.8:B for rice, and 3.8:D for tea. Data for the $PG-EU$ route includes import unit prices from the *Statistical Abstracts for the United Kingdom*, the French *Tableau Général du Commerce Extérieur*, and the Dutch *Ministerie van Buitenlandse Zaken*. By contrast, data on trade flows from Bombay in panel 3.9:B and from Rangoon panel 3.9:D have been collected from the *Statement of Trade and Navigation of the Presidency of Bombay*, and the *Statistical Abstracts for British India*, respectively.



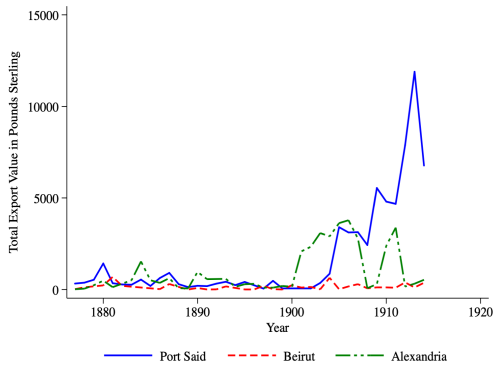
(a) Tea from Bombay to Europe



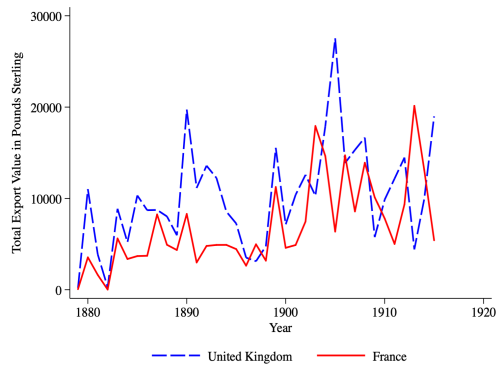
(b) Tea from Bombay to Middle East



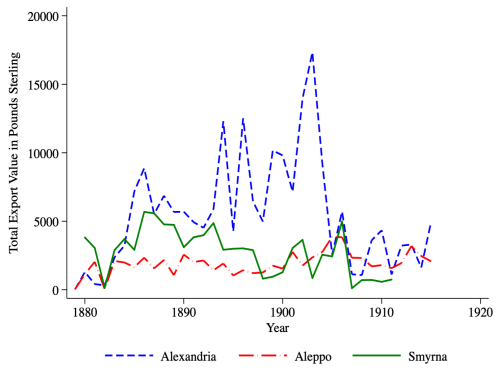
(c) Rice from Rangoon to Europe



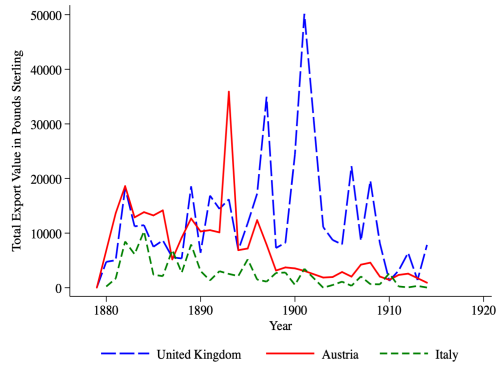
(d) Rice from Rangoon to Middle East



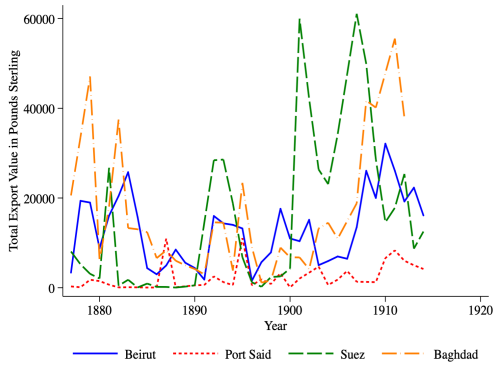
(e) Pepper from Batavia to Europe



(f) Pepper from Batavia to Middle East



(g) Indigo from Calcutta to Europe



(h) Indigo from Calcutta to Middle East

Figure 3.9: Trade flows from ports of the Indian Ocean to regional destinations of Europe, the Eastern Mediterranean, and the Persian Gulf.

The trade flow for pepper to destinations of the Middle East is additionally consistent with the previous marginal trade cost trend from panel 3.8:F. Pepper does not exhibit a distinct expansion of trade flows to destinations of the Middle East in panel 3.9:F, and correspondingly the marginal effect on trade costs also does not exhibit a trend, with the pepper trade for the $PG-EM$ route remaining stable over the period in panel 3.8:F, rather than converging with the trade costs of the $PG-EU$ route. Consistency in the lack of a trend for the trade flow of pepper to the Middle East, and for the marginal trade cost of pepper along Middle Eastern routes, $PG-EM$ confirms a relationship between trade costs and trade flows through the Suez Canal, similar to what has been observed on trade flows and trade costs for rice and tea. Additionally the more narrow and stable difference in the marginal trade cost effect between $PG-EU$ and $PG-EM$ from panel 3.8:F could be related to the more stable flow of pepper from Batavia to either destination, as observed in panels 3.9:E and 3.9:F, which does not demonstrate rapid expansion or decline in the flow of pepper to either destinations of Europe or the Middle East, in contrast to the rapid expansion of flows and trade cost convergence observed for rice and tea.

Lastly, illustrating further consistency between trade flow and marginal trade cost trends is indigo. In panels 3.9:G and 3.9:H, indigo to either Europe or the Eastern Mediterranean does not show a distinct or consistent pattern with Calcutta. For the indigo trade to Europe, trade flows expand to all destinations, and either gradually decline in the case of Italy and Austria, or remains stable in the case of Britain. In panel 3.9:H the ports of Beirut and Suez broadly show an expansion in imports of indigo after 1900, similar to the expansion observed for tea and rice. In contrast, Port Said shows low levels of Calcutta imports without any trend, and Baghdad shows high levels of indigo imports at the beginning of the period, before declining in the middle, and rising again after 1900. Corresponding to the lack of a distinctive trade flow trend, trade costs of indigo for $IO-EU$ and $PG-EM$ routes in panel 3.8:G and 3.8:H remain stable across all three sub–periods without converging along any route, consistent with trends on pepper, but contrasting with trends for rice and tea.

Overall, trends on trade flows across commodities demonstrate similar patterns to what has previously been observed on price ratios and trade costs according to regional destinations within the periphery or between the core and the periphery. Previous analysis has shown that marginal trade costs to the global core of Europe are stable and consistently lower than trade costs within the global periphery or the Eastern Mediterranean for the same commodities. Correspondingly, trade flows are higher, and for several bilateral pairs steadily increasing to Europe, whereas they do not show a consistent pattern of growth to destinations in the Eastern Mediterranean, but only expand

after 1900. The lag in export growth for several commodities to the Eastern Mediterranean several decades after the opening of the Suez Canal suggests that the new route did not contribute to trade between regions of the global periphery to the same extent that it contributed to market integration between Europe and Asia, despite the fact that all destination ports of the Middle East lay at closer distances to ports of origin in the Indian Ocean compared to ports of Europe.

The distinction in trade flows according to regional destination are broadly illustrative of the general pattern of the history of Middle Eastern trade; that although the region experienced an expansion in trade, growth was below the world average. The trends in trade flows show that, "the region's trade grew much less rapidly than that of 'temperate countries of settlement' and somewhat less than that of tropical countries."[83] The lower growth in trade flows from the Indian Ocean to the Eastern Mediterranean is similar to other regions of the global periphery in the late nineteenth century, where it became specialised and economically organised around exports of primary commodities to Europe, with less trade expansion between regions of the global periphery. The Middle East became more specialised in commodity exports, as local manufacturing was lost to competition with Europe, from which it subsequently imported manufactured goods.[84]

Therefore while trade via the Suez Canal contributed to rapid growth, integration, and economic opportunities for trade between the global core and periphery, the creation of new opportunities to trade within the global periphery of the Middle East appear to have been delayed. This delayed effect has been consistently observed according to trade flows and marginal trade costs across a set of commodities that are directly observed as trading from east to west through the Suez Canal. Hence evidence demonstrates the persistence of models of maritime worlds in Middle Eastern integration; despite the link between the Mediterranean and the Indian Ocean worlds offered by the Suez Canal, the lack of a process of integration in the period after the Canal's opening suggests that the two maritime regions of the Middle East remained economically oriented towards either the Mediterranean or the Indian Ocean, but not well–integrated between the two.

3.9 The Persian tobacco trade

Analysis of trade flows demonstrate a similar pattern to trade costs when analysed on the basis of core and periphery routes through the Suez Canal, which shows that there was a lag in the expansion of trade and commodity price convergence between the two maritime regions of the Middle East. However inferences of trade costs and trade flows could also be the result of biases from reports

83. Issawi, *An Economic History of the Middle East and North Africa*, pp. 25.
84. Ibid., pp. 33.

in the trade record. As previously discussed, trade data has been collected from several sources, however all data for the Middle East is taken from diplomatic and consular reports of overseas European empires. While reporting of trade statistics from British, French, and Dutch records is most likely accurate in the reporting of quantities and values of the goods included, potential biases arise from the fact that consular offices were primarily concerned with monitoring and tracking the movement of commodities that were of interest to them, which were goods that were traded between the consular city or district and their home country or colonies. Hence biases in reporting of trade statistics could arise from the omission of goods that were not as widely traded, reporting only goods that traveled via overseas methods, or delayed reporting of goods after they had achieved a significant market share in the consular city or district.[85] Rice, tea, pepper, and indigo had a wide distribution and were traded from Asia to the Middle East and Europe, which has been the basis of the comparative trade costs. However as previously noted, there is a long history to the trade of these commodities across the Indian Ocean which predates the arrival of Europeans, and the use of European steam shipping companies. Historically these commodities would arrive at ports on Arabian Sea and Persian Gulf, before being trans–shipped overland to ports of the Levant and Anatolia. While the historical trade routes for rice, tea, pepper, and indigo across the Middle East have been discussed in previous sections, this section looks in depth at the history of the Persian tobacco trade, and how the archival record on Persian tobacco illustrates some of the potential issues with relying on European trade records to report and infer trade costs.

As previously discussed, Persian tobacco is the only commodity in the dataset that was uniquely traded within the Middle East, and which has been precisely matched from its origin in the Persian Gulf to destination in the Eastern Mediterranean. Figure 3.10 shows the total export of Persian tobacco via the Canal route from Bushire to destinations in the Eastern Mediterranean. The tobacco trade via the Canal only begins in the late 1870s for some ports, and for others not until the late 1880s. A British observer noting the Persian tobacco export at Bushire in 1880 describes, "a considerable export trade in Persian tobacco has sprung up of late years and is increasing. The tobacco is largely shipped via steamer to Syrian and other Turkish ports."[86] Although there is a rapid expansion to the Syrian port of Aleppo, exports to other cities of the Ottoman Empire do not show any distinct trend.

85. Annual series of British, French, and Dutch *Consular and Diplomatic Reports* included information on the total value and quantity of a good, a physical unit of measure, the destination city and country, and a short description of the good. Reports also included total tonnage and number of ships that enter the consular district or port city by nationality. Although not regularly reported annually, nor for each consular district or diplomatic office, several reports will include a brief summary of a commodity's recent trade history in previous years.

86. Diplomatic and Consular Reports, *Trade of Bushire*, no. 1995 Annual Series (1880, London), pp. 12 B. 2.

The appearance of Persian tobacco in the trade records is due to the commodity being distributed by European enterprises, particularly the French *Société du Tombac*, that was only established as a result of the availability of the Suez Canal route for trade between the two maritime regions, "Cette redevance est destinée à garantir le service d'intérêt et d'amortissement d'un nouvel emprunt de 25 millions de francs dont le produit servir à payer une commande de croiseurs qui, selon le désir formel du Sultan, est réservée aux établissements francais. C'est donc un double succès que viennent d'obtenir le commerce et l'industrie francais en Orient et dont l'honneur doit revenir aux efforts combinés du noveau grand vizir Djevad Pacha et de notre ambassadeur, M. Cambon...le port de transit du tombac était anciennement Trébizonde. Actuellement, il est expédié par Buschire, et il passe par le canal de Suez."[87]

Yet due to Persian tobacco's unique consumption within the Middle East, and since records of its trade do not appear until the late 1870s, reporting of trade statistics only captures the amount of Persian tobacco that traveled via overseas modes of transport, through the Canal, carried by European companies, rather than capturing the full degree to which tobacco was traded via any other overland route between Persia, and the Ottoman Empire or Egypt.

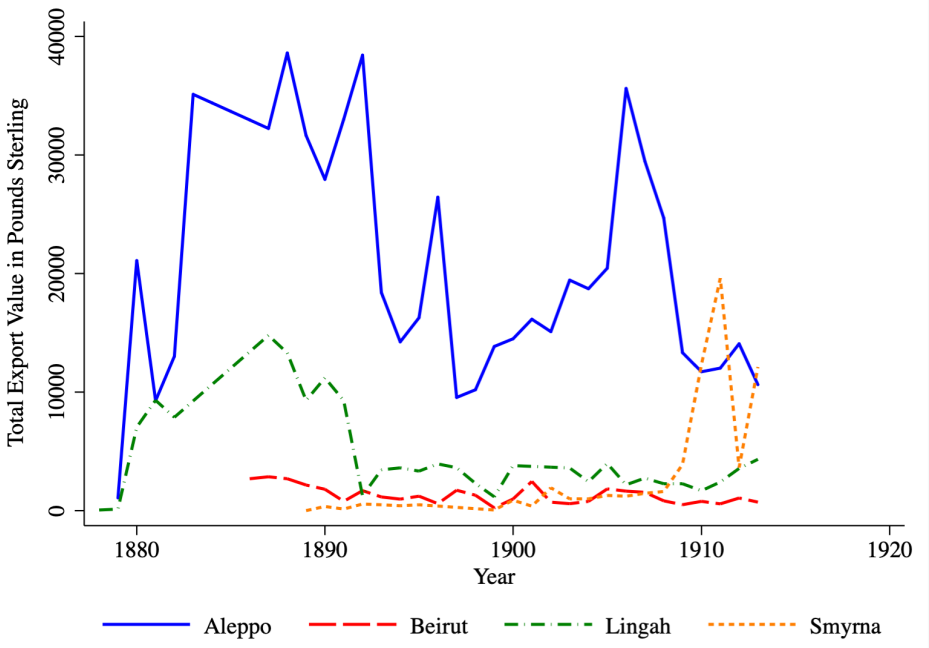


Figure 3.10: Value of exports of Persian tobacco from Bushire to various destinations

87. "This fee is intended to guarantee the interest and monetisation service of a new loan of 25 million francs, the proceeds of which serve to pay for an order of steam–cruisers which, according to the wishes of the Sultan, is reserved for French establishments. So it's a double success that French commerce and industry have just obtained in the Orient, and whose honour must return to the combined efforts of the new grand vizir Djevad Pacha and our ambassador M. Cambon ... the transit port of tombac was historically Trebizonde. Currently, it is shipped by Bushire and it goes through the Suez Canal." (Vicomte Georges de Zogheb and Philippart, *Petite Revue Financière: Le Journal des Débats*, pp. 3 - 5)

The tobacco trade of Ispahan pre–dates the first period of globalisation, and had been traded widely across the Middle East and Asia since the seventeenth century. By the 1670s, Persian tobacco was one of the most important commodities shipped to both Mughal India and Ottoman Iraq, "Persia exports to the Indies an abundance of tobacco...It exports to Turkey, towards Babylon and Nineveh, tobacco...and many other things."[88] Although other forms of tobacco were widely cultivated across the Middle East, Persian tobacco remained a sought–after commodity internationally because it was perceived to be the highest quality, "the best and greatest of tobacco that is made use of in the Indies is carried from Persia, and that is the tobacco which is transported in greater quantities from thence by sea."[89] Therefore, since the Persian tobacco trade via sail or the trans–desert route to the Levant is unrecorded prior to it being taken up by the French *Société du Tombac* in the late 1870s, despite the fact that it was such a widely traded commodity, this suggests some potential biases in the reporting of trade statistics for ports of the Middle East that is only tracking overseas shipping via the Suez Canal. Consequently price data and inferences made on trade costs and flows are more reflective of trade overseas via the Suez Canal, rather than indicative of a general process of regional market integration across all routes. Since prices have been inferred from import unit values, rather than directly observed as the local retail price, the actual price for goods such as Persian tobacco could have been lower than those reported due to the trans–desert caravan trade that pre-dated the Suez Canal, thus the process and degree of commodity price convergence could have been greater than otherwise suggested when only looking at overseas trade.

Despite the British *Diplomatic and Consular Reports* only reporting overseas trade via steamer, there was also an overland route connecting ports of the Persian Gulf to the Mediterranean. The route was as follows, "Baghdad is a 40 days journey for laden caravans from the Mediterranean seaports. In from 6 days steamer pass down the Tigris and Shatt al–Arab to Basra, which is situated on the Shatt al–Arab, not far from the head of the Persian Gulf."[90] The length of time for the overland route is compared to the 27 day journey from Bombay to London via the Canal, or a 6 days journey from Basra to Bombay.[91]

However even with the extensively traversed overland route via Baghdad, it was less popular with local merchants and traders since the routes leading inland from ports of the Gulf were, "disturbed by the insecurity, owing to robbery and blackmail, of the roads between Bushire and Shi-

88. John A. Chardin, *A New and Accurate Description of Persia*, volume 2 (London, Bettesworth: 1724), pp. 321 - 322; in (Ranin Kazemi, "Tobacco, Eurasian trade, and the early modern Iranian economy," *Iranian Studies* 49, no. 4 [2016]: 613–633)

89. John A. Chardin, *A New and Accurate Description of Persia*, volume 2 (London, Bettesworth: 1724), pp. 42; in (ibid.)

90. Diplomatic and Consular Reports, *Trade and Commerce of Baghdad*, Annual Series (1886, London), pp. 107.

91. C. M. Norwood, Great Britain and the Suez Canal, House of Commons, 5 July 1882.

raz."[92] Similarly, for the overland trade from Baghdad it is reported that, "the route is by dromedary to Damascus, across a dry and unpopulated desert, and thence by mail cart over a good road to Beirut...parcels cannot be trusted to these posts for fear of the bags being pillaged by the nomadic tribes met with by the way."[93] Reports suggest that there was a general issue of banditry between every step of the overland route between the Persian Gulf and the Mediterranean.

Consequently for goods shipped via the overland route, trade costs incurred an extra fee, "heavy duties are synonymous with 'heavy smuggling'. All articles bearing a heavy duty are largely brought into the country through the means of native caravans...systematic smuggling is carried on with the smaller Persian Gulf ports, notwithstanding the vigilance and untiring efforts of the European staff of the Custom Administration."[94] Higher trade costs as a result of 'heavy duties' were additionally observed on caravan routes between other interior cities across the region, "against advantages gained by the somewhat steadier exchange with the Persia Gulf, merchants had to contend with unprecedentedly high rates of carriage between Baghdad, Kermanshah, Hamadan, and Tehran."[95]

The reports refer to the types of goods that were typically subject to 'heavy duties', which were generally luxury commodities of a lower bulk to value ratio that were in high demand by the tribes, and could be sold in the local markets. The reports refer to, "guns, tea, spices, and indigo, all bearing 'high duties' into the country."[96] Therefore British Diplomatic and Consular Reports directly acknowledge a degree of imprecision in their reporting due to the existence of an extensive caravan trade that extracted 'heavy duties' for the overland shipment of goods, which included several commodities studied, including tea, indigo, and spices, in which pepper is categorised.

Despite the history of this ancient trade route across the desert, with the arrival of the steamship and the Suez Canal, and the persistent issues facing the overland route, its use for trade between the two regions continued to decline. Reports repeatedly cite the continued decline in the overland trade route via Baghdad in 1900, "business during the previous years was very depressed, especially in the import branch. The chief cause of the depression were: the high carriage prices ruling the home markets for most commodities, and the high rates of discount in Bombay, enhancing dif-

92. Diplomatic and Consular Reports, *Trade and Commerce of Bushire*, no. 3581 Annual Series (1905, London), pp. 9.

93. Diplomatic and Consular Reports, *Trade and Commerce of Turkey: Baghdad*, Annual Series (1885, London), pp. 107.

94. Diplomatic and Consular Reports, *Trade and Commerce of Bushire*, no. 3581 Annual Series (1905, London), pp. 7.

95. Diplomatic and Consular Reports on Trade and Finance, *Trade of Baghdad and Busrah*, no. 1592 Annual Series (1895, London), pp. 5.

96. Diplomatic and Consular Reports, *Trade and Commerce of Bushire*, no. 3581 Annual Series (1905, London), pp. 7.

ficulties."[97] Essentially referring to the high costs of importing goods via the caravan trade for an interior city like Baghdad, whereas trade costs via overseas routes in Bombay continued to become cheaper. The diversion of trade from the overland caravan route to the Suez Canal has also been historically assessed, "Damascus, Aleppo, Mosul, Beirut, and even Istanbul suffered from the diversion to the Canal of the pilgrim and caravan trade of Iraq, Arabia, and Iran."[98] Hence although reports overlook and are not able to accurately account for the trade via the caravan route, the route was fraught with difficulties, price distortions, and was in declining use over the period. Nevertheless although it may have been more costly to ship these goods via the overland caravan route, the existence of this active trade overlooks a potentially greater process of integration occurring between the two coastal regions of the Middle East.

Although data refers only to overseas trade within the Middle East, and trade records admit the existence, but lack of record–keeping, of the trade of several commodities via the overland route, issues with the route such as the extraction of 'heavy duties', the preference of Persian merchants to ship via steamer, the declining usage of the route, and the presence of banditry suggests that it would not have contributed much more to integration between the two maritime regions of the Middle East compared to what has been observed from the overseas route via the Suez Canal. As previously observed, price gaps of Persian tobacco do not demonstrate any evidence of integration, with the Smyrna – Bushire price gap not significantly declining over time, with a coefficient of –0.343 (0.332), and the Aleppo – Bushire price gap widening over the period with a coefficient of 0.073 (0.261) from figure 3.6.

Taking all price data on tobacco collectively, the trend in the marginal effect of the tobacco trade through the Suez Canal between the Persian Gulf and the Eastern Mediterranean based on equation 3.1, and as previously shown for the four other commodities in figure 3.8 is illustrated in figure 3.11. From the figure, the marginal trade cost trend also does not demonstrate any distinct convergence across the three sub–periods with the $IO - IO$ zero y–axis trade cost, showing no evidence of market integration between the Middle East's two maritime regions. Despite qualitative evidence on the tobacco trade that suggests a clear preference for the overseas route via the Canal, even if trade records were able to account for the overland trade, based on Persian tobacco price ratios and marginal trade costs, the added degree of integration when accounting for the overland trade would likely have still been small, without significantly altering the overall depiction of a delay or slower process of market integration for the Middle East between the two maritime regions.

97. Diplomatic and Consular Reports on Trade and Finance, *Trade of Baghdad*, no. 2707 Annual Series (1900, London), pp. 3.
98. Issawi, *An Economic History of the Middle East and North Africa*, pp. 51.

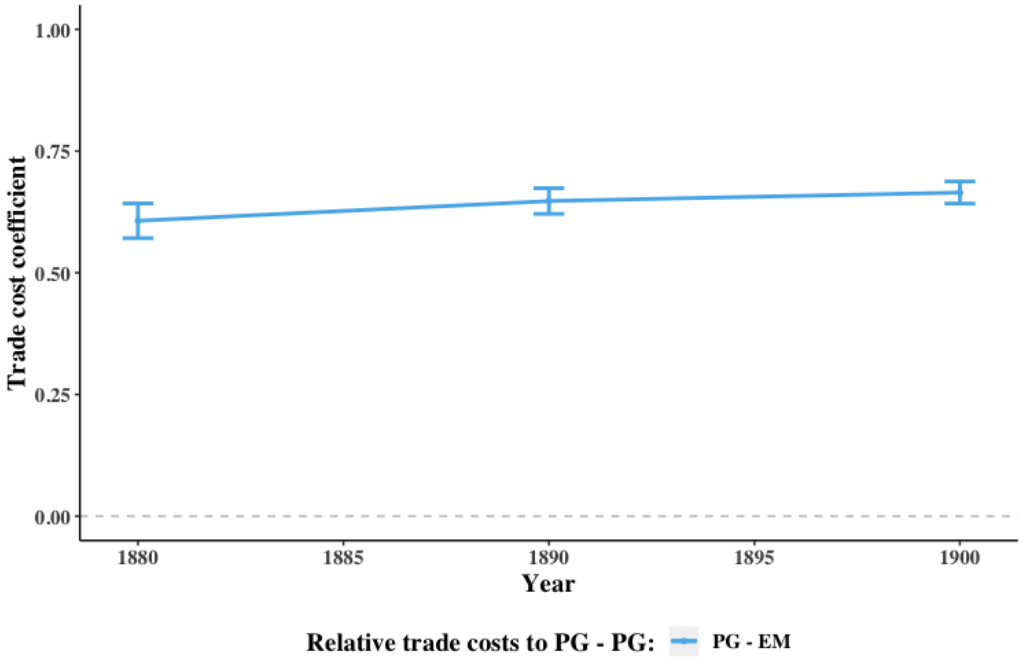


Figure 3.11: Trade route trends for Persian tobacco in 15–year sub–periods from equation 3.1

More important than the added effect of accounting for the overland caravan route on Middle Eastern market integration is that there should at least be some degree or process of integration. Despite the limited contribution that the overland route could have played, the lack of evidence of a significant process of integration according to price ratios and marginal effects of Persian tobacco is most likely due to biases of reporting in the trade record. Across analysis, this paper has relied on European trade reports to measure integration of the Middle East through the Suez Canal, and has found consistent evidence of a lack of integration between the two maritime regions. Yet given the overall period of globalisation, and the actively used caravan route to carry luxury commodities, there most likely should be some degree of integration observed between the Eastern Mediterranean and the Persian Gulf, regardless of the trade route. That integration according to price ratios and marginal effects for Persian tobacco do not show a convergence trend while marginal trade costs for other commodities do, suggests that there is at least some bias in the trade record, since any process of convergence observed on one staple commodity should similarly be observed for others.

Nevertheless even if there was evidence of commodity price convergence, and even if the overland route did significantly contribute to regional integration, it is unlikely to have had such a large effect to alter the findings of the relative process of integration within the Middle East compared to integration on more long–distance routes between Europe and Asia through the Suez Canal. From analysis on trade cost trends, the cost of trading from ports of the Indian Ocean to Europe was con-

sistently cheaper than trading within the Indian Ocean at closer distances and without requiring additional costs for passage through the Suez Canal. Trade from the Indian Ocean to the Eastern Mediterranean incurred even higher costs than trade across the Indian Ocean, thus the relative trade costs from the Indian Ocean to destinations of the Eastern Mediterranean were higher than using the Canal to trade to Europe at even greater distances. Even if trade records accounted for the overland caravan trade within the Middle East, it would still be unlikely to change the results that the Suez Canal contributed less to market integration between the two maritime regions of the Middle East as part of the global periphery, rather than it did to integration on more long–distance routes between Europe and Asia, from the global periphery to the core.

3.10 Middle Eastern shipping

Analysis of market integration between the Mediterranean and the Indian Ocean in comparison to integration between Europe and Asia has demonstrated a significant difference in trade costs and trade flows depending on whether trade was within the global periphery, or from the periphery to the core. While there are potential biases in the reporting of trade statistics due to the collection of data from European sources, consistency across commodities and bilateral city pairs provides strong evidence that the Middle East experienced relatively less integration in comparison to integration between Europe and Asia in the first period of globalisation. Potential explanations for the slower and lagged trade growth and integration within the Middle East, despite the proximity of ports of the Eastern Mediterranean and the Persian Gulf via the Canal route, are likely related to the history of overseas shipping within and between the two maritime regions, confirming the predominance of models of maritime worlds in economic growth and development of the Middle East.

Prior to and in the years immediately following the opening of the Suez Canal, shipping in the Mediterranean and the Indian Ocean remained separate services that ran primarily within each respective maritime world without crossing through the Suez Canal, as previously discussed. Before the Canal, steamship liners, tramp steamers, and sail boats would operate between ports within the Mediterranean or along the coast of the Indian Ocean, and merchandise would be transferred at the ports of Egypt or the Levant for trade between Europe and Asia. Over the course of the nineteenth century, regular liner services began to replace shipping both by tramp and sail, "because of their regularity, early steam services quickly attracted passengers and mail...thus the Austrian Lloyd's original fleet in 1836 averaged 254 tons, but figures rose to 397 in 1850, 526 in 1860, and passed the 1,000 mark in 1874; the other main lines in the Mediterranean show parallel development.

Hence, from the 1840s on, steam services rapidly took over the region's trade in which local sailing ships had been important."[99] Despite the rapid growth of steam liner companies prior to the Suez Canal, tramp shipping continued to extensively operate across both maritime worlds. However the irregularity with which tramp shipments operated and their lack of regional or port–based services meant that it was difficult to account for their routes, or how it may have contributed to Middle Eastern market integration. In contrast, there is an extensive history of increasing usage of liner services in both the Mediterranean and Indian Ocean maritime worlds, which operated 45% of the British fleet, and a majority of cargo by 1914.[100] Although the history of liner shipping in the Mediterranean and the Indian Ocean cannot fully account for all trade within or between maritime regions, based on their size in the shipping market, it does contribute to understanding the lower levels of market integration observed between ports of the Middle East at relatively closer distances connected by the Canal, compared to integration between Europe and Asia at greater distances, since liner services were based out of a particular port, and operated within regional conferences.

Prior to the opening of the Suez Canal, most steam shipping services between the Mediterranean and the Indian Ocean operated through the ports of Egypt. There were five British services that ran through Egypt: two lines from Southampton to Alexandria, two between Suez and Calcutta, and one between Suez and Bombay. Similarly five French lines served from Marseille to Bombay and Hong Kong by way of connecting between Alexandria, then overland to Cairo and Port Said. Austrian, Italian, Russian and Ottoman lines also first connected at Alexandria, before traveling overland to Suez or Port Said and onward to Bombay, Basra, or Hong Kong.[101] Due to Egypt's control of the Isthmus of Suez, it also controlled the coastal trade of both the Red Sea and the Mediterranean, making it the natural entrepot for all trade between Europe and Asia.

As previously discussed, ports of the Levant also specialised in trans–shipment between Europe and Asia via the desert route that connected ports of the Mediterranean with Baghdad, and subsequently via the river trade of the Tigris and Euphrates, to Basra on the Persian Gulf coast. The Euphrates and Tigris steam navigation company, and the Turkish steam navigation company used deep–draught steamships on the shallow rivers of the Tigris and Euphrates to transport heavy loads at regular intervals between the interior city of Baghdad to the Persian Gulf port of Basra.[102] From Baghdad, the string of ports of the Levant from Jaffa to Aleppo were connected via the overland

99. Issawi, *An Economic History of the Middle East and North Africa*, pp. 47 - 48.
100. Harlaftis and Theotokast, "The Handbook of Maritime Economics and Business."
101. Ahmad Ahmad al–HItta, *Tarikh Mirs al–iqtisadi* (The Economic History of Egypt) (Cairo, 1957), pp. 219 – 243.
102. Farnie, *East and West of Suez: The Suez Canal in History*, pp. 146.

caravan trade, "the caravans between these places vary from 10 to 100 mules or camels. There are muleteers who are continually employed on these roads, so that there is always abundance of opportunities for the transmission of goods."[103] Aleppo, Beirut, and Damascus were all well–connected to Mosul and Baghdad via the caravan trade, "the importations in transit, forwarded to Damascus and Beirut, not being for the consumption of those cities only, go by the caravans to Baghdad, whence they are distributed in the adjacent countries. Those, again, destined for Aleppo find their way into Asia Minor, especially to the towns of Orfa, Diarbekir, Malatiah, Sivas, etc."[104] From the Levant ports, nearly all merchandise would be taken up by European companies that were, "long established in Beirut and Aleppo, and who are largely, if not wholly, engaged in the import and export trade."[105] The Austrian Lloyd ran regular service from Trieste to Beirut and Aleppo. The Aziziya Shipping Company ran regular services between Beirut and Constantinople. The French *Messageries Maritimes* ran regular and frequent shipping between Marseilles and Beirut, and the various steamship companies of the Antwerp Combined traveled between Hamburg and Antwerp to the ports of Alexandretta and Beirut. Hence the port cities of Egypt and the Levant served as major entrepots for trade between the Mediterranean and the Indian Ocean, as all trade along major routes and large ports between Europe and Asia traded via routes passing through ports of the Middle East.

Although these cities were already entrepots of the Mediterranean, the creation of a direct sea route between the Eastern Mediterranean and the Arabian Sea was anticipated to further foster trade and growth for the entrepot economies of the region. From the beginning of the nineteenth century, Mediterranean powers such as France, Italy, and the Ottoman Empire had witnessed a decline in their relative share of world trade that had been shifted from Mediterranean routes via the Middle East, to the Cape route that went directly between North–West Europe and the Indian Ocean. Although each decade since the 1830s had witnessed an increase in the trade of the Mediterranean overall, the growth in trade via the Cape going directly to North–West Europe was even greater. The expectation of the Suez Canal was intended to challenge British domination of the global economy and global shipping by redirecting trade that had been lost to North–West Europe, and reverting it back to Mediterranean routes and Mediterranean port cities, as noted by a British publication in 1872:

> The cities of the Mediterranean would become once more the centre of the world and regain the most profitable branch of economic activity in the entrepot trade with all its enriching

103. British consular reports, John MacGregor, *Commercial Statistics* (London, 1847), II, pp. 140 – 150.
104. Consul Report of Ibrahim Pacha, from John MacGregor, *Commercial Statistics* (London, 1847), II, pp. 140 – 150.
105. From E. Weakley, "Report on the conditions and prospects of British trade in Syria," Great Britain, *Accounts and Papers, 1911*, LXXXVII, pp. 81 – 85.

> ancillary traffic in unloading, pilfering, warehousing, processing, distributing and financing and its associated freight, insurance, depot, consignment and transhipment charges. England would lose in succession its commerce, its merchant marine, its maritime supremacy and finally its Indian possessions. Thus Lesseps appears as the avenger of a hundred seaboard cities ruined by the avarice of England and was accordingly decorated on the successful completion of the Canal by the rulers of the Mediterranean states of Russia, Greece, Turkey, Austria, Italy, France and Belgium.[106]

Although Britain became the largest client–state of the Suez Canal, all other major countries using the Canal route lay in the Mediterranean, of which major Mediterranean port cities did benefit from an increase in shipping with Asia, as previously assessed in figure 3.9, and as the savings of distances from the Indian Ocean via the Canal was the greatest for the Mediterranean.[107] Despite the expectations of the Canal to increase trade with the Mediterranean, evidence has shown that the major beneficiaries in terms of lower trade costs and higher trade flows was trade to Europe, and especially trade with Britain, rather than trade of the Eastern Mediterranean.

While most shipping between Europe and Asia prior to the opening of the Suez Canal operated through the ports of Egypt or the Levant, after the opening of the Canal, those port cities were entirely bypassed for direct trade between Europe and Asia. Although the Suez Canal connected the two major maritime regions of the Eastern Mediterranean and the Indian Ocean, the Canal route was not so much an opportunity to economically integrate the Middle East, but to further integrate the Middle East with Europe, as a French observer reported on the economic opportunities provided by the shorter route to the Persian Gulf, "grâce au percement de suez et à la vapeur, il ne faut plus parcourir que 1,600 lieues marines, de Marseille à Bassorah...le transport va être simple et régulier. Trente jours suffiront au besoin pour emmener les blés de Bassorah à Marseille, des rives de l'Euphrate aux côtes de Provence."[108] For example, most shipping from the port of Basra was indeed European liner services that operated directly between European ports and Basra, without stopping at other ports along the way, "most shipping is by steamer and of greater tonnage visited the port. Shipping with Bombay shows little change from last year. To the usual number of companies running regular services between Europe and the Gulf are added the Anglo–Arabian and Persian Steamship Company, which started in 1893 and the Clan line, which started monthly service in August, 1894."[109] Thus the opening of the Suez Canal created new opportunities for

106. *The Spectator*, 17 February 1872, pp. 198 ii., in (Farnie, *East and West of Suez: The Suez Canal in History*)
107. Ibid., pp. 138.
108. "Thanks to the Suez Canal and the steamship, it is no longer necessary to travel 1,600 leagues from Marseilles to Basra, the transport will be easy and regular. 30 days suffice to bring wheat from Basra to Marseilles, from the banks of the Euphrates to the coast of Provence."; *Le Canal de Suez*, 15 – 17 Janvier 1870, pp. 29.
109. Diplomatic and Consular Reports on Trade and Finance, *Trade of Baghdad and Busrah*, no. 1592 Annual Series (1895, London), pp. 6.

European shipping lines to trade directly with the Persian Gulf, by entirely bypassing interior cities of the Middle East and the Eastern Mediterranean.

In the case of interior cities, the regularity of the services and the capacity of higher tonnage redirected most of the trade of Baghdad towards the Persian Gulf via the Tigris River, "owing to the export trade of the town passing down the Tigris, with but trifling exceptions, in river steamers for transshipment, chiefly at Bussorah, to ocean steamers taking it through the Suez Canal, and to the shipping business at Baghdad being nearly altogether in the hands of our two principle British firms here."[110] Consequently much of the traditional caravan trade via the trans–desert route was rerouted to the coastal ports and through the Suez Canal, and most trade was subsequently oriented towards Europe. Additionally, an important factor to the rapid increase in Middle Eastern shipping via overseas modes was the adoption of regular steamer services out of Persian Gulf ports. However as the history of liner services and the analysis of trade costs from the Persian Gulf region suggests, these steamship services integrated the Persian Gulf with Europe and the Indian Ocean, and less so within the Middle East.

The bypassing of Middle Eastern ports of Egypt and the Levant in favour of direct services between Europe and Asia was a process that began from the very beginning of the Canal's opening. From 1870 the Austrian Lloyd switched service from operating between Trieste to Alexandria, to operating several lines directly from Trieste to Bombay. Marseilles had previously run services through Port Said en route to Bombay by the *Fraissinet* Steam Company, but began a new service of *le Asie* that traveled directly from Marseilles through the Canal to Bombay.[111] While Turkey had previously used the overland route through Syria to trade with the port of Basra, it began operating a direct service, the *Babel*, between Constantinople and Basra in 1870. Gray, Paul & Company of London also initiated a direct service between London and Bombay in June 1870.[112] In addition, Barcelona, Genoa, and Odessa all established national shipping lines that traveled directly to Bombay or Calcutta, where they had previously contracted shipping services with the P&O that connected to Indian Ocean ports via Alexandria, Suez, or Port Said.[113]

110. Diplomatic and Consular Reports on Trade and Finance, *Trade of Turkey: Baghdad*, Annual Series (1885, London), pp. 109.

111. "La Compagnie Fraissinet a été la première compagnie francaise adoptant Port Said comme escale régulière. C'est un steamer de cette Compagnie, l'*Asie*, qui, passant par le canal, a effectué le premier voyage direct sur Bombay." (The Frassinet Company has been the first French company to use Port Said as the regular stopover. It is with the steamer l'*Asie* which travels through the Canal to make the first direct journey to Bombay.); *Le Canal de Suez*, 1 Janvier 1870, pp. 4.

112. Between 1870 and 1871, several other British steam companies initiated direct services between England and port cities of India. The *Glengyle* of McGregor Gow & Co. between Liverpool and Calcutta began in November 1870. The *Cleator* of the same company between Liverpool and Hong Kong. In 1871, new direct services to Calcutta were established by George Smith & Sons of Glasgow, Charles Palmer of Newcastle, Robert Alexandre of Liverpool, and Frederick Green of London.

113. Farnie, *East and West of Suez: The Suez Canal in History*, pp. 140 – 145.

As national lines between European ports and the Indian Ocean were established, competition and greater demand for services to the east necessitated a change in the size and scale of shipping. The most well–established company operating in the Mediterranean prior to the opening of the Suez Canal was the P&O, which operated a combination of regular steam and sail services between European ports and Egypt, which was subsequently trans–shipped to ports of the Indian Ocean. With the Suez Canal, the P&O was taken wholly by surprise by the success of the Canal. The company's receipts declined from 2,549,000 pounds sterling in 1868 to 2,000,000 pounds sterling in 1871 as its Mediterranean monopoly profits were eliminated by national services that operated directly between Europe and the Indian Ocean.[114] In order to adapt to the new competition, the P&O had to sell off its older, smaller, sailing vessels, for larger, cheaper, and faster steamers that could operate directly between major ports of Europe and the Indian Ocean through the Canal. Since the Suez Canal could only be traversed by steamship, it increased steamship use on routes between Europe and Asia. This also expanded the carrying capacity of Suez Canal–crossing liner steam services relative to sailing ships operating within minor ports, and tramp shipping, whose lack of regular port–based service or participation in a regional conference kept their tonnage small. By October 1871 P&O began direct steam service between London and Bombay on the *Khedive* line, rather than previously shipping via Port Said.

Evidence from the way steamship services and shipping companies were reorganised to take advantage of the Suez Canal by operating directly between Europe and the Indian Ocean give an indication of how the advantages offered by the Canal were disproportionately distributed between regions. While the Suez Canal was widely promoted as a boost to the Mediterranean economies, shipping records indicate that this was only true for European ports of the Mediterranean, for which the Suez Canal, "qui nous en ouvre les portes, amènera un rapprochement inévitable entre l'Européen et l'Asiatique."[115] The dichotomy illustrated between Europe and Asia and how the opening of the Suez Canal was seen in terms of trade between the two continents demonstrates the primary dimension in which the Canal was intended to serve, and who it was intended to benefit. Trade within Asia, within the global periphery, between the Indian Ocean and the Eastern Mediterranean, was not considered nor utilised, despite promotions that the Canal would create, "a Venice of the desert, another Alexandria, an Egyptian Calcutta."[116]

Previous analysis has identified an unequal distribution of trade growth and integration ac-

114. *The Times*, 14 December 1871, 4 iii, 'Cheap Travelling' in (ibid.)
115. The Suez Canal, who opens the doors for us, will bring about an inevitable rapprochement between Europe and Asia."; *Le Canal de Suez*, 4 Août 1870, pp. 363.
116. F. de Lesseps, *Lettres* (1875), i. 278, 30 Octobre 1855, Lesseps to *The Times* in (Farnie, *East and West of Suez: The Suez Canal in History*, pp. 43)

cording to price gaps, trade costs, and trade flows between destinations of Europe and the Eastern Mediterranean from the Indian Ocean. While widespread evidence has demonstrated an overall process of globalisation in the period, this has been notably absent and significantly lagging for integration within the Middle East in the same period. Evidence from historical shipping records suggests that the reason for the differences in trade costs and trade flows was due to the reorientation of European shipping that connected European ports directly to colonial ports of Asia, whereas they were previously connected via trans–shipment from entrepots of the Eastern Mediterranean. Since most liner shipping connected major cities serviced at regular intervals, rather than tramp shipping operating through smaller ports at irregular intervals, the smaller ports of the Middle East meant that integration between the two maritime regions lagged behind that of cities at greater distances between Europe and Asia. Hence market integration in the first period of globalisation was more of a phenomenon between the global core and periphery and between major ports, rather than a general process occurring between minor ports and regions within the global periphery.

3.11 Conclusion

The traditional perspective of maritime world historians is that the Mediterranean constitutes a distinct world, and the Indian Ocean another. Separately however, the regional landmass stretching from the Eastern Mediterranean coast and eastward is typically treated as a singularly unified region within the realm of the Indian Ocean world, "the problem of whether this universe of Arab navigation should be considered as really autonomous compared with the Mediterranean one. Obviously not: it was scarcely more than an extension of the Eastern Mediterranean, an almost unique instance of partially overlapping units."[117] How the Middle East interacted between both autonomous units of the Indian Ocean and the Mediterranean is indeed a unique instance of overlapping worlds, however the region was hardly an extension of the Eastern Mediterranean. This paper has demonstrated that not only was the Arabian Sea and Persian Gulf economically distinct from the Eastern Mediterranean, but that the Indian Ocean was in fact more integrated with Europe at greater distances than it was with the Eastern Mediterranean in relatively closer proximity. Not only was there an absence of economic unity extending from the Eastern Mediterranean across the Indian Ocean, even in the period after the opening of the Suez Canal, the land between the Arabian Sea and the Eastern Mediterranean continued to function as a barrier to integration that was occurring more rapidly across oceans and between continents at greater distances.

117. Pierre Chaunu, *European Expansion in the Later Middle Ages* (Amsterdam: North Holland Publishing Co., 1979), pp. 218.

Despite widespread evidence of global commodity price convergence in the first period of globalisation, this paper has shown that market integration within the Middle East between the Eastern Mediterranean and the Persian Gulf according to price ratios and price correlation was significantly less evident compared to integration within other regions of the global periphery.[118] In order to assess the extent to which these bilateral price trends are broadly characteristic of the region overall, an original dataset of five uniquely matched commodities between origin and destination across Europe, the Mediterranean, the Persian Gulf, and the Indian Ocean, as well as the directly observed trade route through the Suez Canal, has been analysed. Integration according to commodity price ratios finds that price differences were lowest between ports of the Indian Ocean and those of Europe, and highest between ports at closer distances, but within the global periphery of the Middle East. This suggests that trade costs were significantly differentiated according to destination, depending largely on whether trade was between the global core and periphery, or within the periphery. Regression analysis differentiating trade costs according to broader regional trade routes confirms that it was significantly cheaper to trade between Europe and Asia, rather than within the Indian Ocean, or from the Persian Gulf to the Eastern Mediterranean.

With the trade route of all five commodities being directly observed as passing through the Suez Canal from archival trade records, the results have further implications for how the Canal contributed to integration within or between core and periphery regions in the period after its opening. The expectation of the Suez Canal was not only to bring Asia economically closer to Europe, but also to advance the economic development of the Middle East, "la vielle moyen–orient verra renaître pour elle une ère de prospérité qu'elle ne connait plus depuis bien des siècles. Et tout cela par le simple effet du rapprochement des distances, tout cela par le percement du canal de Suez."[119] It was strategically intended to remake the Mediterranean Sea as the centre of global trade, revitalising the entrepot economies of several Mediterranean port cities, including those of Egypt and the Levant, which were already thriving entrepot economies based on their role in trans–shipment between Europe and Asia.[120] However analysis in this paper has shown that such expectations in terms of advancing the economies of the Middle East and further integrating the region between the two maritime worlds proved to be illusory, as the greatest opportunities for trade via the Canal went to trade between the global core of Europe and the global periphery of

118. Chilosi and Federico, "Early Globalisations: The integration of Asia in the world economy, 1800 - 1938."
119. "The old Middle East will see a rebirth of an era of prosperity that she has not known for several centuries. And all as a result of the simple effect of the closeness of distance, all this through the development of the Suez Canal."; *Le Canal de Suez*, 15 Janvier 1870, pp. 29.
120. Farnie, *East and West of Suez: The Suez Canal in History*, Georgi–Dufour, 182, Arles–Dufour a Dufour–Feronce, 27 Septembre 1856.

Asia, with little benefit in the initial years of the Canal's opening in terms of lower trade costs and greater integration for the Middle East.

Evidence of the imbalance in the benefits to trade and integration within the Middle East are also confirmed in the history of shipping companies that traversed both maritime worlds. While port cities of the Levant and Egypt were formerly central to trade between Europe and Asia, acting as intermediaries between the two regions, the opening of the Canal allowed companies to trade directly with Asia without having to stop at Middle Eastern ports. The increasing frequency of long–distance shipping lines through the Suez Canal contributed to lower trade costs across commodities that were traded between Asia and Europe relative to trade within the Middle East where there were fewer companies operating between minor port cities of either maritime region of the Eastern Mediterranean or the Persian Gulf.[121]

Yet despite differences in the cost of shipping according to major or minor regional trade routes and destination regions, trends over time show that there was still a process of declining trade costs between the Middle East's two maritime regions. Although marginal trade cost differences never reached the level of those observed between Asia and Europe, convergence trends demonstrate that the Middle East did witness a process of integration in the first period of globalisation, although the process was slower and began later. This is similarly reflected in trade flow trends which shows that trade between Asia and the Middle East did not immediately react to greater opportunities to trade via the Suez Canal, but only after 1900 was there a distinct expansion in trade from the Indian Ocean to the Eastern Mediterranean.

By mapping trade networks in terms of economic integration across regions, this paper has demonstrated that the conceptual framing of a unified Middle Eastern landmass was not as applicable in the first period of globalisation as the historical framework of maritime worlds.[122] Despite the Suez Canal route that linked the Mediterranean and the Indian Ocean, the subcontinental region between the two maritime worlds continued to act as an economic barrier rather than a link between them. Even in the first period of globalisation that was largely brought about by the opening of the Suez Canal, the conceptual framing of maritime worlds continued to prevail in terms of the overseas economic orientation and integration within the global periphery. While market integration proceeded rapidly across continents and oceans within and between the global core, the pace of integration within the global periphery proceeded much slower.

With innovations in transportation infrastructure such as the Suez Canal that connected mar-

121. Issawi, *The Economic History of the Middle East, 1800 - 1914: A Book of Readings*, pp. 293 - 304.
122. Bose, *A Hundred Horizons: The Indian Ocean in the Age of Global Empire*, pp. 272 - 282.

itime worlds, and the rapid adoption of steamships and the proliferation of steam companies, the revolution in transportation technology of the 19th century proved to be more beneficial for integrating the core economies of Europe with the peripheral economies of Asia, rather than offering equal opportunities of integration within the Asian periphery. Therefore although the Middle East had been a continental barrier separating the Mediterranean and the Indian Ocean worlds, it was central to trade between the two. Instead, with the opening of the Suez Canal making trade between the two continents direct, the smaller port cities of the Middle East suddenly became geographically isolated.

In models of maritime world history, the opening of the Suez Canal that abruptly linked and disrupted the unity of the ancient worlds of the Mediterranean and the Indian Ocean in a new era of modernity marked the end of these distinctive spheres of interaction.[123] However this paper has shown that what the first period of globalisation may have done for integration between the European core and the Asian periphery, did not necessarily or equally apply to interactions and integration across maritime worlds within the global periphery. This paper has shown that forms of unity and integration within the global periphery of the Mediterranean and the Indian Ocean persisted in the first period of globalisation and in the era of high imperialism.

123. Green, "Maritime worlds and global history: Comparing the Mediterranean and Indian Ocean through Barcelona and Bombay."

3.12 Appendix

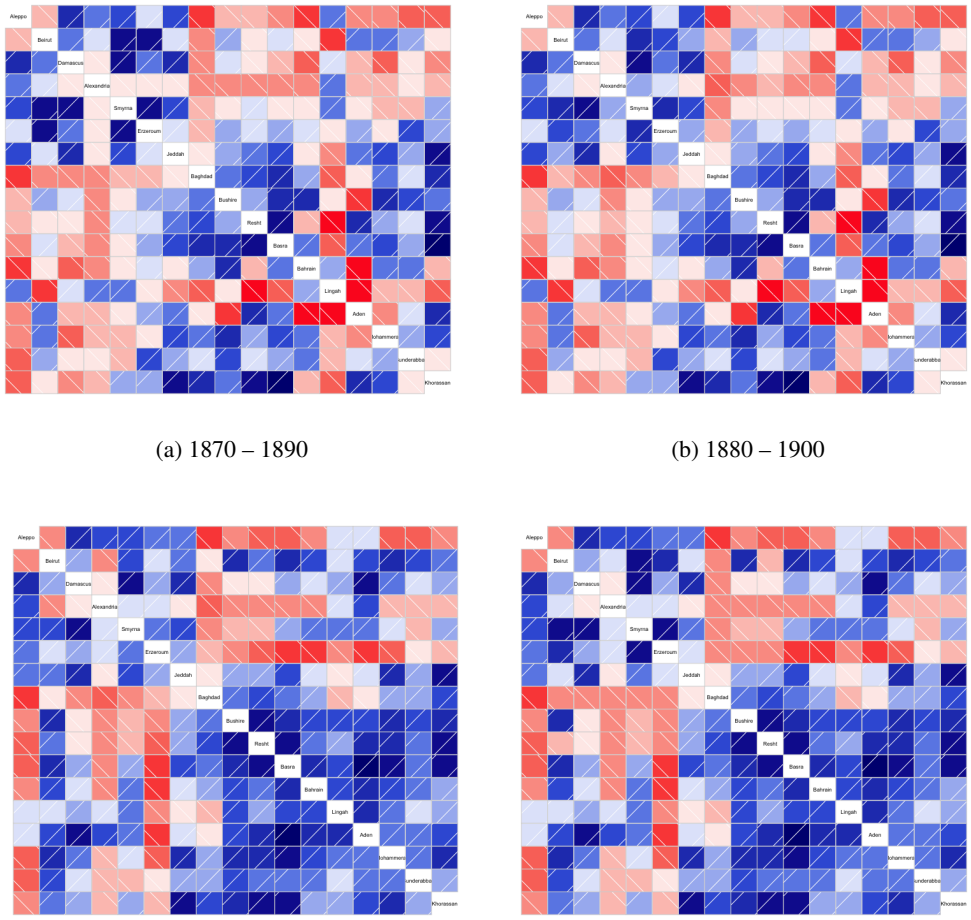
section 1

Tables 3.2 and 3.3 show a subset of correlation coefficients between city pairs that are intended represent all types of geographic relationships across the Middle East in order to provide a general summary of market integration according to correlation analysis. Correlations on the complete rice price dataset for all bilateral pairs of cities as shown in figure 3.1 are plotted in figure 3.12 showing a matrix for 17 cities of the Middle East in Persia and the Ottoman Empire between 1870 and 1914. The arrangement of the correlation matrix across the diagonal is clustered according to maritime regions. Towards the top left are cities of the Eastern Mediterranean, and towards the bottom right are cities of the Persian Gulf and Arabian Sea. Near the centre is the city of Baghdad, an interior city between the Eastern Mediterranean and the Persian Gulf, and Jeddah, the only city in the dataset that is on the Red Sea. Matrices have been similarly divided into the same 15–year sub–periods, as well as showing correlations over the entire period 1870 to 1914. Figure 3.12 shows higher correlation coefficients in blue with a forward slash, becoming darker as coefficients approach 1, and lower or negative correlation coefficients in red with a backward slash, becoming darker as coefficients decrease towards –1.

Analysing the full set of bilateral pairs, figure 3.12 further illustrates the lack of market integration according to correlation. What is firstly noticeable about the panels is that across all four periods, there are significantly large areas of low or negative correlation. This is similar to the trends observed in correlation coefficients from table 3.2 where there is a persistent lack of correlation, or process of increasing price correlation over time. Second, the panels show two distinct sectors of high price correlation. The first is in the upper left quadrant, and the second is in the bottom right quadrant of the panels. As the diagonal refers to cities of the Eastern Mediterranean in the top left and cities of the Persian Gulf in the bottom right, these two maritime regions correspond to areas of high correlation. However the top right and bottom left quadrants refer to bilateral pairs of cities that traverse the two maritime regions. Across all four panels, these quadrants remain mostly negative over time. Overall, the impression from the four panels illustrates a lack of high or increasing price correlation of rice across the Middle East, and is consistent with analysis shown in table 3.2 which shows a lack integration according to correlation.

As a basis of comparison with figure 3.12 the same analysis is done between bilateral pairs of cities across the Arabian Sea and Indian Ocean. To further expand the size of the maritime region and to compare the degree and process of price correlation in the same period, figure 3.13 shows the price correlation matrix for cities of the Persian Gulf, the Arabian Sea, and across the Indian Ocean.

The diagonal of the matrix similarly clusters sub–regions of the Indian Ocean into quadrants. Towards the top left diagonal are cities of the Middle East, mainly those of the Persian Gulf, but also including Jeddah on the Red Sea, and Alexandria on the Eastern Mediterranean. Towards the



(a) 1870 – 1890

(b) 1880 – 1900

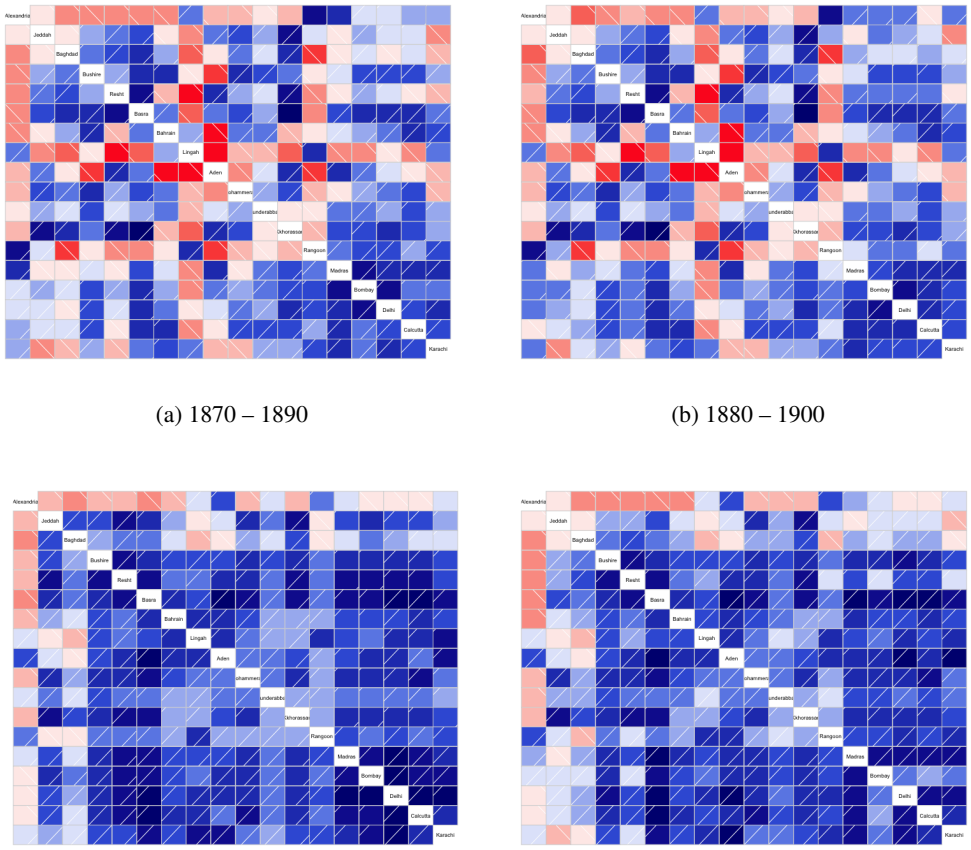
(c) 1890 – 1914

(d) Overall

Figure 3.12: Correlation matrix for bilateral pairs of cities across the Middle East

bottom right are coastal port cities of India. Overall from figure 3.13, it is firstly clear to see a much more distinct process of increasing price correlation among all bilateral pairs of cities. The one city that remains predominantly negatively correlated with most other cities of the Indian Ocean is Alexandria, which is also the only city in the matrix that was not on the coastal Indian Ocean, but on the Eastern Mediterranean. However even Alexandria still shows correlation with several cities of the Indian Ocean.

Second, the first two panels of figure 3.13 do not show any distinct clustering of correlation amongst groups of cities as observed between the Eastern Mediterranean and the Arabian Sea in figure 3.12. Although the lower right quadrant for cities of India show higher correlation than the other three in panel 3.13:A, which is representative of the greater political unity and ease of transportation across India, the presence of this clustered group does not persist in subsequent periods. By panel 3.13:B corresponding to the years 1885 – 1900, there are clusters of blue in all four quadrants, representing high correlation amongst bilateral pairs within the Persian Gulf and



(a) 1870 – 1890

(b) 1880 – 1900

(c) 1890 – 1914

(d) Overall

Figure 3.13: Correlation matrix for bilateral pairs of cities across the Arabian Sea and Indian Ocean

India, as well as across the Arabian Sea.

Third, the fact that figure 3.13 for price correlations across the Arabian Sea show higher and increasing correlations compared to figure 3.12 for cities of the Middle East provides evidence of a significant lack of integration across the Middle East's two maritime regions compared to other regions of a similar size, and even overseas regions, such as the Arabian Sea. The increasing correlation of rice prices for cities of the Arabian Sea is what would be expected given the period, and is confirmed in the correlation matrix for figure 3.13. The lack of a similar trend in the correlation matrices for the Middle East is unexpected as increasing price correlation is observed between cities at much greater distances in figure 3.13. What is interesting about the matrices for the Middle East in figure 3.12 is that two distinct sub–regions emerge, which are based around coastal regions. Taken together, the two figures suggest that the Middle East did not experience a process of integration as a sub–continental region, but instead was more economically oriented overseas.

SECTION 2

Previous analysis has looked at the price gap for a set of 5 commodities traded across the Mid-

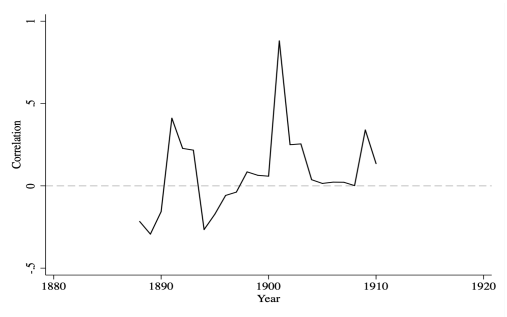
dle East that has identified a lack of integration during a period of globalisation. Although the price gap has been used as one measure of identifying the absence of market integration in the Middle East, correlation coefficients in sub–periods have also been used to demonstrate trends over time. However in the case of price correlations within sub–periods, there is a potential issue of spurious correlation in the case of common price trends without actual trade between city pairs, or common price trends without any convergence in the price gap. Conversely there could be a lack of an integration if prices are in fact converging, though not trending in the same way. To control for this when identifying a lack of integration across the Middle East's two maritime regions, the price series has been differenced, and a rolling window of 7 years is used in order to better capture potential shocks in the price series. The first three rows of figure 3.14 takes the rolling correlation of the differenced price series for bilateral pairs of cities across the Middle East. As a basis of comparison, the bottom row shows the rolling correlation trend of two long distance routes between Europe and Asia that are known to pass through the Suez Canal, one between Batavia and Amsterdam, and the other between London and Calcutta.

Figure 3.14 demonstrates a similar lack of market integration in the Middle East that has been observed under previous correlation and price gap analysis. In some years rolling correlations are positive with low coefficients, and in others they are negative, with similarly low absolute value coefficients. Several city pairs, such as rice between Baghdad and Smyrna, wheat between Bahrain and Mohammerah, wheat between Beirut and Bahrain, and pepper between Alexandretta and Bahrain all appear to capture a positive correlation trend in the 1890s, and a negative price correlation shock around the middle of the 1900s. The trends suggests that a potential shock that was commonly experienced across the Middle East, however the trends still show negative movements, with low and negative correlation over the period. The overall impression across city pairs is that the Middle East is not undergoing a process of commodity price convergence, consistent with previous evidence from bilateral correlation analysis and price gaps.

In contrast to correlation trends of the Middle East, the bottom row panels G and H of figure 3.14 shows city pairs between Europe and Asia where the commodity trade route is known to pass through the Suez Canal. In panel G, pepper prices between Amsterdam and Batavia are highly correlated with a stable coefficient near 1 for almost the entire period. For panel H, between London and Calcutta, the correlation trend is more volatile, and also demonstrates a clear process of integration, being negatively correlated at the beginning of the period, to positively related around 0.5 by the end. When correlations between these two long distance routes are compared to those of the Middle East, the lack of high or positive correlation trends confirms previous evidence from sub–period correlations and price gap trends that the Middle East was not integrating in a similar way as that of other regions on more long–distance trade routes.

SECTION 3

The expanding share of Indian exports shipped via the Suez Canal route, composing the ma-



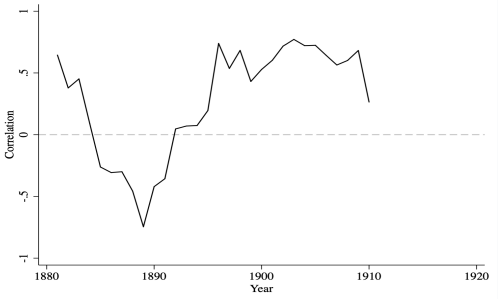
(a) Aleppo – Beirut, rice



(b) Baghdad – Smyrna, rice



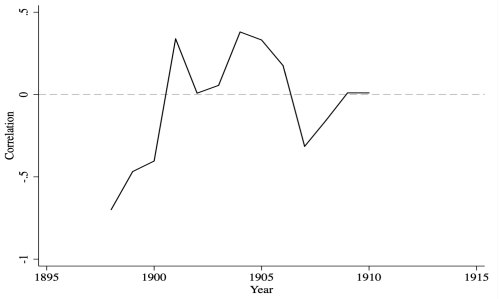
(c) Bahrain – Mohammerah, wheat



(d) Aden – Bushire, indigo



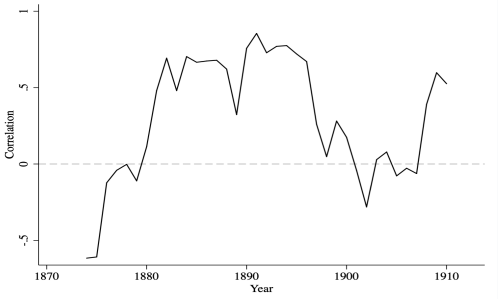
(e) Alexandretta – Bahrain, pepper



(f) Beirut – Bahrain, wheat



(g) Amsterdam – Batavia, pepper



(h) London – Calcutta, indigo

Figure 3.14: Rolling correlations of first difference in commodity prices in the Middle East

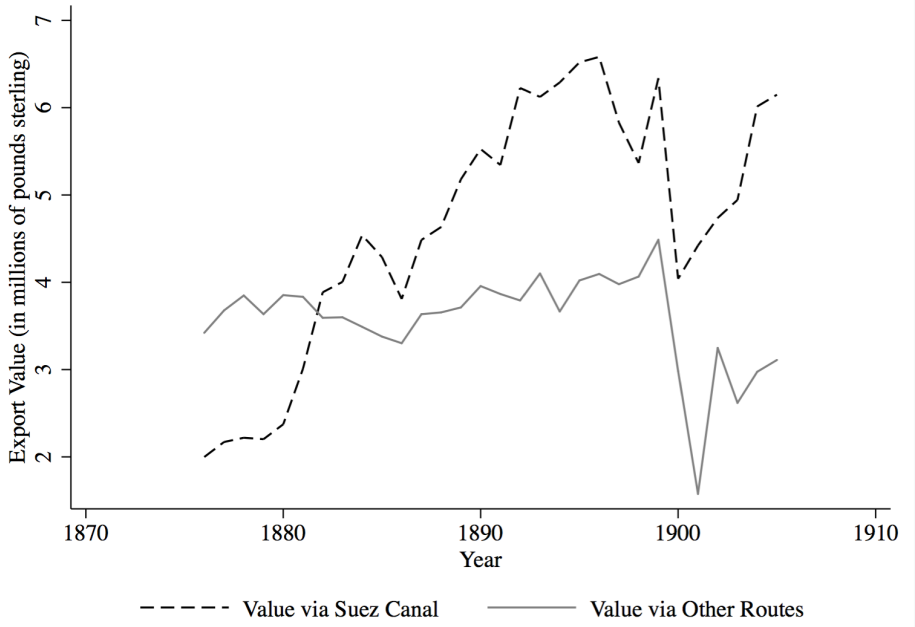


Figure 3.15: Value of Indian exports traded via the Suez Canal against any other route

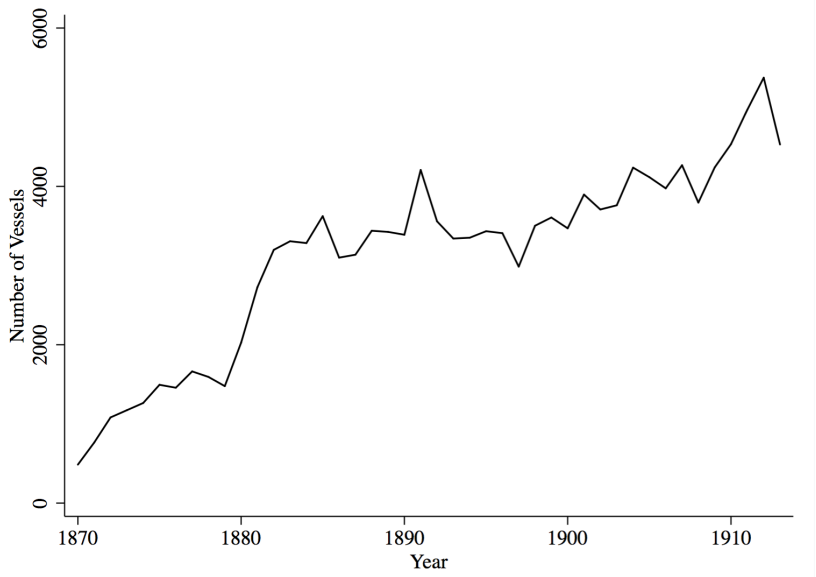


Figure 3.16: Number of vessels of any type passing through the Suez Canal

jority total Indian trade value by 1882, is demonstrated in figure 3.15, which shows the total value of Indian exports passing through the Canal in comparison to any other route. From the figure, there is a continuous growth in Indian trade passing through the Canal, demonstrating how much it contributed to expanding trade ties between the Indian Ocean and Mediterranean. Ocean freight rates on bulk goods from India to Europe fell by one–third between 1873 and 1893, and by the latter date, more than two–thirds of the total export from India passed through the Canal, mainly to destinations of Europe, but also to ports in between, such as those of the Middle East.[124] In contrast, Indian exports traveling via any other route than the Canal remained stable, which suggests that trade to other parts of Asia and the Indian Ocean was not affected by the Suez Canal's opening, but only contributed to an expansion of India's westward trade.[125] It would normally be expected that the expansion of trade flows from the Indian Ocean through the Suez Canal would increase trade ties and integration for all ports between the Indian Ocean and the Mediterranean.

SECTION 4

Figure 3.16 illustrates the continual expansion in the capacity of the Canal to facilitate trade via the increased number of ships that passed through it. The growth in the number of vessels suggests the increasing accessibility of the Canal route to more ships, connecting more cities, carrying a greater variety of merchandise, which implies higher trade flows and a greater degree of market integration. Considering the regular travel through the Canal by liner shipping, the expansion in the number of vessels passing through the Canal also suggests the increasing accessibility of the Suez Canal to all types of shipping services including tramp. Although tramp shipping routes through the Canal are difficult to fully account for, the growth in the number of vessels using the Canal route generally suggests an increase in all types of steamships, liner or tramp, using it.

Aside from expanding the dimensions of the Suez Canal to allow for more ships serving more routes, access to the Canal was also made easier by the gradual reduction in duties levied for passage. Fees were applied uniformly based on tonnage, rather than a flat rate per ship. The levying of fees for Canal passage increases the price of a commodity at destination when transported via the Canal route. However this effect declines over time as fees are reduced in figure 3.17. Declining fees also suggest continued growth in trade via the Suez Canal, which would lead to increased integration for any city pair connected by it, since transportation costs such as Canal fees would make up a smaller percentage of the price of a commodity at destination over time.

Declining duties also suggests that it should have contributed to a general process of market integration for any bilateral city pair connected by it, since duties were charged in per ton of cargo, irrespective of type of merchandise or its destination. However evidence that price gaps for city

124. Tirthankar Roy, *The Economic History of India, 1857 - 1947* (Oxford: Oxford University Press, 2006), pp. 94 – 97.

125. The sharp decline in the value of Indian exports is most likely the result of the Indian famine of 1899 to 1900, which was the result of harvest failure. As a harvest failure resulting from India's agricultural dependence, this would have a significant impact on the value of Indian exports, since these were mostly agricultural exports as well, at different levels of processing. (ibid., pp. 158 – 161)

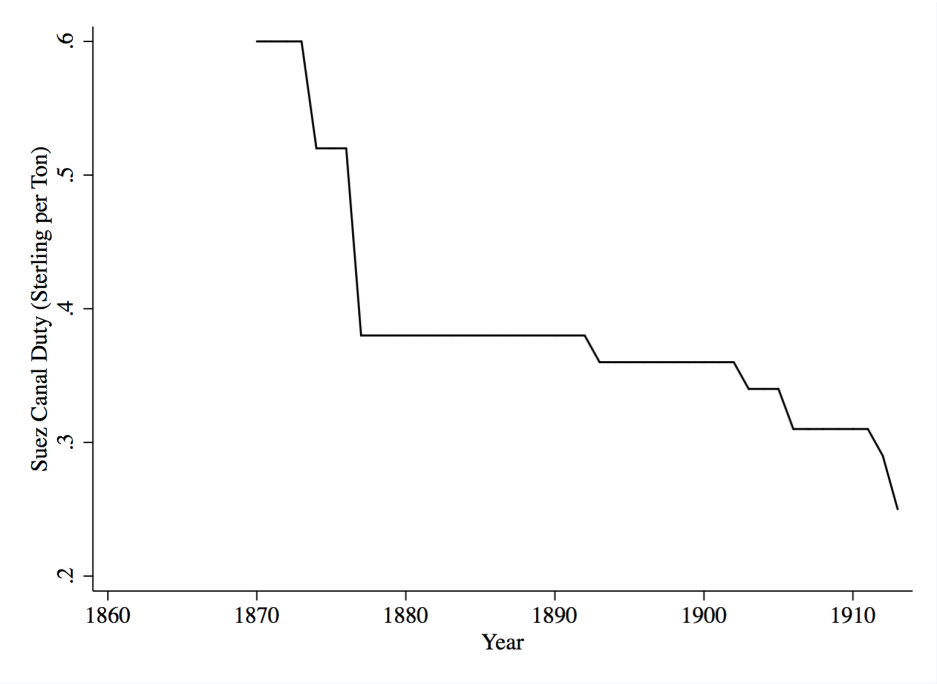


Figure 3.17: Suez Canal duties charged per ton of cargo

pairs between Europe and Asia at further distances were lower than for city pairs at relatively closer distances within the two coastal regions of the Middle East suggests that distance was not comprising the largest percentage of trade cost between cities connected via the Canal, but neither were the fees levied at the Canal.

From figure 3.17, the decline in fees charged for passage also indicates that the Canal route comprised a smaller percentage of total trade costs for all bilateral pairs over time. Therefore price convergence for cities connected via the Canal should similarly be observed between the two maritime regions of the Middle East as it has been for ports of Europe and the Indian Ocean. Since the $IO-EM$ price gap remains higher across all commodities compared to the $IO-EU$ price gap despite uniformly applied reductions in Canal fees and closer distances to any origin port of the Indian Ocean, this suggests a systematic difference in the cost of trading through the Suez Canal between the European core and the Asian periphery, compared to the cost of trading within the periphery of Asia and the Middle East. Expanding access to the Canal for all types of trade routes contributed to commodity price convergence for ports within the Middle East, however why the price gap should be larger for city pairs within the Middle East compared to those from Asia to Europe could not be due to any factor relating to differences in fees levied at the Canal, since they were universally charged in per ton of cargo.

3.13 Bibliography

primary sources

Annuaire Statistique de la France. Service de la statistique generale de France Annual Series. Institut national de la statistique et des etudes economiques, Paris: Ministere de l'agriculture et du commerce, 1870 - 1915.

Annual Statement of the trade and navigation of the Bengal Presidency. Report General on External Commerce, issuing body 17 - 23. Government at the Education Society's Press, London: India Office, 1875 - 1915.

Annual Statement of the trade and navigation of the Madras Presidency. Report General on External Commerce, issuing body 17 - 23. Government at the Education Society's Press, London: India Office, 1875 - 1915.

Annual Statement of the trade and navigation of the Presidency of Bombay. Report General on External Commerce, issuing body 17 - 23. Government at the Education Society's Press, London: India Office, 1875 - 1915.

Annuario Statistico Italiano. Statistical Yearbooks Annual Series. Rome: Ministero di Agricoltura industria e commercio, 1880 - 1914.

Diplomatic and Consular Reports on Trade and Finance for Egypt: Trade and Commerce of Port Said. Report of Trade Annual Series. Stationery Office, London: Foreign Office and the Board of Trade, 1870 - 1914.

Diplomatic and Consular Reports on Trade and Finance for Egypt: Trade and Commerce of the Consular District of Alexandria. Report of Trade Annual Series. Stationery Office, London: Foreign Office and the Board of Trade, 1870 - 1914.

Diplomatic and Consular Reports on Trade and Finance for Egypt: Trade, Commerce, and Navigation of Suez. Report of Trade Annual Series. Stationery Office, London: Foreign Office and the Board of Trade, 1870 - 1914.

Diplomatic and Consular Reports on Trade and Finance for Turkey: Trade and commerce of Beirut and the Coast of Syria. Report of Trade Annual Series. Stationary Office, London: Foreign Office and the Board of Trade, 1870 - 1914.

Diplomatic and Consular Reports on Trade and Finance for Turkey: Trade and Commerce of Jeddah. Report of Trade Annual Series. Stationary Office, London: Foreign Office and the Board of Trade, 1870 - 1914.

Diplomatic and Consular Reports on Trade and Finance for Turkey: Trade of Basra. Report of Trade Annual Series. Stationary Office, London: Foreign Office and the Board of Trade, 1870 - 1914.

Diplomatic and Consular Reports on Trade and Finance for Turkey: Trade of Constantinople and District. Report of Trade Annual Series. Stationary Office, London: Foreign Office and the Board of Trade, 1870 - 1914.

Diplomatic and Consular Reports on Trade and Finance for Turkey: Trade of Damascus. Report of Trade Annual Series. Stationary Office, London: Foreign Office and the Board of Trade, 1870 - 1914.

Diplomatic and Consular Reports on Trade and Finance for Turkey: Trade of Jaffa. Report of Trade Annual Series. Stationary Office, London: Foreign Office and the Board of Trade, 1870 - 1914.

Diplomatic and Consular Reports on Trade and Finance for Turkey: Trade of Palestine. Report of Trade Annual Series. Stationary Office, London: Foreign Office and the Board of Trade, 1870 - 1914.

Diplomatic and Consular Reports on Trade and Finance for Turkey: Trade of Smyrna. Report of Trade Annual Series. Stationary Office, London: Foreign Office and the Board of Trade, 1870 - 1914.

Diplomatic and Consular Reports on Trade and Finance of Persia: Trade and Commerce of Bunder Abbas and Lingah. Annual Series Various Numbers. Stationary Office, London: Foreign Office and the Board of Trade, 1870 - 1914.

Diplomatic and Consular Reports on Trade and Finance of Persia: Trade of Bushire. Annual Series Various Numbers. Stationary Office, London: Foreign Office and the Board of Trade, 1870 - 1914.

Diplomatic and Consular Reports on Trade and Finance of Persia: Trade of Mohammerah. Annual Series Various Numbers. Stationary Office, London: Foreign Office and the Board of Trade, 1870 - 1914.

Diplomatic and Consular Reports on Trade and Finance of Persia: Trade of Shiraz. Annual Series Various Numbers. Stationary Office, London: Foreign Office and the Board of Trade, 1870 - 1914.

Diplomatic and Consular Reports on Trade and Finance of the Persian Gulf. Annual Series Various Numbers. Stationary Office, London: Foreign Office and the Board of Trade, 1870 - 1914.

Diplomatic and Consular Reports on Trade and Finance of the Persian Gulf: Trade of Muscat. Annual Series Various Numbers. Stationary Office, London: Foreign Office and the Board of Trade, 1870 - 1914.

Diplomatic and Consular Reports on Trade and Finance of the Persian Gulf: Trade of the Bahrein Islands. Annual Series Various Numbers. Stationary Office, London: Foreign Office and the Board of Trade, 1870 - 1914.

Evolution economique des possessions francaises de l'Afrique equatoriale. Gouvernement general de l'Afrique Occidentale Tableu de population, de culture, de commerce et de Navigation Annual Series. Paris: Ministere de la Marine et des Colonies, 1881 - 1914.

Statistical Abstract for the United Kingdom. Annual Series. Statistical Department, Board of Trade, 1860 - 1940.

Statistical Abstract relating to British India. Annual Series. Office of the Economic Adviser, Dominion of India: House of Commons Parliamentary Papers, Commercial intelligence department, Calcutta Government, 1860 - 1915.

Tableau general du commerce exterieur: Commerce de la France avec ses colonies et les puissances etrangeres. Statistical Yearbooks Annual Series. Paris: Administration des douanes, 1880 - 1914.

Anderson, James E. "A Theoretical Foundation for the Gravity Equation." *American Economic Review* 69, no. 1 (March 1979): 106–116.

Anderson, James E., and Eric van Wincoop. "Trade Costs." *Journal of Economic Literature* 42, no. 1 (September 2004): 691–751.

Askari, Hossein, Maha Bazzari, and William Tyler. "Economic Challenges Facing Middle Eastern and North African Countries: Alternative Futures." Chap. Policies and Economic Potential in the Countries of the Gulf Cooperation Council, edited by Nemat Shafik, 225–255. 12. Macmillan, 1998.

Babones, Salvatore. "What is world-systems analysis? Distinguishing theory from perspecitve." *Thesis Eleven* 127, no. 1 (2015): 3–20.

Balfour-Paul, Jenny. *Indigo in the Arab World*. London: Routledge, 1997.

Benetrix, Agustin S., Kevin H. O'Rourke, and Jeffrey G. Williamson. "The spread of manufacturing to the poor periphery, 1870 - 2007." *National Bureau of Economic Research Working Paper Series* 18221 (July 2012): 1–78.

Bogart, Dan. "Nationalisations and the Development of Transportation Systems: Cross-Country Evidence from Railroad Networks, 1860 - 1912." *Journal of Economic History* 69, no. 1 (March 2009): 202–237.

Bonine, Michael E., Abbas Amanat, and Michael Ezekiel Gasper. *Is there a Middle East? The evolution of a geopolitical concept*. Palo Alto, CA: Stanford University Press, 2011.

Bose, Sugata. *A Hundred Horizons: The Indian Ocean in the Age of Global Empire*. Cambridge, MA: Harvard University Press, 2006.

Brancaccio, Giulia, Myrto Kalouptsidi, and Theodore Papageorgiou. "Geography, Search Frictions, and Endogenous Trade Costs." *NBER Working Papers*, June 2017, 1–61.

Brandt, Loren. "Chinese Agriculture and the International Economy, 1870 - 1930s: A Reassessment." *Explorations in Economic History* 22 (1985): 168–193.

Brown, Carl L. *Imperial Legacy: The Ottoman Imprint on the Balkans and the Middle East*. New York: Columbia University Press, 1996.

Bussiere, Matthieu. "Exchange rate pass-through to trade prices: The role of nonlinearities and asymmetries." *Oxford Bulletin of Economics and Statistics* 75, no. 5 (2013): 731–759.

Cavallo, Alberto. "More Amazon Effects: Online Competition and Pricing Behaviour." *Jackson Hole Economic Policy Symposium Proceedings*, 2018, 1–42.

Chaunu, Pierre. *European Expansion in the Later Middle Ages*. Amsterdam: North Holland Publishing Co., 1979.

Cheng, Siok-Hwa. *The Rice Industry of Burma, 1852 - 1940*. Kuala Lumpur: University of Malaya Press, 1968.

Chilosi, David, and Giovanni Federico. "Early Globalisations: The integration of Asia in the world economy, 1800 - 1938." *Explorations in Economic History* 57, no. 1 (2015): 1–18.

Clark, Don P. "Scale economies and trade." *Applied Economics Letters* 19, no. 10 (2012): 965–968.

Clark, Edward C. "The Ottoman Industrial Revolution." *International Journal of Middle East Studies* 5 (1974): 65–76.

Combes, Pierre-Philippe, and Miren Lafourcade. "Transport Costs: Measures, determinants, and regional policy implications for France." *Journal of Economic Geography* 5, no. 1 (February 2005): 319–349.

Davidson, Russell, and James G. MacKinnon. *Estimation and Inference in Econometrics*. Oxford, England: Oxford University Press, 1993.

Disdier, Anne-Celia, and Keith Head. "The Puzzling Persistence of the Distance Effect on Bilateral Trade." *The Review of Economics and Statistics* 90, no. 1 (February 2008): 37–48.

Donaldson, Dave. "Railroads of the Raj: Estimating the Impact of Transportation Infrastructure." *LSE Asia Research Centre Working Papers* 41 (March 2010): 1–54.

Economic Integration in Western Asia. Technical report. London: United Nations Economic Commission for Western Asia, 1985.

Eng, Pierre van der. "The sources of long-term economic growth in Indonesia, 1880 - 2008." *Explorations in Economic History* 47, no. 1 (2010): 294–309.

Farnie, D. A. *East and West of Suez: The Suez Canal in History*. Oxford, England: Clarendon Press, 1969.

Federico, Giovanni. "How much do we know about market integration in Europe?" *Economic History Review* 65, no. 2 (2012): 470–497.

Feenstra, Robert C. *Advanced International Trade: Theory and Evidence*. 2nd. Princeton, NJ: Princeton University Press, 2016.

———. "New Product Varieites and the Measurement of International Prices." *American Economic Review* 84, no. 01 (March 1994): 157–177.

Findlay, Ronald, and Kevin H. O'Rourke. *Power and Plenty: Trade, War, and the World Economy in the Second Millennium*. Princeton University Press, 2007.

Fujita, Masahisa, Paul Krugman, and Anthony J. Venables. *The Spatial Economy: Cities, Regions, and International Trade*. Cambridge, MA: MIT Press, 2000.

Geraci, Vincent J., and Wilfried Prewo. "Bilateral Trade Flows and Transport Costs." *The Review of Economics and Statistics* 59, no. 1 (February 1977): 67–74.

Gopinath, Gita, and Oleg Itskhoki. "Frequency of price adjustment and pass-through." *Quarterly Journal of Economics* 125, no. 2 (2010): 675–727.

Gopinath, Gita, Oleg Itskhoki, and Roberto Rigobon. "Currency choice and exchange rate pass-through." *American Economic Review* 100, no. 1 (2010): 304–336.

Green, Nile. "Maritime worlds and global history: Comparing the Mediterranean and Indian Ocean through Barcelona and Bombay." *History Compass* 11, no. 7 (2013): 513–523.

Harcourt, Freda. *Flagships of Imperialism: The PO Company and the politics of empire froms its origins to 1867*. Manchester: Manchester University Press, July 2013.

———. "The high road to India: The PO Company and the Suez Canal, 1840 - 1874." *International Journal of Maritime History* 22, no. 2 (December 2010): 19–72.

Harlaftis, Gelina, and Ioannis Theotokast. "The Handbook of Maritime Economics and Business." Chap. Maritime business during the twentieth century: Continuity and change, edited by Costas Th. Grammenos, vol. 2. 1. London: Lloyd's List, 2010.

Head, Keith, and John Ries. "Increasing returns versus national product differentation as an explanation for the pattern of US-Canada trade." *American Economic Review* 91, no. 4 (2001): 858–876.

Helpman, Elhanan, Marc Melitz, and Yona Rubinstein. "Estimating trade flows: Trading partners and trading volumes." *Quarterly Journal of Economics* 123, no. 2 (May 2008): 441–487.

Hill, Hal. *The Indonesian Economy*. Cambridge: Cambridge University Press, 2000.

Huff, Gregg. "Export-led Growth, Gateway Cities and Urban Systems Development in Pre-World War II Southeast Asia." *Journal of Development Studies* 48, no. 10 (August 2012): 1431–1452.

Huff, Gregg, and Giovanni Caggiano. "Research in Economic History." Chap. Globalisation and labour market integration in late nineteenth and early twentieth century asia, edited by A. J. Field, G. Clark, and W. A. Sundstorm, 255–317. 6. Oxford: Elsevier, November 2007.

Hummels, David. "Toward a Geography of Trade Costs." *GTAP Working Papers*, no. 17 (1999): 1–32.

Hynes, William, David S. Jacks, and Kevin H. O'Rourke. "Commodity market disintegration in the interwar period." *European Review of Economic History* 16 (January 2012): 119–143.

Inalcik, Halil. "Bursa and the commerce of the Levant." *Journal of the Economic and Social History of the Orient* 3, no. 2 (August 1960): 131–147.

Issawi, Charles. *The Economic History of the Middle East, 1800 - 1914: A Book of Readings*. Chicago, IL: University of Chicago Press, 1966.

Issawi, Charles P. *An Economic History of the Middle East and North Africa*. New York: Columbia University Press, 1982.

———. *The Economic History of Iran: 1800 - 1914*. Chicago, IL: University of Chicago Press, 1971.

———. *The Economic History of Turkey, 1800 - 1914*. Chicago: University of Chicago Press, 1980.

———. *The Fertile Crescent, 1800 - 1914: A Documentary Economic History*. New York: Columbia University Press, 1982.

Issawi, Charles P., Isfandiyari Halah, and Abraham L. Udovitch, eds. *The Economic Dimensions of Middle Eastern History: Essays in Honor of Charles Issawi*. Princeton, NJ: Darwn Press, 1990.

Jacks, David S. "What drove 19th century commodity market integration?" *Explorations in Economic History* 43 (July 2006): 383–412.

Jacks, David S., Christopher M. Meissner, and Dennis Novy. "Trade Booms, Trade Busts, and Trade Costs." *Journal of International Economics* 1, no. 83 (2011): 185–201.

———. "Trade Costs, 1870 - 2000." *American Economic Review* 98, no. 2 (2008): 529–534.

———. “Trade costs in the first wave of globalisation.” *Explorations in Economic History* 47, no. 2 (2010): 127–141.

Karakoc, Ulas, Sevket Pamuk, and Laura Panza. “The Spread of Modern Industry to the Periphery since 1871.” Chap. Industrialisation in Egypt and Turkey, 1870 - 2010, 1st ed., edited by Kevin H. O’Rourke and Jeffrey G. Williamson, 1–33. 7. Oxford: Oxford University Press, 2017.

Kazemi, Ranin. “Tobacco, Eurasian trade, and the early modern Iranian economy.” *Iranian Studies* 49, no. 4 (2016): 613–633.

Kratoska, Paul H. “The British Empire and the Southeast Asian rice crisis of 1919 - 1921.” *Modern Asian Studies* 24, no. 1 (1990): 115–146.

Krugman, Paul. “First nature, second nature, and metropolitan location.”

———. “Increasing returns and economic geography.” *Journal of Political Economy* 99, no. 3 (June 1991): 483–499.

Krugman, Paul, and Anthony J. Venables. “Globalisation and the Inequality of Nations.” *Quarterly Journal of Economics* 110, no. 4 (November 1995): 857–880.

Landes, David S. *Bankers and Pashas: International Finance and Economic Imperialism in Egypt*. London: Heinemann, 1958.

Latham, A. J. H., and Larry Neal. “The international market in rice and wheat, 1868 - 1914.” *The Economic History Review* 36, no. 2 (May 1983): 260–280.

Maddison, Angus. *Maddison Project Historical Statistics*. Database. Groningen Growth and Development Centre, University of Groningen, 2013.

Martinez-Zarzoso, Immaculada. “Alternative Sea Routes: What Effect on Maritime Trade?” *SAIS Review of International Affairs* 33, no. 2 (2013): 61–74.

Martinez-Zarzoso, Immaculada, and Celestino Suarez-Burguet. “Transport costs and trade: Empirical evidence for Latin American imports from the European Union.” *Journal of International Trade and Economic Development* 14, no. 3 (September 2005): 353–371.

McGee, T. G. *The Southeast Asian City: A Social Geography of the Primate Cities of Southeast Asia*. London: G. Bell / Sons, 1967.

Mitchener, Kris James, and Marc Weidenmier. “Trade and Empire.” *The Economic Journal* 118, no. 533 (November 2008): 1805–1834.

Mohammed, Saif I. Shah, and Jeffrey G. Williamson. “Freight rates and productivity gains in British tramp shipping, 1869 - 1950.” *National Bureau of Economic Research Working Paper Series*, no. 9531 (February 2003): 1–67.

Niblock, Tim, and Emma Murphy, eds. *Economic and Political Liberalisation in the Middle East*. London: British Academic Press, 1993.

Niroomand, Farhang, and W. Charles Sawyer. “The extent of scale economies in US foreign trade.” *Journal of World Trade* 23, no. 6 (1989): 137–146.

North, Douglass. “Ocean Freight Rates and Economic Development, 1750 - 1913.” *Journal of Economic History* 18, no. 4 (December 1958): 537–555.

Novy, Dennis. “Gravity Redux: Measuring international trade costs with panel data.” *Economic Inquiry* 51, no. 1 (January 2013): 101–121.

Ojala, Jari, and Stig Tenold. "Maritime trade and merchant shipping: The shipping/trade ratio since the 1870s." *The International Journal of Maritime History* 29, no. 4 (2017): 838–854.

O'Rourke, Kevin H., and Jeffrey G. Williamson. *Globalisation and History: The Evolution of a Nineteenth-Century Atlantic Economy*. Cambridge, MA: MIT Press, 1999.

———. "When did globalisation begin?" *European Review of Economic History* 6 (2002): 23–50.

Owen, Roger. *The Middle East in the World Economy, 1800 - 1914*. London: Methuen, 1987.

Owen, Roger, and Sevket Pamuk. *A History of Middle East Economies in the Twentieth Century*. London: I. B. Tauris, 1998.

Pamuk, Sevket, and Jeffrey G. Williamson. "Ottoman De-Industrialisation 1800 - 1913: Assessing the Shock, Its Impact and Response." *National Bureau of Economic Research Working Paper Series* (Cambridge, MA) 14763 (2009): 1–43.

Pascali, Luigi. "The Wind of Change: Maritime Technology, Trade, and Economic Development." *Barcelona Graduate School of Economics Working Paper Series*, no. 764 (June 2014): 1–39.

Pearson, Michael N. *The Indian Ocean: Seas in History*. London: Routledge, 2003.

Pollard, Sidney. "British and world shipbuilding, 1890 - 1914: A study in comparative costs." *Journal of Economic History* 17, no. 3 (September 1957): 426–444.

Pope, Andrew. "British steamshipping and the Indian coastal trade, 1870 - 1915." *Indian Economic and Social History Review* 32, no. 1 (1995): 1–21.

Prange, Sebastian R. "'Measuring by the bushel': Reweighing the Indian Ocean pepper trade." *Historical Research* 84, no. 224 (May 2011): 212–235.

Quataert, Donald. *Manufacturing and Technology Transfer in the Ottoman Empire, 1800 - 1914*. Istanbul: Isis Press, 1992.

Rathbone, M., and T. H. Farrer. *Memorandum and Tables relative to the trade between the United Kingdom and the East: Memorandum on trade between the United Kingdom and the East through the Suez Canal*. House of Commons Parliamentary Papers. Board of Trade, December 1882.

Rouis, Mustapha, and Steven R. Tabor. *Regional Economic Integration in the Middle East and North Africa: Beyond Trade Reform*. World Bank Publications, 2012.

Roy, Tirthankar. *The Economic History of India, 1857 - 1947*. Oxford: Oxford University Press, 2006.

Silva, J. M. C. Santos, and Silvana Tenreyro. "The Log of Gravity." *The Review of Economics and Statistics* 88, no. 4 (November 2006): 641–658.

Sinclair, Stuart, Norman Bleetman, Paul Hackett, Trevor Maggs, and Michael Wilson, eds. *Middle East Economic Handbook*. 1st ed. Vol. 4. London: Euromonitor Publications, 1986.

Solar, Peter M. "Opening to the East: Shipping Between Europe and Asia, 1770 - 1830." *Journal of Economic History* 73, no. 3 (September 2013): 625–661.

Steele, David. "Imperialism and Nationalism in the Middle East: The Anglo-Egyptian Experience, 1882 - 1982." Chap. Britain and Egypt, 1882 - 1914: The Containment of Islamic Nationalism, edited by Keith M. Wilson, 1–25. 1. London: Mansell Publishing, 1983.

Stigler, George J., and Robert A. Sherwin. “The Extent of the Market.” *The Journal of Law and Economics* 28, no. 3 (October 1985): 555–585.

Turner, Paul, and Justine Wood. “Nonlinear exchange rate pass-through in industrial economies.” *Applied Economics* 49, no. 4 (June 2017): 397–402.

Vicomte Georges de Zogheb, M. le, and Simon Philippart. *Petite Revue Financière: Le Journal des Débats*. Technical report. Paris: Sociéte du Tombac, December 1893.

Whiting, Richard C. “Imperialism and Nationalism in the Middle East.” Chap. The Suez Canal and the British Economy, 1918 - 1960, edited by Keith M. Wilson, 76–95. 4. London: Mansell, 1983.

Williamson, Jeffrey G. “Core Growth and World Transport Revolutions.” Chap. 2, edited by Jeffrey G. Williamson, 7–24. Cambridge, MA: MIT Press, 2014.

———. “Globalisation and the Great Divergence: Terms of trade booms and volatility in the poor periphery, 1782 - 1913.” *National Bureau of Economic Research Working Paper Series* 13841 (2008): 1–51.

———. “Land, Labour, and Globalisation in the Third World, 1870 - 1940.” *Journal of Economic History* 62, no. 1 (March 2002): 55–85.

———. *Trade and Poverty: When the Third World Fell Behind*. Cambridge, MA: MIT Press, 2011.

Wilson, Rodney. *The Economies of the Middle East*. London: Macmillan Press, 1979.

Wink, Andre. “From the Mediterranean to the Indian Ocean: Medieval history in geographic perspective.” *Comparative Studies in Society and History* 44, no. 3 (2002): 416–445.

Zanden, Jan Luiten van. *Changing Economy in Indonesia*. Database of historical prices and wages. Amsterdam: International Institute of Social History, 1975 - 1996.

Zanden, Jan Luiten van, and Daan Marks. *An Economic History of Indonesia, 1800 - 2010*. London: Routledge, 2012.

Chapter 4

Trade and Industrialisation in the Period of Dual Dominance:

The Intensive and Extensive Margins of Bombay and Calcutta Trade, 1875 – 1910

Chapter Abstract

The first era of globalisation is characterised by the dichotomy between core industrialising economies of Europe, and the staple commodity exporting economies of the colonial periphery. At the same time, within colonial India, the period is also described as one of *dual dominance* of the Indian economy by the two major port cities of Bombay and Calcutta, as major entrepots of trade and centres of large–scale industry and finance. By collecting an original, disaggregated dataset of trade at both port cities, this paper looks at the relationship between trade costs and the intensive and extensive margins of trade. This paper finds that the dominant cities of the Indian economy operated in two distinct spheres of trade: the first and primary role was as peripheral port cities specialising in the export of commodities to a rapidly industrialising Europe, and secondly, as economic centres within colonial India, the cities functioned as core economies exporting more highly differentiated industrial products across the global periphery of the Indian Ocean. Despite the similarities between the two cities, comparing the margins of trade between Bombay and Calcutta also highlights important contrasts in the origins of each city's trade networks and foundations in large–scale manufacturing. Although both cities exhibited spheres of trade in types of products according to regional destination, such regional biases were more evident in the case of Bombay, and less pronounced for Calcutta, most likely due to the distinct political and economic functions and foundations of each city.

4.1 Introduction

The traditional image of India and the Indian Ocean economy in the era of high imperialism between 1875 and 1910 is primarily that of a colonial exporter specialised in a narrow set of commodities and raw materials to, and imports of more highly–valued manufactured goods from Europe, and that this bilateral relationship contributed to a growing divergence in economic development between the global core and the colonial periphery. However at the same time as the peripheral functions of the Indian Ocean region persisted, historians have also identified a unique degree of economic consolidation and development focused on the two major port cities of Bombay and

Calcutta. Within the economic history of colonial India, this phenomenon is widely cited as the "heyday of dual dominance", defined by the economic and political consolidation and competition between the two major port cities.[1] From their foundations as colonial emporiums, the two cities built on their trading profits and the enterprise of the communities that dominated foreign trade to emerge in the late nineteenth century as the major industrial centres, "Calcutta and Bombay, the two commercial capitals of India, are the slow products of British rule...under British rule, an era of production on a great scale, based upon the cooperation of capital and labour, in place of the small household manufactures of ancient times. The great industrial cities of British India are the type of this change."[2]

The concept of 'dual dominance' is generally used as a descriptive framing for understanding the economic primacy of the two port cities during the era of high imperialism based on a small, but rapid process of economic diversification away from the export of staple commodities with the rise of large–scale manufacturing and increased economic agglomeration. Indeed rapid industrialisation within the periphery was well underway by the end of the nineteenth century across Asia.[3] Bombay had become the world's fourth largest cotton textile producer by 1914. Similarly Calcutta was the world's largest producer of jute manufactures in the same year.[4] The two ports alone accounted for the vast majority of the total Indian import and export trade, and an unrivalled majority of the large–scale factory output. By 1893, 83% of the capital of all rupee joint–stock companies in India, and 92% of the capital of Sterling companies operating in India were controlled from either Bombay or Calcutta.[5] Due to the high level of industrial and commercial agglomeration, the history of Indian economic growth and industrialisation in the pre–war period is dominated by the history of these two port cities. Thus 'dual dominance' describes the exceptional degree of economic control and competition between Bombay and Calcutta, as the *Report of the Indian Industrial Commission* specifically refers to the two cities as examples for how to foster further industrialisation, "the most convenient way of presenting the commercial and industrial conditions of the country, as a basis for our proposals, is by a description of selected areas or centres as specimens of economic development, in which the factors with which we have to deal appear in varying

1. Claude Markovits, "The Oxford India Anthology of Business History," chap. Premier Industrial Centres: Bombay and Calcutta, ed. Medha M. Kudaisya, vol. 1, 28 (Oxford, UK: Oxford University Press, 2011), 282–297.

2. William Wilson Hunter, *The Indian Empire: Its Peoples, History, and Products* (London: W. H. Allen / Co., 1893), pp. 660.

3. Agustin S. Benetrix, Kevin H. O'Rourke, and Jeffrey G. Williamson, "The spread of manufacturing to the poor periphery, 1870 - 2007," *National Bureau of Economic Research Working Paper Series* 18221, no. 1 (July 2012): 1–78.

4. Morris D. Morris, "Cambridge Economic History of India," chap. 7, ed. Dharma Kumar and Meghnad Desai, vol. 2 (Cambridge, England: Cambridge University Press, 1983), 551–676.

5. Omkar Goswami, "Calcutta, The Living City," chap. Calcutta's Economy, 1918 - 1970: The Fall from Grace, ed. Sukanta Chaudhuri, vol. 2 (Oxford, UK: Oxford University Press, 1990), 88–96.

circumstances and degrees. Prominent among these are the great cities of Bombay and Calcutta."[6]

Yet despite the historical conceptualisation of a rapidly urbanising and industrialising Indian economy premised on 'dual dominance', the framework contrasts with the traditional characterisation of the colonial Indian economy from a global perspective in which it "was crucial to Britain and the British Empire as a market for its manufactures, chiefly textiles, machinery, and metals, and as a source of food, migrant labour, industrial raw materials, and manufactured goods intensive in labour and natural resources."[7] Both frameworks of India as either a peripheral colonial economy, or as an urbanised 'dual dominant' economy, are purely descriptive for understanding the broad structures and composition of India in the period. There have been extensive empirical studies of Indian trade at an aggregate, national level which have demonstrated that India was indeed a peripheral economy specialising in the export of staple commodities to, and imports of manufactured goods from Europe. However there has not been an empirical study of the disaggregated trade statistics specifically from the two primary port cities of India within the context of the 'dual dominance' framework. Indeed the framework of 'dual dominance' itself has largely been taken for granted, with a systematic comparison of the role of the two cities having been addressed only descriptively, and never empirically.[8] Therefore, considering contrasting descriptive narratives of the Indian economy in the period, but the lack of empirical evidence or comparative analysis for the historical framework of 'dual dominance', this paper presents an empirical analysis of an originally compiled dataset of disaggregated exports from Bombay and Calcutta. In doing so, this paper addresses two questions; to what degree did the 'dual dominant' port cities of Bombay and Calcutta function as peripheral entrepots linking the colonial hinterland to the global core of Europe, and to what degree did they foster early industrialisation in the Indian Ocean?[9]

In order to empirically assess the framework of 'dual dominance', particularly as it contrasts with prevailing narratives of a colonial economy that is characterised by a distinctive trading relationship with Europe, this paper similarly looks at trade statistics, but specifically drawn from the two port cities. This paper analyses a novel dataset of disaggregated granular trade statistics of exports specifically from the presidencies of Bombay and Calcutta, to the universe of destinations. Archival trade records distinguish trade and production from the 'chief port' of Bombay or Calcutta in comparison to 'all other ports' within the presidency, and distinguishes between exports

6. Sir T. H. Holland et al., *Report of the Indian Industrial Commission*, Parliamentary Papers (Calcutta: Indian Industrial Commission, 1918), pp. 8.

7. Tirthankar Roy, *The Economic History of India*, vol. 1 (Oxford, UK: Oxford University Press, 2011), pp. 4.

8. Claude Markovits, *Merchants, Traders, Entrepreneurs: Indian business in the colonial period* (Basingstoke, Hampshire: Palgrave Macmillan, 2008), pp. 128 - 151.

9. Gregg Huff, "Export-led growth, gateway cities, and urban systems development in pre-World War II Southeast Asia," *Journal of Development Studies* 48, no. 10 (August 2012): 1431–1452.

of 'foreign produce and manufacture' from exports of 'Indian produce and manufacture' at the primary ports. By using export trade specifically from the chief port, and based only on exports of 'Indian produce and manufacture', this paper assesses each city's exports by product type and destination. In doing so, this paper provides a quantitative dimension to the descriptive characterisation of the historical Indian economy according to the framework of an urbanised, industrial 'dual dominant' economy in order to provide a systematic comparison of the extent of economic control of the two ports, which can subsequently be compared to the prevailing narrative of India as a peripheral economy in era of high imperialism.

While most empirical studies of colonial Indian trade have found it to be largely in line with that of a peripheral economy, such studies have been purely descriptive and aggregate in their analysis of the trade statistics.[10] In contrast, this paper disaggregates trade to look at the granular statistics from each of the primary port cities within the framework of 'dual dominance'. Therefore, in addition to analysing the descriptive trade statistics of what each city exported and to where it was shipped, by decomposing exports, this paper also comparatively analysis each city according to the margins of trade, which are important for understanding the economy of the two port cities, and for determining which narrative of the colonial Indian economy predominates, as the margins of trade imply very different consequences for economic growth, urban agglomeration, and industrial development.[11] While descriptive analysis of India's aggregate trade statistics simply illustrate that it was indeed economically characterised as a part of the colonial periphery based on trade relations with the global core of Europe, an analysis of the margins of trade for Bombay and Calcutta explores in greater detail the dispersion and composition of India's exports from the two primary industrial centres, as described under the framework of 'dual dominance'. Thus an analysis of the margins of trade assesses firstly the extent to which the two cities were in fact complementary under a framework of 'dual dominance', and secondly determines which narrative of the colonial Indian economy predominated in the period.

If trade expansion was mostly intensive by exporting more of each variety of a good, then this implies that the price for each variety on the world market should decline. This is because specialisation introduces de facto diminishing returns: countries that accumulate capital faster than average experience declining export prices, depressing the rate of return and discouraging further accumulation.[12] Thus there is a terms of trade decline as Bombay and Calcutta produce and export

10. Jeffrey G. Williamson, *Trade and Poverty: When the Third World Fell Behind* (Cambridge, MA: MIT Press, 2011), pp. 75 - 100.

11. Robert C. Feenstra, "New Product Varieties and the Measurmenet of International Prices," *American Economic Review* 84, no. 1 (March 1994): 157–177.

12. Daron Acemoglu and Jaume Ventura, "The World Income Distribution," *Quarterly Journal of Economics* 117,

more of the same good to achieve the same balance of trade that it had in the previous period. However the intensive margin is also important for expanding trade and reinforcing bilateral trade ties, as a country continues to gain from economies of scale. Yet without producing more varieties, per unit prices decline, and the goods become less valuable.[13] Although studies of the colonial Indian economy focus on aggregate trade, it is trade on the intensive margin that they tend to focus on when claiming that India was characterised as a peripheral economy since the primary interest was in the quantity of trade going from India to any other country.[14]

Conversely, if trade grew on the extensive margin, by exporting a wider array of goods or higher–quality goods, then rather than experiencing lower prices with increased quantities of each variety, the port city economy grows by exporting more varieties at different prices, or exporting higher quality goods at higher prices to more countries. Considerable literature has focused on how economic growth and development is associated with increased export diversification, or the extensive margin of trade.[15] Di Giovanni and Levchenko (2010) have demonstrated how export diversification protects from price variations in product markets.[16] Hausman (1981) pioneered an approach looking at micro data of input factors and the production line for an individual good in order to estimate welfare changes, and finds significant welfare gains from the introduction of new varieties of products.[17] Empirical studies on the effects of the addition of new product varieties to markets has found it to have large welfare effects on both importer and exporter countries.[18] In addition, other studies have shown that richer countries export more product varieties of higher value, consistent with the correlation between economic development and export diversification. This quality difference accounts for approximately 9 percent of country differences in real income per worker.[19] Therefore a comparative analysis of each port's margin of trade contributes to understanding firstly the extent to which the framework of 'dual dominance' describes the relationship

no. 2 (May 2002): 659–694.

13. Paul R. Krugman, "Increasing Returns, Monopolistic Competition, and International Trade," *Journal of International Economics* 9, no. 1 (February 1979): 469–479.

14. Daniel Lederman and William F. Maloney, *Does what you export matter? In search of empirical guidance for industrial policies* (Washington DC: The World Bank, 2012); Daniel Lederman and William F. Maloney, "Natural Resrouces, Neither Curse nor Destiny," chap. Trade Structure and Growth, ed. Daniel Lederman and William F. Maloney, 2 (Washington DC: World Bank Publications, 2007), 15–40.

15. Bailey Klinger and Daniel Lederman, "Export discoveries, diversification, and barriers to entry," *Economic Systems* 35, no. 1 (2011): 64–83; Elhanan Helpman and Paul R. Krugman, *Trade Policy and Market Structure* (London: MIT Press, 1989).

16. Julian di Giovanni and Andrei A. Levchenko, "Putting the parts together: Trade, vertical linkages, and business cycle comovement," *American Economic Journal: Macroeconomics* 2, no. 2 (April 2010): 95–124.

17. Jerry Hausman, "Exact Consumer's Surplus and Deadweight Loss," *American Economic Review* 71, no. 1 (1981): 662–676.

18. Christian Broda and David E. Weinstein, "Globalisation and the Gains from Variety," *Quarterly Journal of Economics* 121, no. 2 (May 2006): 541–585.

19. David Hummels and Peter J. Klenow, "The variety and quality of a nation's exports," *American Economic Review* 95, no. 3 (June 2005): 704–723.

between Bombay and Calcutta based on the geographic dispersion of exports, and secondly to determining which narrative of the Indian economy prevailed in the era of high imperialism according to the type and variety of exports.

By compiling trade data for each city, a decomposition and analysis of exports from Bombay and Calcutta in this paper firstly addresses a comparative estimation of the size and relative degree of agglomeration of large–scale manufacturing at the two port cities to empirically assess the extent to which the framework of 'dual dominance' describes the colonial Indian economy. Second, contrasts between the two cities highlights any factors between how each city functioned within India and the Indian Ocean according to exports by product type and destination. Third, given the implications for the margins of trade, comparative analysis of both trade margins according to level of product differentiation and regional destinations determines which narrative of the economy of the Indian Ocean predominates: whether the cities were simply colonial gateways exporting staple commodities to and importing manufactured goods from the global core of Europe, or if they were industrial centres to a distinct Indian and Indian Ocean economy.

This paper will first discuss the features and general characteristics of 'dual dominance' in the Indian economy in section 4.2. Estimates on the size of manufacturing in each city, as well as the role of external relative to domestic markets for manufactured goods are discussed in sections 4.3 and 4.4. Sections 4.5, 4.6, and 4.7 will present the data and two different decompositions of the trade data of each port city. Sections 4.8, 4.9, and 4.10 will present analysis on total trade, the intensive, and the extensive margins of trade respectively. Section 4.11 presents robustness checks to analysis, and section 4.12 concludes.

4.2 Characteristics of 'Dual Dominance'

The pattern of 'dual dominance' in the colonial Indian economy has often been discussed in the historical literature, and has been systematically analysed qualitatively, but no attempt has been made to quantitatively evaluate the framework of 'dual dominance'. Therefore in order to observe the degree to which the two cities were in fact dominant and complementary in the export trade of the Indian economy, this section presents the aggregate trade statistics of the two cities. Figure 4.1 shows the percentage of total Indian exports that left from either of the two port cities. In most years, Calcutta retains the largest share of India's exports over Bombay, but both cities combined represented a significant majority of India's overall exports. The combined share of exports from either port city represented at least 75%, and as much as 80% of total Indian exports in the period.

Although both cities emerged in this period as rival leaders of Indian commerce, Calcutta had

long been the traditional trading and financial centre of India throughout the 19th century, hence its overall lead in percentage of Indian exports relative to Bombay. In 1820, Bombay's merchandise export amounted to little more than a quarter of Calcutta's, and its imports were valued at less than half of Calcutta's. The surplus of exports over imports at Bombay was worth only a small fraction of Calcutta's surplus.[20] However what was so impressive and distinct about the period of 'dual dominance' was how the two cities competed with, and complemented each other as the primary port for total Indian exports. This is illustrated in figure 4.1 by the movements in each city's share of exports that are inversely related. Any growth in total export shares to Calcutta corresponds in a loss to Bombay, and vice versa.

In the early 19th century, Bombay's initial upswing in exports was mainly due to a rise in the Chinese demand for opium, as well as a growing tendency to ship the opium of Malwa through Bombay, rather than through the ports of Portuguese India. By the mid–1850s however, "the most promising development was the establishment of the first modern cotton–textile mills...the use of modern machinery in Bombay was eloquent testimony to the emergence of a structure of 'dual dominance' in the Indian colonial economy".[21]

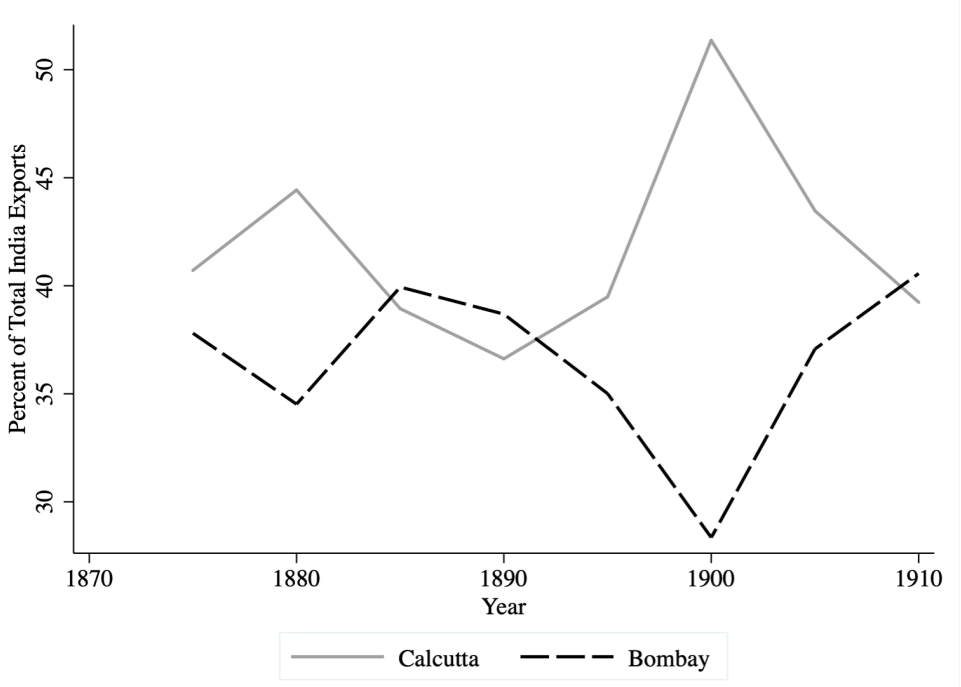


Figure 4.1: Share of Bombay and Calcutta exports to total India exports, 1875 – 1910.[22]

20. Markovits, "The Oxford India Anthology of Business History," pp. 284.

21. Ibid., pp. 285 - 286.

22. Data on the total value of exports for Bombay and Calcutta is taken from the *Trade of Bombay Presidency* and *Trade of Bengal Presidency* in each year. Data on total India trade is taken from the *Statistical Abstracts of India* in the years corresponding to: From 1875 – 85, no. 20, pp. 122 – 125; From 1880 – 1890, no. 25, pp. 206 – 221; From 1885

Occupying opposite ends of the subcontinent, the two cities operated as distinct hubs to their respective hinterland economies of Western or Eastern India, and the surrounding maritime regions of the Arabian Sea and the Bay of Bengal. Both cities were primary ports, highly specialised in the export of staple commodities to Europe with relatively little industrial production. Nevertheless Calcutta retained primacy as the trading, financial, and political centre of colonial India. The beginning of the period of 'dual dominance' came with the rise of large–scale industry to both cities. In 1853 the first jute mill in Calcutta was established, and the following year the first cotton textile mill was established in Bombay. From the founding of the first large-scale mills in each city in the 1850s to becoming major world producers of jute and cotton at the outbreak of the First World War, the cities gradually moved from the production of raw material into upstream production and export of higher value goods. Over the period, exports were initially focused on raw cotton and jute, subsequently expanding to yarn and thread by the 1870s, and final product piece goods in the 1880s.

Demonstrating the exceptional economic influence of the two port cities in the period of 'dual dominance', table 4.1 shows the extent to which industrial exports had agglomerated in the two cities. Looking at the composition of exports by sector as defined in the archival trade records, table 4.1 illustrates the breakdown of the combined Bombay and Calcutta exports as a percentage of total Indian exports. Firstly, as previously illustrated in figure 4.1, the share of exports coming from both cities represented an overwhelming majority of India's total trade. Second, of the largest export sectors that represented more than 1% of total Indian trade, the only sector to demonstrate significant and stable growth as a percentage of total Indian exports was in manufactured goods, initially being only 3% of total export value, and ending the period as the largest export sector at nearly 32% of total Indian trade.

As illustrated from evidence of industrial agglomeration, trade and financial centralisation, the period of 'dual dominance' of the colonial Indian economy has long been recognised and extensively studied, as the colonial pattern of economic development of primary port cities predisposed them to early industrialisation. Operating as commercial, political, and industrial centres, how the two cities, as the main ports of entry to a primary producing colonial hinterland, managed to integrate into the world economy on the basis of specialisation in primary products, and subsequently consolidate industrial activity to become some of the largest centres of industrial production in the

– 1895, no. 30, pp. 214 – 219; From 1888 – 1898, no. 33, pp. 222 – 223; From 1903 – 13, no. 48, pp. 160 – 161.

23. Data on total India trade is taken from the *Statistical Abstracts of India* in the years corresponding to: From 1875 – 85, no. 20, pp. 122 – 125; From 1880 – 1890, no. 25, pp. 206 – 221; From 1885 – 1895, no. 30, pp. 214 – 219; From 1888 – 1898, no. 33, pp. 222 – 223; From 1903 – 13, no. 48, pp. 160 – 161.

Table 4.1: Composition of exports: Percentage share of combined Bombay and Calcutta exports in total export value by categories, 1875 – 1910

Year	Animals	Food & drink	Metals	Chemicals	Oils	Manuf.	Commod.	Combined
1875	0.02	13.60	0.25	26.13	0.45	3.11	33.25	76.81
1880	0.03	18.82	0.08	24.75	0.51	5.02	32.46	81.65
1885	0.06	12.80	0.06	18.07	0.29	7.27	30.33	68.88
1890	0.17	13.71	0.10	12.66	0.37	11.58	31.98	70.56
1895	0.15	17.00	0.08	13.67	0.70	18.36	24.88	73.30
1900	0.17	18.38	0.29	12.05	0.30	22.99	25.70	79.89
1905	0.23	14.58	0.34	12.49	0.22	30.71	32.89	91.46
1910	0.17	17.61	0.14	8.11	0.30	31.90	26.94	85.16

Notes: Column *Combined* refers to the combined total exports of Bombay and Calcutta as a percentage of total Indian exports. Categories as defined in annual series *Trade of the Bombay Presidency* and the *Trade of the Bengal Presidency*. Total value of Indian exports from annual series *Statistical Abstracts for British India*.[23]

Indian Ocean region has been analysed as two separate stories of either Indian deindustrialisation or Indian industrialisation, but not collectively. With both port cities' economic foundation in a highly specialised staple export trade, there has not been a systematic analysis of the comparative composition of the two cities' exports outside of cotton and jute manufactures, the margins of trade in relation to city growth, or the geographic and spatial dispersion of exports. However understanding all of these factors collectively bears important implications for how trade and industrialisation evolved in India in the twentieth century; it was the legacy and intersection of both colonialism and commerce at the two primary ports that led to the contemporary organisation of Indian economic development over the course of the twentieth century.[24]

4.3 Cotton and jute textile industries

The history of large–scale industry in the second half of the nineteenth century in India is largely associated with developments in the cotton, jute, and iron and steel industries. Only towards the end of the nineteenth century was there diversification of industry away from these three sectors. Nevertheless over the period, they were almost entirely localised at Bombay and Calcutta, and exports of cotton and jute textiles continued to be the largest, as well as the fastest growing industries. The dominance of the cotton textile and clothing industry in Bombay is reflected in the rapid growth of the number of factories in the city. From 1875 until 1914, there was an extraordinary expansion in the concentration of cotton industry in Bombay, unmatched by any other city in India. This concentration was noted in the Indian Industrial Commission in 1918, "the principal industry of Bombay is the spinning and weaving of cotton...Calcutta is no doubt less favourably situated in

24. Vijay K. Seth, *Ascent and Decline of Native and Colonial Trading: Tale of Four Indian Cities* (New Delhi: Sage Publications, 2019).

respect of the cotton tracts generally than Bombay."[25] Table 4.2 shows the corresponding growth of industry in Bombay.

Table 4.2: Cotton Textile Industry in Bombay

Year	No. of mills	No. of spindles	No. of looms	Number of workers
1877	51	1,244,206	10,385	Not stated
1900	193	4,945,783	40,124	161,189
1914	271	6,778,895	104,179	260,275
1918	262	6,653,871	116,484	282,227

Notes: Report of the Indian Industrial Commission, 1916 – 1918, pp. 17 – 19.

The growth of the cotton industry at Bombay was inextricably tied to the growth of the city's foreign trade that came with the opening of the Suez Canal in 1869.[26] The new industry was built on trading profits and the enterprise of the local communities which dominated the city's foreign trade.[27] The Suez Canal benefitted Bombay more than any other Indian port by increasing the city's trade ties to Europe to the extent that by 1900, Bombay had surpassed Calcutta to become the largest port by total value for Indian imports, largely driven by imports from Europe, as well as the major centre for the distribution of imports to internal markets across the subcontinent.[28]

Like most colonial port cities at the time, Bombay's foreign trade was initially based on the export of raw materials from the colonial hinterland, and the import of manufactured goods from Europe. The transition from Bombay's exports of raw cotton to cotton manufactures occurred through local Indian enterprise, in contrast to Calcutta where large–scale industry arose through European–controlled export companies. In Bombay, Indian merchant communities were subordinated to expatriate capital in the export trade of raw cotton, as European and Liverpool agency houses for cotton textiles sought to ensure the supply of raw cotton for their own factories in Europe. With limited access to foreign capital, local Indian entrepreneurs responded by diversifying into the spinning of raw cotton and investing in mills for local markets.[29] From the rapid expansion of the cotton textile industry as shown in table 4.2, the city became more specialised in the export of cotton textiles, and less so for raw cotton. From the city's dominance in cotton textiles, the city also served as a prime location for several other industries. Bombay held the largest number of India's wool, paper making, silk, and glass mills, and a significant share of leather and chemical

25. Holland et al., *Report of the Indian Industrial Commission*, pp.15.

26. R. Balakrishna, *Regional Planning in India*, 1st ed. (Bangalore City: Bangalore Printing / Publishing Company, 1948), pp. 32.

27. Tirthankar Roy, "The Oxford India Anthology of Business History," chap. Milestones in the Rise of Indian Industry, ed. Medha M. Kudaisya, vol. 1, 24 (Oxford, UK: Oxford University Press, 2011), 225–234.

28. Markovits, "The Oxford India Anthology of Business History," pp. 287.

29. Rajnarayan Chandavarkar, *The Origins of Industrial Capitalism in India: Business Strategies and the Working Classes in Bombay, 1900 - 1940* (Cambridge, England: Cambridge University Press, 1994), pp. 65.

mills. Production of iron and steel in India became dominated by the Tata Iron and Steel Company, which was also based in Bombay, and rapidly expanded their exports in the early twentieth century.[30]

Table 4.3: Jute Textile Industry in Calcutta

Year	No. of mills	No. of looms	Av. no. of workers	Av. no. workers per mill
1870	5	950	Not stated	Not stated
1885	23	6,132	47,863	2,081
1895	28	9,580	69,179	2,471
1905	38	18,400	123,869	3,260
1914	64	36,050	216,288	3,380

Notes: Report of the Indian Industrial Commission, 1916 – 1918, pp. 17 – 19.

At the same time as cotton manufacturing burgeoned in Bombay, the jute industry rapidly expanded in Calcutta, becoming the largest supplier of jute manufactures globally by 1914. Calcutta had long been associated with the jute trade, and in a similar process as Bombay with cotton, Calcutta initially provided raw jute that would subsequently be manufactured in Europe, in cities such as Dundee, Scotland. From the establishment of the first jute mill in 1855, Calcutta began to directly compete with Dundee in jute manufactures.[31] However the jute industry expanded more rapidly in Calcutta than anywhere else during the period, as shown in table 4.3. Between 1869 and 1913 the number of mills increased from 5 to 64, and employment increased from approximately 7,000 to 215,000.[32] At the same time as production grew, the industry also expanded to more markets, and diversified jute products. In the 1875–78 period, Calcutta exported 3.5 million yards of jute fabric and nearly 25 million bags every year. By 1883, these figures rose to 4.25 million yards of fabric and more than 53 million bags per year. Calcutta also diversified jute manufacturing in the production of hessian goods, a jute product that had long been the exclusive domain of Dundee manufacturers. Additional diversification of jute products were in gunnies and bales, which both doubled in the volume of exports from the beginning of the period to the 1890s.[33]

Aside from the rapid growth in the two predominant textile industries of cotton and jute, there was also a rise in several other industries in the two port cities. Between 1870 and 1914 there was an explicit desire on the part of colonial administrators, merchants, and entrepreneurs to diversify

30. Balakrishna, *Regional Planning in India*, pp. 30 - 45.

31. Jim Tomlinson, *Dundee and the empire: 'Juteopolis', 1850 - 1939*, vol. 1 (Edinburgh, Scotland: Edinburgh University Press, 2014), "Calcutta is Dundee's most formidable opponent in the jute industry, yet Dundee brains and capital have been chiefly instrumental in establishing and developing the trade on the banks of the Hooghly." – Dundee Medical Officer of Health, 1912, pp. 36.

32. Roy, *The Economic History of India*, pp. 190.

33. Tara Sethia, "The rise of the jute manufacturing industry in colonial India: A global perspective," *Journal of World History* 7, no. 1 (Spring 1996): 71–99.

manufacturing given the intense competition of cotton and jute textile mills. The *swadeshi* movement that began in 1905 was a popular effort to promote indigenous industrial enterprise on the basis of securing for India the profits which accrue from the manufacture of raw materials, the export of which India had traditionally been confined.[34] Therefore several large–scale industries emerged which led to further economic agglomeration around the ports. The desire for industrial diversification was laid out in the report of the Indian Industrial Commission, "although it must be clearly recognised that Indian industries are now, and will be in the future, chiefly based on the agricultural products of the country, we find that, important and valuable as they are, much still requires to be done for industrial development. The extent to which there is manufacturing, whether for export or internal consumption, instead of being sent out of the country as raw materials, should, in some cases, be largely increased...we desire, however, to draw attention here to the necessity of securing the inception in India of certain very specialised and essential industries which must be set up in this country at the earliest possible date."[35]

Alongside the textile industries there was similarly rapid growth in coal mining, paper and glass making in Calcutta, and leather making, iron, steel, and railway production in Bombay. Both cities had railway workshops, arms factories, and large private engineering firms.[36] Between 1880 and 1914, the expansion of large–scale industrial production occurred at an average annual rate of between 4 and 5 per cent, a rate of growth comparable with other parts of the rich world.[37] By 1914, the total number of factories in Calcutta was 973, or 35.4 per cent of the total in India, and Bombay had 613, or 22.3 per cent of all Indian factories, with the majority of total Indian factories based in the two cities.[38] In addition, the two cities represented the majority of factory employment for all of India as shown in table 4.4. The aggregation of factories in these cities derived from their position as transportation hubs, markets for labour, capital, and services, as sites of European settlement, and their proximity to lands engaged in cotton and jute cultivation.

While an economic geography of 'dual dominance' divided the subcontinent into two regions centred around either Bombay or Calcutta, their industrial growth was not limited to competition within the subcontinent, but spanned across a much larger overseas market. In the case of Bombay's regional hinterland, "the sphere of industrialisation and infrastructure networks both underwrote and emerged from the port's connectivity with colonial networks and beyond. Not only did Bombay

34. Holland et al., *Report of the Indian Industrial Commission*, pp. 73.
35. Ibid., pp. 34 – 56.
36. Morris, "Cambridge Economic History of India," pp. 599.
37. Ibid., pp. 592.
38. Aseema Sinha, *The Regional Roots of Development Politics in India: A Divided Leviathan* (Bloomington: Indiana University Press, 2005), pp. 44.

Table 4.4: Location of Large–Scale Industry, 1911

State	Share of Prov./St. in Fact. Emp. (%)	Share of Factory Emp. in overall Industry Emp. of Prov./St.
Madras	7.5	2.4
Bombay	29.9	21.6
Bengal	36.8	19.2
United Provinces	6.3	1.8
Punjab	3.8	1.9
Bihar and Orissa	2.7	1.8
Central Provinces and Berar	5.4	5.9
Hyderabad	n.a.	n.a.
Mysore	n.a.	n.a.
Total	100.0	5.0

Source: Statistical Abstract for British India, Calcutta, various years.

emerge in the mid–19th century as the leading industrial city for the surrounding region, it did so on the basis of trade and integration with larger colonial markets for raw materials and finished products that reached across the Indian Ocean to Britain."[39] The economic foundation of Bombay as an entrepot for trade across the Arabian Sea continued to serve as the market upon which the city's cotton manufacturing grew. With local entrepreneurs establishing cotton mills based on their experience in the external trade of raw cotton, those same external markets continued to be the basis upon which industrialisation in Bombay occurred during the period.[40]

Similarly Calcutta, as the long predominant port city of colonial India, commanded the largest trade across the Bay of Bengal and the wider Indian Ocean.[41] Jute, and other manufactures from Calcutta, permeated from the port's regional market in the Bay of Bengal to the wider Indian Ocean and Europe, "Calcutta's encroachment upon Dundee's share of jute manufactures in the world market rapidly rose after the end of the nineteenth century...this meant more exports of gunny bags to Burma, the various Indian ports, the Straits Settlements, the United Kingdom, China, Australia, Europe, and the Americas."[42] From initially specialising in the export of raw jute to manufacturing jute products, European entrepreneurs established jute mills in Calcutta as a means of competing with long–dominant manufacturing cities in Europe such as Dundee. In contrast to

39. Nile Green, "Maritime Worlds and Global History: Comparing the Mediterranean and Indian Ocean though Barcelona and Bombay," *History Compass* 11, no. 7 (2013): 513–523.

40. Sandip Hazareesingh, "Interconnected synchronicities: The production of Bombay and Glasgow as modern global ports, c. 1850 - 1880," *Journal of Global History* 4, no. 1 (March 2009): "The spatial transformation of the port of Bombay through land reclamation was one of the significant outcomes of this process, resulting ultimately in its dependent modernisation in the interests of the steamship–driven, European trade ... the attractiveness of Bombay as a regular destination for its steamships was premised on the latter's importance as a 'sub–imperial' location, offering, beyond India, potential access to the ports of the Indian Ocean." – pp. 10.

41. Sunil S. Amrith, *Crossing the Bay of Bengal: The furies of nature and the fortunes of migrants* (Cambridge, MA: Harvard University Press, 2013), pp. 46.

42. Sethia, "The rise of the jute manufacturing industry in colonial India: A global perspective," pp. 79.

Bombay, the establishment of large–scale jute factories in Calcutta was led by European, rather than local entrepreneurs, for the purpose of exporting jute manufactures to markets where businessmen already had well–established trade ties. Hence the rise of Calcutta's jute industry was always more externally oriented towards overseas markets rather than based on the domestic market.

Considering that the industrial foundations of both cities arose from their trade with external markets, the composition and distribution of external trade provides insights into the process of industrialisation. How exports of different categories evolved over the period, which regional markets mattered most for each city's manufacturing expansion, and how the two cities competed in international markets demonstrates the process of industrial development in the two Indian port cities. Hence this paper comparatively evaluates the margins of trade for the two main ports of colonial India, which has significant implications for understanding the development of Indian industrialisation.

4.4 Market size

Despite the rapid growth in industrial production and employment in large–scale cotton and jute factories from both port cities, most textile manufacturing production was distributed within the domestic market, with a smaller share of production reserved for export. Estimates of the domestic Indian market for industrial output have been estimated on the basis of cotton cloth consumption, which has consistently demonstrated a much larger share of textile imports from Britain compared to domestic Indian production.[43] Although demand for textiles in the domestic Indian market was growing, Indian production was not competitive, hence there were growing shares of British textile imports, and less for domestic Indian production. This growth in Indian imports from Britain continued to expand over the period.

However despite a low level of domestic Indian production of cloth relative to imports, there was still a growing international export of Indian–produced cotton yarn. Twomey (1983) has shown that total domestic production of cotton yarn exceeded total domestic consumption, and that most of this growth came from factory production, the surplus of which was sent to external markets. He shows that mechanised production of yarn and cloth both grew by larger amounts than their corresponding import totals after 1880, confirming that from approximately 1880, there was an Indian re–industrialisation on the basis of large–scale textile manufacturing of cotton textiles.[44]

43. Michael J. Twomey, "Employment in Nineteenth Century Indian Textiles," *Explorations in Economic History* 20, no. 1 (1983): According to his estimates, prior to 1850, cloth consumption was composed of 10% domestic Indian production. However in the second half of the nineteenth century, this expands to approximately 40% domestic Indian consumption, the rest being supplied by Lancashire.

44. Ibid., pp. 53.

Similarly, Broadberry, Custodis, and Gupta (2015) have demonstrated that there was expanding domestic Indian cotton production, consumption, and imports from Britain due to demand from an increasing population, therefore the main driver of Indian textile production came from the domestic market. Although imports of cotton manufactures from Britain continued to grow over the nineteenth century, this only contributed to de–industrialisation of the Indian textile industry between 1801 and 1851. Indian textile production and exports expanded from mid–century on the basis of modern, large–scale factory production based at the port cities of Bombay and Calcutta from the 1850s.[45] Despite the growing imports of cotton textiles from Britain over the course of the nineteenth century to satisfy the growing domestic Indian market, "cotton cloth was overwhelmingly India's main industrial export...and non–agricultural exports were driven by cotton textiles."[46] Although a growing Indian population was the primary driver of expanding domestic production and imports of cotton manufactures, the export markets for Indian textiles also grew on the basis of large–scale manufacturing. While the size of export markets was much smaller in comparison to the domestic Indian market, even as consumption exceeded domestic production, modern factory–based textile industries also grew through overseas exports.

Table 4.5 assess the relative size of the external Indian market in textiles compared to the domestic market by comparing quantities of textile production for export from each port city compared to the total estimates of domestic production and consumption of cotton textiles from Twomey's estimates of the domestic Indian market. The table represents the combined amounts of all types of textile exports, including cloth and yarn, but does not include jute textile exports from Calcutta.[47] Firstly from the table, as previously discussed, Bombay was the primary centre of Indian cotton production, hence the quantity of exports far exceeded that of Calcutta's. Second, the combined exports from both cities represented a much smaller share of either total Indian production or consumption, but represented the vast majority of total cotton exports. For the Indian market overall, production was less than half the estimated total Indian consumption, with imports from Britain making up most of India's consumption. Despite the smaller size of domestic production, there was still a sizeable export of cotton textiles, which at its peak represented 58% of total Indian production of cotton textiles in the 1900 – 1904 period. Third, even though the volume

45. Stephen Broadberry, Johann Custodis, and Bishnupriya Gupta, "India and the great divergence: An Anglo-Indian comparison of GDP per capita, 1600 - 1871," *Explorations in Economic History* 55, no. 1 (2015): 58–75.

46. Ibid., pp. 66.

47. Based on previous estimates of manufactured jute exports in 1883, 4.25 million yards of jute fabric and approximately 53 million jute bags were produced. While there is not an estimate on the conversion for 1 jute bag in terms of length in yards square, using Twomey's conversion rate of 1 cotton piece good = 17 square yards, this would make jute textile production in Calcutta 15.317 billion yards. Given the total estimates for domestic production and consumption of cotton textiles in the 1880–1884 period in table 4.5, the scale of jute textile production is not comparable. Hence jute textile production has been omitted from Calcutta's estimates.

of cotton exports was much smaller compared to the size of the domestic market, cotton exports from Bombay and Calcutta composed nearly all of total Indian cotton exports. Hence although the export markets for textiles from Bombay and Calcutta were smaller than the overall domestic Indian market, the external orientation of the port city economy and the international connections were more strategic in supporting the rise of large–scale manufacturing, as textile manufactures were the main industrial export of India, and as illustrated in table 4.5 nearly all of Indian cotton exports came from Bombay and Calcutta.

Table 4.5: Total exports of textile manufactures compared to total Indian production and consumption in m. yds.

Year	Total Ind. prod.	Total Ind. consum.	Total Ind. cotton exp.	Total Ind. cotton imp.	Bombay tot. cotton exp.	Calcutta tot. cotton exp.
1870			38	1325		
1875					62	108
1880–1884	1200	3000	317	2118	126	184
1885–1889	1500	3400			335	213
1890–1894	1600	3500	901	2277	663	194
1895–1899	1700	3600			792	237
1900–1904	1800	3700	1045	2448	578	270
1905–1909	2200	4300			754	270
1910	2500	5000	785	2268	650	126

Notes: All quantities are reported in millions of yards. Comparative estimates of domestic Indian production and consumption of cotton yarn and cloth taken from Twomey (1983). Estimates of total cotton and jute manufactures includes yarn and cloth. Piece goods converted to yards at 17 square yards per piece. Weight in lbs. converted to yards at 4 yds of cloth = 1 lb of yarn, both from Twomey (1983).

To further compare the relative size of export markets, table 4.6 shows the quantity of cotton textile exports from Bombay and the quantity of jute textile exports from Calcutta based on the destination region being either to Europe or across the Indian Ocean. From table 4.5, the export market for Bombay and Calcutta textiles was much smaller than the domestic market, but from table 4.6, there is a distinct difference in the orientation of exports for each city. Countries of the Indian Ocean were the largest destination market for cotton textiles from Bombay, and the second largest destination for jute textiles from Calcutta.

Both cities exhibit steady growth in the quantity of textile exports over the period to all destinations. As previously mentioned, Calcutta was the world's largest producer of jute textiles by the end of the period, whereas Bombay was only the fourth largest producer of cotton textiles in the same period. Correspondingly the quantity of jute exports from Calcutta is much larger than cotton from Bombay. Additionally from the table, Bombay's exports are much more concentrated in the Indian Ocean, whereas for Calcutta, the largest share of jute exports went to Europe, with a more sizeable share also going to other countries.

The difference in the relative share of exports by destination region reflects differences in the origins of the cotton and jute industries. As previously discussed, cotton factories in Bombay were primarily established by Indian entrepreneurs who developed export markets in nearby countries around the Arabian Sea that they were familiar with, or with which they had connections. In contrast, jute factories were primarily established by European financiers, whose primary interest was in lowering costs for jute products sold in European markets by moving large–scale manufacturing closer to the centre of the raw jute trade in Calcutta. Hence from table 4.6, Europe remains the primary destination for jute textiles, followed closely by the Indian Ocean. Overall textile exports by destination in table 4.6 show that, despite the smaller size of the export market compared to the domestic one, the Indian Ocean served as a major regional market for the trade in textiles produced at the two port cities.

Table 4.6: Quantity of exports of cotton textiles from Bombay and jute textiles from Calcutta by destination region

	Calcutta, jute exports			Bombay, cotton exports		
Year	Indian Ocean	Europe	Other countries	Indian Ocean	Europe	Other countries
1875	131	456	4	50	11	0.69
1880	122	480	5	118	0.21	8.57
1885	171	608	9	304	0.444	30
1890	275	913	6	605	8.6	49
1895	166	1108	19	719	65	7.7
1900	418	1311	47	477	93	7.6
1905	807	1332	44	633	119	3.14
1910	1005	1386	43	753	96	0.059

Notes: Quantities of cotton and jute are reported in millions of yards. Estimates are for total cotton and jute textile manufactures including yarn and cloth. The same conversion rate for piece goods is applied for both cotton and jute, which is: piece goods are converted to yards at 17 square yards per piece. Gunny bags made of jute fabric are converted from number to weight at approximately 3 lbs. per bag. For cotton, weight in lbs. is converted to yards at 4 yds of cloth = 1 lb of yarn, both from Twomey (1983). For jute, weight in lbs. is converted to yards at 1 yd of cloth = 1 lb of yarn.

4.5 Data

Drawing from two separate datasets of disaggregated trade data, the annual reports of the *Trade of the Bombay Presidency* and the *Trade of the Bengal Presidency* show a highly detailed set of external, overseas trade for all port cities within each presidency. The highly detailed annual series specifies the difference in exports from the primary port of either Bombay or Calcutta, from any other minor port within the presidency, as well as distinguishes between exports of "foreign merchandise" that was intended for re–export, from exports of "Indian produce and manufacture" that was produced within the presidency. The data provides export destination city and country, total

value, quantity, and a physical unit of measure for some products, as well as a text–based product description.

A standard issue with historical trade data is that the classification of traded products used by British authorities are not consistently reported across countries or over time. Therefore from the information that is provided in the archival trade record, product categories from both cities are aggregated and matched according to the SITC–2 classification in each year. From the trade records of the *Trade of the Bombay Presidency* and the *Trade of the Bengal Presidency*, there is extensive consistency in the reporting of items between the two trade records in each year. Although there are naturally differences in the types of products exported from each city, with Calcutta being particularly focused on exports of jute manufactures, and Bombay on cotton, the procedure of coding and aggregating the variety of products from the two trade records according to the SITC classification has produced a consistent number of products over time within each port at the 3 and 4–digit SITC classification. Figure 4.2 shows the number of items exported from each city in each year, as well as the combined number of items from both ports.

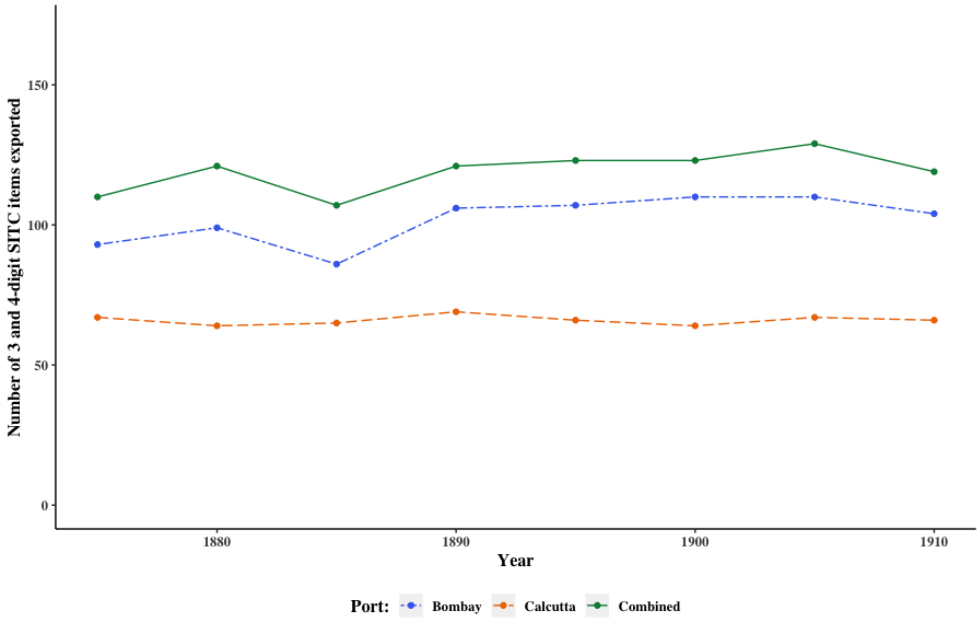


Figure 4.2: Variety of 3 and 4–digit SITC goods exported, 1875 – 1910.[48]

From the figure, the number of items exported increased slightly over the period as a whole, indicating that the process of aggregating items to the 3 and 4–digit classification for each city is consistently defined, and that the number of items exported gradually diversified. Additionally, despite the similar share of total Indian exports from either port, due to differences in the system of

48. List of items are taken from the annual series of the *Trade of Bombay* and *Trade of Bengal Presidency*, they are aggregated into the standardised 3 and 4–digit SITC classifications, and consistently matched in each year.

reporting goods, there are more items reported for Bombay than for Calcutta. There is a persistent difference of approximately 20 items exported between the two cities, and a 15 item difference between Bombay's exports and the total number of export categories across both cities. Hence the difference in number of items at each port is mostly due to differences in the products themselves, rather than an issue with encoding products to the SITC classification. However in some cases, differences in the number of goods from each city is the result of how products are aggregated to SITC classifications.

For example, although there were 7 different types of jute manufactures reported in the *Trade of the Bengal Presidency*, they are aggregated under one code in the SITC classification as product number 6545 for "Fabrics, woven or jute or other textile bast fibres of heading 2640", with item 2640 being "Jute, other textile bast fibres, nes, raw, processed, but not spun".[49] In contrast, from reports of the *Trade of the Bombay Presidency*, there were 24 variations of cotton manufactures reported, which fall under 7 different items in the SITC codes.[50] There are also two products that were uniquely exported from Bombay, for which there are no SITC codes, which are "opium", and "poppy". Yet because they make up a sizeable portion of Bombay's exports, they are still included as two items, although they are not assigned SITC codes. Such discrepancies in the reporting and aggregation of product categories accounts for the difference in the number of goods exported from each port.

In terms of destinations, there were approximately 200 potential trading partners, comprised of sovereign states, colonies and territories for the period.[51] As a colony of the Indian Ocean, the colonial trade records are highly disaggregated to represent all types of smaller colonies or port cities whose trade was highly, if not entirely, dependent on trade with one of the two port cities, which give a more accurate estimate of the global dispersion of Indian products. With the inclusion of smaller, but enumerated island colonies of the Indian Ocean, of the total potential trading partners, by the end of the period the combined destinations for both port cities was 97 countries, colonies, or territories, which represented a significant share of the potential global trading partners.

From figure 4.3, both Calcutta and Bombay show an increase in the number of trading partners.

49. From appendix table 4.14, item title "Jute, other textile bast fibres, nes, raw, processed, but not spun" is coded under the broader heading 264, rather than the more narrowly defined code 2640.

50. The 7 variations of cotton are: 263 for "cotton", 6513 for "cotton yarn", 652 for "Cotton fabrics, woven (not including narrow or special fabrics)", 6584 for "Other furnishing articles of cotton", 084 for "Articles of apparel and clothing accessories", 8471 for "Shawls, scarves, mantillas, veils and the like", and 269 for "Old clothing and other old textile articles; rags".

51. Michael Huberman, Christopher M. Meissner, and Kim Oosterlinck, "Technology and Geography in the Second Industrial Revolution: New Evidence from the Margins of Trade," *Journal of Economic History* 77, no. 1 (March 2017): 39–71.

As the long–predominant primary port and capital of colonial India, the number of Calcutta's trading partners consistently exceeded that of Bombay's destinations. With 30 trading partners for Bombay and 39 for Calcutta at the beginning of the period, to 71 and 78 respectively by the end.[52] Demonstrating how the two cities competed in the same markets, but also the degree to which they operated in separate spheres, the average difference in destinations between Bombay and Calcutta was 10, and the difference between Calcutta and the combined total averaged 19. Therefore Calcutta exported to approximately 10 more markets than Bombay, but each city traded with approximately 20 distinct markets that the other did not trade with. The regional distribution of Bombay and Calcutta exports broadly adheres to each city's respective maritime basin, with Bombay exporting to more destinations across the Arabian Sea, and Calcutta around the Bay of Bengal.[53]

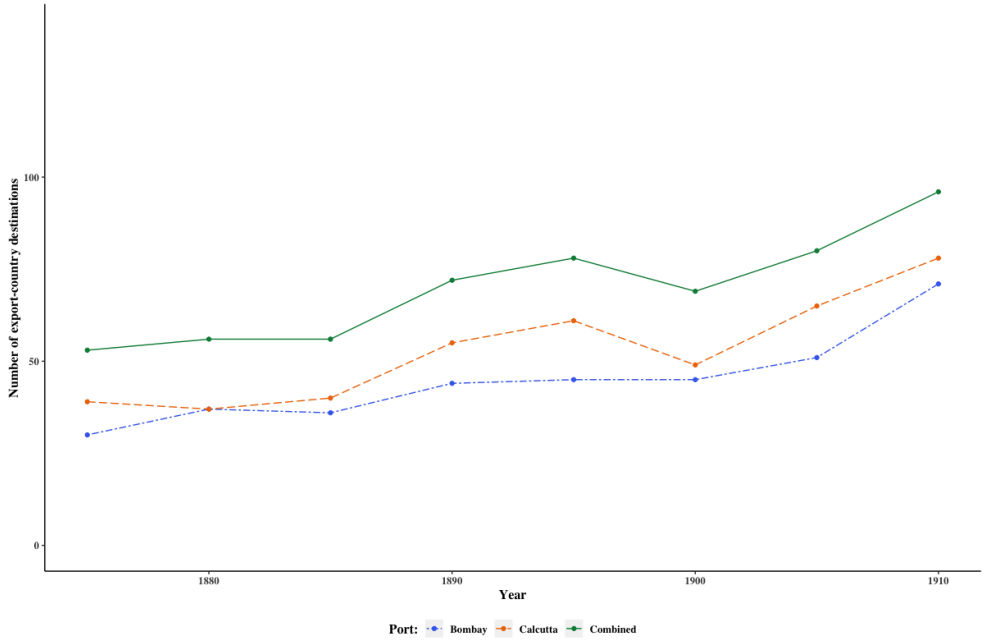


Figure 4.3: Number of Export Destinations, 1875 – 1910.[54]

Combining the data from figures 4.2 and 4.3, figure 4.4 shows the combined number of items exported from both Bombay and Calcutta to each continental region. From the figure, the largest number of goods exported went to destinations of the Indian Ocean, followed by Europe, with the varieties of exports to both regions stable over the period. The Indian Ocean category features only

52. Huberman, Meissner, and Oosterlinck, "Technology and Geography in the Second Industrial Revolution: New Evidence from the Margins of Trade"; Christopher M. Meissner and John P. Tang, "Upstart Industrialisation and Exports: Evidence from Japan, 1880 - 1910," *Journal of Economic History* 78, no. 4 (December 2018): These figures are similar to other countries at the time, such as Belgium or Japan.

53. Amrith, *Crossing the Bay of Bengal: The furies of nature and the fortunes of migrants*, pp. 32 - 62.

54. List of destinations are taken from the annual series of the *Trade of Bombay* and *Trade of Bengal Presidency*. Reports include country and city destination, and have been aggregated to country destination in figure 4.3. Destinations for colonial possessions are treated as separate country destinations, and are consistently matched in each year.

those countries of Asia, Africa, and the Middle East that were along the Indian Ocean coast, for all other countries of Africa and Asia that were not along the Indian Ocean coast, they are categorised according to each continent respectively. Hence the number of items exported to Africa represents only those countries or colonies of West and North Africa, with South Africa included as the western boundary of the Indian Ocean. The eastern boundaries of the Indian Ocean is formed by French Indochina and Indonesia, with Australia being a part of the Pacific rather than the Indian Ocean, due to the country's major population agglomeration being on the Pacific coast.[55]

Exports to Africa and Asia outside of the Indian Ocean witnessed the greatest growth in the variety of goods imported from either of the two Indian port cities, reaching the same number of varieties of goods as that of the Indian Ocean by the end of the period. Coefficients on the time trend for the increase in the number of items is highest for Africa with a coefficient of 2.05***(0.336), and second highest for Asia at 1.25**(0.518). The growth trend for product varieties to Africa and Asia suggests a steady process of expanding market entry of goods to nearby markets of the Indian Ocean. Although the number of items exported does not increase as quickly for other regions, there is still significant growth in exported items for almost all other regions. With the greatest variety of exports already distributed across the Indian Ocean, the time coefficient on number of items increases by 0.367*(0.178), however the growth rate is slightly faster to Europe with a time coefficient of 0.441**(0.168). Variety of products also increases to the Americas with a coefficient of 0.524***(0.132). The only region where the number of items exported does not significantly increase is to the Middle East, which refers in this case only to parts of the Middle East that are west of the Suez Canal, and hence were not directly accessible along the Indian Ocean coast, with a coefficient of 0.072 (0.158) on the pure time trend for number of items. Without any significant declines in product varieties to any regional destination, there is not any distinct evidence for market exit of Bombay and Calcutta goods from any region.

The larger variety of products to destinations in the Indian Ocean and other parts of Asia or Africa is surprising considering that the greatest value of overall Indian trade went to Europe. Table 4.7 shows the distribution of total Indian exports by continent. From the table, overall Indian trade appears characteristic of a peripheral colonial economy, with the largest value of goods going to countries of Europe. However the second largest destination after Europe was countries in the Indian Ocean, taking in approximately one–quarter of all Indian export value. While this is a much

55. A map of how the Indian Ocean region is defined, along with all other comparable global regions used in this paper is illustrated in Appendix section 1, figure 4.12.

56. List of destinations are taken from the annual series of the *Trade of Bombay* and *Trade of Bengal Presidency*. Reports include country and city destination, which have been aggregated to continental destination, and are consistently matched in each year.

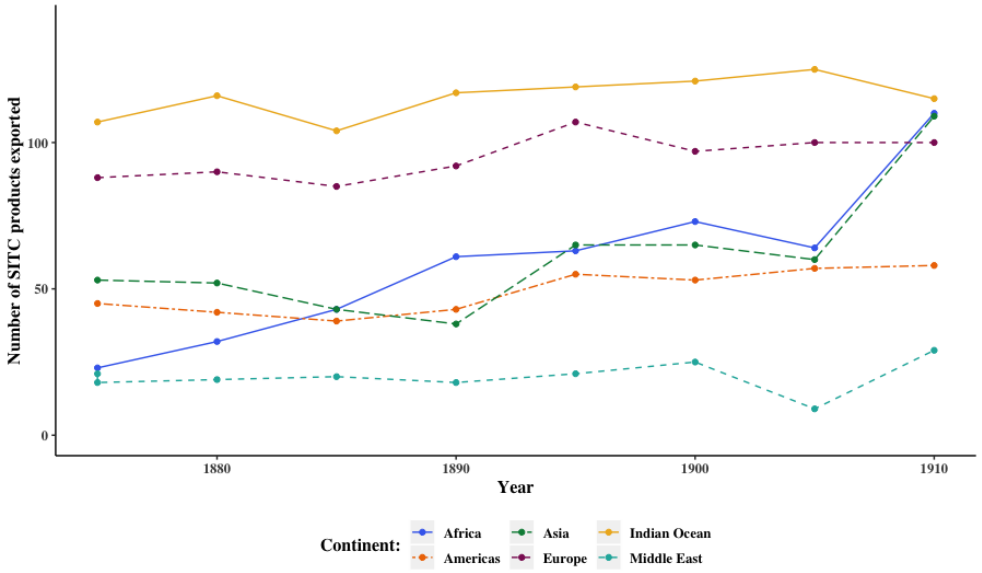


Figure 4.4: Combined number of SITC products export by continental destinations, 1875 – 1910.[56]

smaller share when compared to the variety of products from figure 4.4, it is interesting that the variety of products was higher to the Indian Ocean, Asia, or Africa by the end of the period than to destinations of Europe, despite the largest value of exports going to Europe. This suggests that most of the value of Indian exports to Europe was concentrate in relatively fewer varieties of products, whereas there was higher value in exports to the Indian Ocean, which was more diversified, and in which the varieties continued to expand over time.

Finally, as previously demonstrated in table 4.1 showing the combined shares of Bombay and Calcutta exports to total Indian exports by sector, the records for the *Trade of the Bombay Presidency* and the *Trade of the Bengal Presidency* not only includes information on the quantity, value, destination, and description of the good exported, but also maintained a consistent categorisation of exports according to product type. Exports were broken down into 7 categories, which included animals, articles of food and drink, metals, chemicals, oils, manufactured goods, and commodities. From the trade records, animals is defined as category 1, and refers to types of living animals. Category 2 is for articles of food and drink, and includes products such as grains, vegetables, fruits, and spices. Category 3 is metals and manufactures of metal, which includes products such as hardware and cutlery, copper, brass, and iron, wrought and unwrought. Category 4 is referred to as chemicals, drugs, medicines and narcotics, dyeing and tanning materials. This includes products such as saltpetre, indigo, opium, and tobacco. Category 5 is oils, which includes essential, vegetable, and cocoanut oils. Category 6 is commodities, referred to in the trade records as raw materials and unmanufactured articles, which includes products such as raw cotton, gums and resins, hides

and skins, seeds, shells and cowries, wood, and wool. Category 7 is the final category and refers to manufactured articles, including yarns and textile fabrics, cotton piece goods, apparel, bags and sacks, books and printed material, and cabinets and furniture. This broad categorisation is also largely consistent with that of the SITC 1–digit categories. The types of distinctions made between categories in the archival classification broadly fit into the SITC classification by product description, with categories 0, 1, and 4 in the 1–digit SITC corresponding to the two categories "Animals" and "Articles of food and drink" from the archival classification, and categories 7, 8, and 9 corresponding to category 7 in the archival classification for "manufactured goods".

Table 4.7: Total Indian exports by destination: Percentage share of exports by geographic region, 1875 – 1910

Continent	1875	1880	1885	1890	1895	1900	1905	1910
Europe	61.05	54.84	62.05	68.00	66.66	65.54	64.74	65.02
Asia	0.69	0.84	1.12	4.33	4.40	4.29	5.39	4.86
America	3.42	5.33	4.67	5.69	4.62	5.48	7.32	6.28
Africa	6.40	7.08	5.36	0.76	1.19	1.21	0.62	0.59
Australasia	0.11	0.13	0.18	0.17	0.16	0.29	0.26	0.29
Indian Ocean	28.77	32.21	26.69	21.04	22.98	23.19	25.07	22.96

Notes: Total value of Indian exports by country from annual series *Statistical Abstracts for British India*. The region *Indian Ocean* refers to countries along the Indian Ocean coast of Africa, Asia, and Australasia. Only countries of Africa, Asia, and Australasia that were not on the Indian Ocean coast are categorised in each respective continent.

From these 7 categories, table 4.8 shows the number of SITC classified items that fall into each type of category, in comparison to the 10 categories from the SITC 1–digit classification. As previously shown, the number of items consistently reported across all years is higher for Bombay than for Calcutta, and most of this difference in coding product types for the two cities comes from the reporting of manufactured goods, accounting for 30 more products for Bombay compared to Calcutta from the archival trade classification. Demonstrating broad consistency in the categorisation of products according to SITC 1–digit classification, there are similar shares of products in each of the 10 categories for each city, although due to differences in how the trade records are compiled, and perhaps suggestive of the particular interests of the British officials recording trade statistics, Calcutta has less enumerated products, with Bombay having a total of 139, and Calcutta having 75, with a combined total of 149 unique products exported from both cities.

The summary of data and classification of goods provides some initial inferences on the export trade of the two primary port cities. First, both cities had a wider distribution of products to destinations across the Indian Ocean, even though the majority of the overall trade value went to Europe. Second, both cities expanded the variety of exports to a larger number of trading partners

over time, and most of the new markets they entered were within the global periphery of Africa and Asia rather than trade to the global core of Europe. Third, between the two port cities there is a wider variety of products recorded for Bombay than for Calcutta, but the categorisation of products from the 7 archival categories to the 10 SITC 1–digit categories shows broad consistency in the share of the number of items in each category for both cities. Despite the period being one of 'dual dominance' in Indian economic history, the two ports appear not only complementary in terms of regional spheres and specialisation in different textile manufacturing industries, but also in terms of types of export varieties.

Table 4.8: Number of SITC products according to 10 category 1–digit SITC classification, and 7 category archival trade classification, 1875 – 1910

1–digit SITC	Description	Bombay	Calcutta	Categories	Bombay	Calcutta
0	Food and live animals	1	1	Animals	5	5
1	Beverages and tobacco	4	3	Food and bev.	26	10
2	Crude materials, inedible	23	15	Metals	20	3
3	Mineral fuels, lubricants	5	3	Chemicals	13	10
4	Animal and vegetable oils	13	3	Oils	6	3
5	Chemicals	14	10	Commodities	23	15
6	Manufactured goods	44	14	Manuf. Goods	46	29
7	Machinery and transport	12	9			
8	Miscellaneous manuf.	20	16			
9	Commodities not classified	3	1			

Notes: Items encoded according to the 3 and 4–digit SITC classification. 7 export sector categories taken from assigned categorisation in the annual series *Trade of the Bombay Presidency*, the *Trade of the Bengal Presidency*, and the *Statistical Abstracts for British India*. Some category titles from both SITC classification and archival trade record classification have been abbreviated, having removed phrases including "... and related material" and "... and related products".

4.6 Decomposition 1: Diversification of exports

Between 1875 and 1910, Bombay and Calcutta diversified their exports in two major dimensions: first, from exporting raw and low value commodities to exporting higher value manufactured goods, and second, from exporting commodities to Europe, to exporting a wider variety of products to smaller, poorer and more peripheral economies of Asia, Africa, and the Pacific. As a peripheral colony during the period, figure 4.5 shows Bombay's exports in primary products such as food, chemicals, oils, live animals, and commodities, which compose the largest share of exports in 1875 at more than 80%, but rapidly declines over the period to 40% by 1910.[57] Commodities

57. Meissner and Tang, "Upstart Industrialisation and Exports: Evidence from Japan, 1880 - 1910," The classification of types of products and the trends in the shares of each category as a percentage of total trade is similar to what has been observed for Japan over the same period, with over 80% of trade being in primary products in 1880, to less than 20% by 1910.

compose the largest single export group in 1875, at 56%, gradually being taken over by exports of manufactured goods where in 1895, the majority value of Bombay's exports were in manufactured goods at 54%.

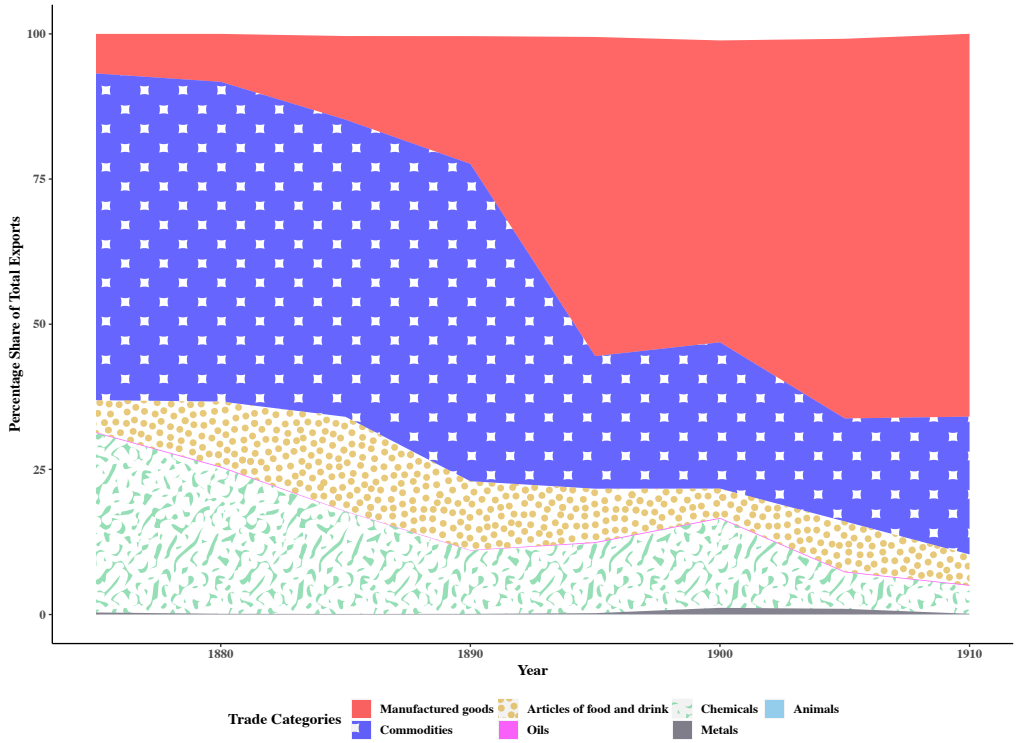


Figure 4.5: Bombay Export Shares by Sector, 1875 – 1910

By comparison Calcutta, as the historically predominant port city of British India, does not show as much of a change in the composition of exports as that of Bombay. Figure 4.6 shows Calcutta exports, which demonstrate a gradual expansion in the share of exports in manufactured goods, but this never forms a majority, as is the case with Bombay. The rate of growth for Calcutta's manufacturing sector is only 2% in 1875 and expanding to 19% by 1910, whereas Bombay's manufacturing sector grows from 8% in 1875 to 65% by 1910. Calcutta's trade shows a more balanced representation across all sectors, rather than Bombay's trade that was initially reliant on commodities, and subsequently shifted to heavily exporting manufactures. For both cities, the manufacturing sector includes cotton and jute textiles, other cotton and jute products and finished goods, and any other type of manufactured goods.

From the increase in the number of destinations served from figure 4.3, figure 4.7 shows the share of exports by geographic region. Europe makes up the majority of Bombay's export shares at the beginning of the period, but that share is gradually reduced over the period, from 61% in 1875 to 42% in 1905. The shift of trade away from Europe is mostly absorbed by trading partners of the Indian Ocean, which expands in value from 38% in 1875 to 46% in 1905. Bombay exports

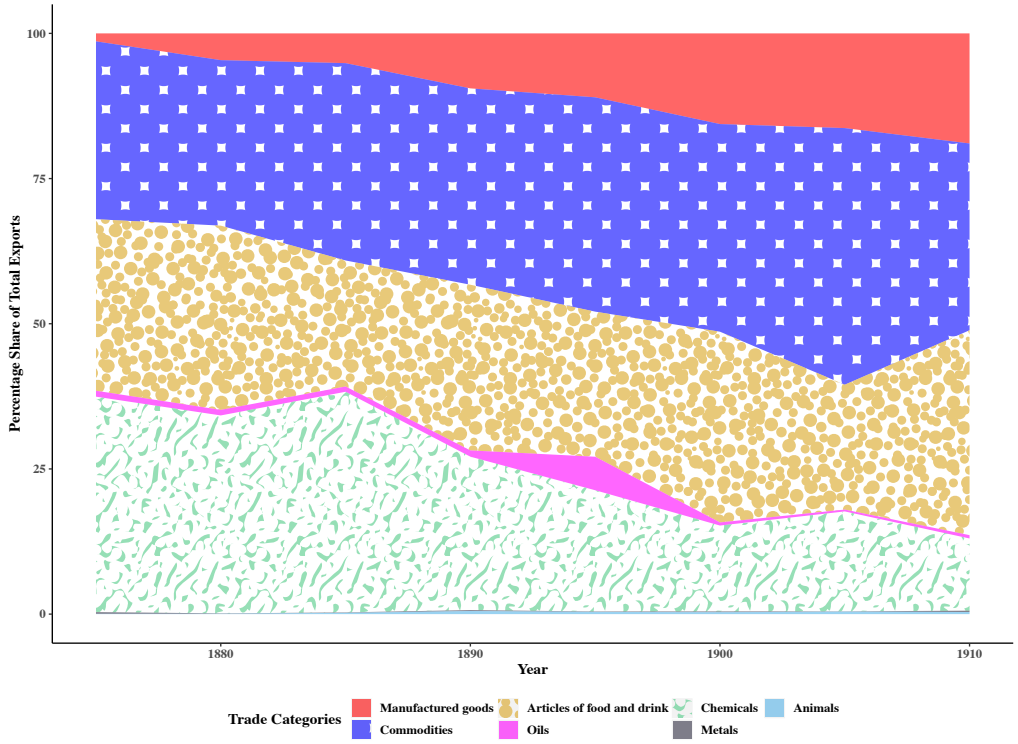


Figure 4.6: Calcutta Export Shares by Sector, 1875 – 1910

also show a shift further east, as trade with Asia outside of the Indian Ocean also expands in shares from near 0% in 1875, expanding to 14% in 1910.[58]

Contrasting with the trends in export shares by destination for Bombay, Calcutta demonstrates a wider distribution of exports to all regions of the world. From figure 4.8, Europe continues to be the largest destination for Calcutta exports, but the share of exports to Europe does not show any significant trend, as is the case with a declining trend for Bombay, beginning with 55% of Calcutta's trade in 1875, and ending the period with 51%. Additionally the share of exports to countries in closest proximity to Calcutta, which are those of the Indian Ocean, do not make up as large of a share compared to Bombay's trade. However Calcutta's trade across the Indian Ocean does show the greatest expansion as a share of total trade, from 13% in 1875 to 23% in 1910. The trends from figures 4.7 and 4.8 illustrate how the two main port cities of India competed and complemented each other in the period of 'dual dominance'. Calcutta, as the long predominant Indian port and colonial capital exported much more widely than Bombay, whereas Bombay had a much larger share of trade with the surrounding regions of the Indian Ocean, and hardly traded with any region outside of the Indian Ocean or Europe.

The dispersion of exports by destination also reflects differences in the origins of industry in

58. Asia is differentiated from the Indian Ocean region as Northeast Asia, which includes all ports of Japan and Korea, and ports of China other than Hong Kong.

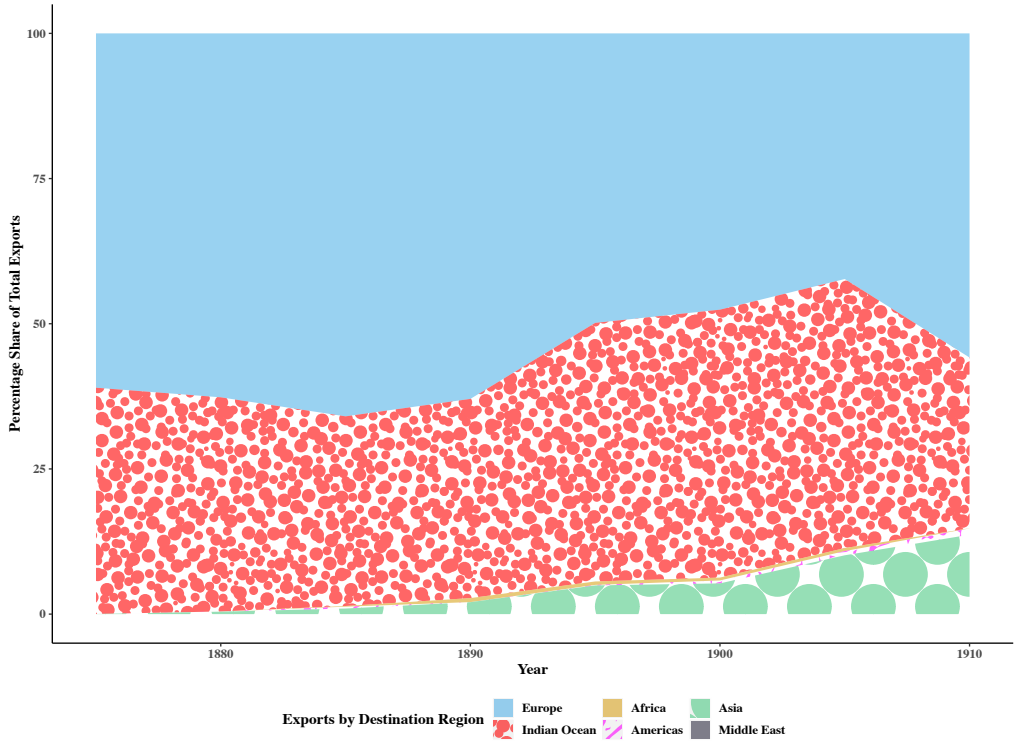


Figure 4.7: Bombay Export Shares by Destination, 1875 – 1910

each city. What is distinctive about the cotton textile industry in Bombay in comparison to the jute industry in Calcutta is that the cotton textile industry was financed and administered by Indians, whereas in Calcutta the jute factories were largely European–owned.[59] Ownership and financing of manufacturing in either city is illustrative of how exports were distributed. European–owned jute firms in Calcutta invested in large–scale manufacturing explicitly for the export of jute products to markets they were familiar with in Europe. In contrast, native entrepreneurs in Bombay were less familiar with very distant markets, and had far more knowledge of local conditions within India and the immediate surrounding region around the Arabian Sea.

Of the native businessmen in Bombay that gave rise to the city's industrial development, historians have given particular attention to the role of the Parsis in the cotton textile industry. Ideologically and culturally outside the mainstream of Indian life, they were arguably free to respond to new economic opportunities.[60] At the beginning of the 19th century, when about 10,000 Parsis lived in Bombay, they were already recognised as the richest native community on the island through their extensive foreign trade activities based on communal ties across the Indian Ocean. Just as Europeans established jute mills on the basis of their networks with their countries of origin in Europe, Parsis also promoted Bombay mills through ties to their communities of origin, which

59. Morris, "Cambridge Economic History of India," pp. 579 – 580.

60. Ibid., Of the ninety–five mills established in Bombay City before 1914, Parsis were credited with having produced at least 34, while Hindus promoted 27, Europeans promoted 15, Muslims 10, and Jews 5. pp. 580 – 581.

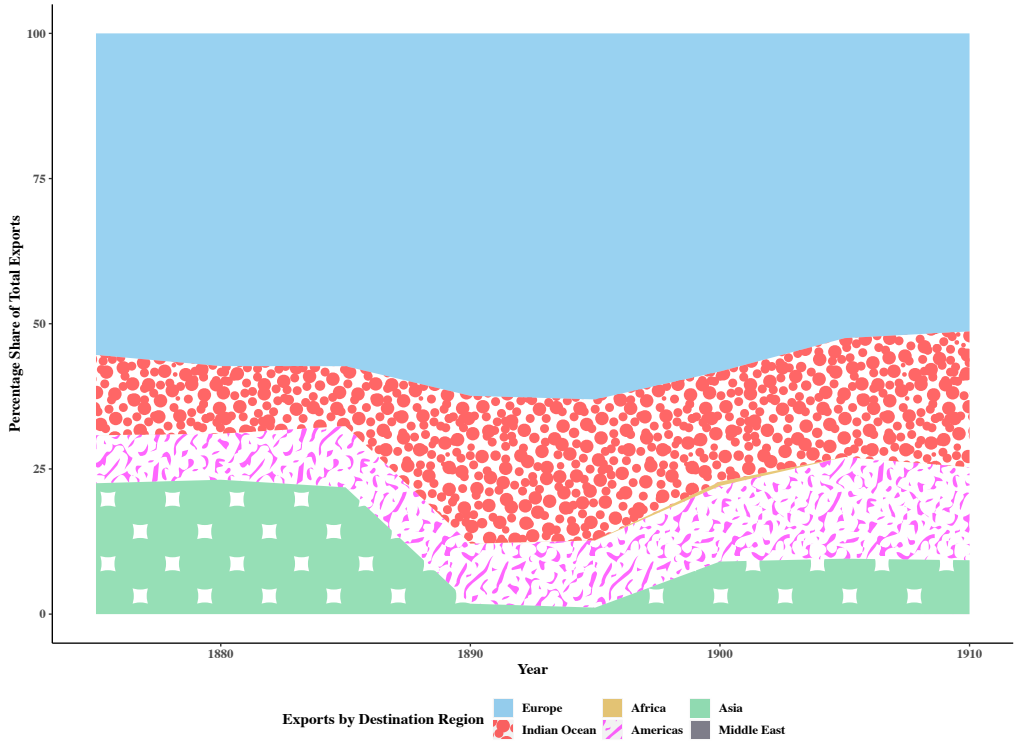


Figure 4.8: Calcutta Export Shares by Destination, 1875 – 1910

were originally across the Arabian Sea with Persia.[61] Hence evidence from the distribution of exports for Bombay and Calcutta in figures 4.7 and 4.8 demonstrates how the type of entrepreneur and their communal ties contributed to differing forms of industrial development in the period of 'dual dominance'.

Combining both dimensions of commodity type and export destination for Bombay and Calcutta's major regional export markets of Europe and the Indian Ocean, figure 4.9 shows trends in how Bombay and Calcutta traded with the two largest destination regions. Overall there is a general pattern of increased manufacturing shares to both regions. However the expansion of manufacturing exports to destinations in the Indian Ocean occurs at a more rapid pace compared to Europe. In the case of Calcutta, the change in manufacturing exports to Europe is hardly noticeable, only increasing from 2% in 1875 to 5% in 1910. In contrast, Bombay's exports of manufactured goods to the Indian Ocean goes from 2% in 1875 to 24% in 1910. The expansion in manufacturing is much more rapid for Bombay than for Calcutta, becoming the largest share of exports to either regional destination by 1910. In the case of Bombay's trade to Europe, manufacturing forms 55% of exports, but Bombay's trade of manufactured goods across the Indian Ocean expands to 72% by the end of the period.

61. Simin Patel, "Cultural intermediaries in a colonial city: The Parsis of Bombay, 1860 - 1921" (PhD diss., Oxford University, 2015).

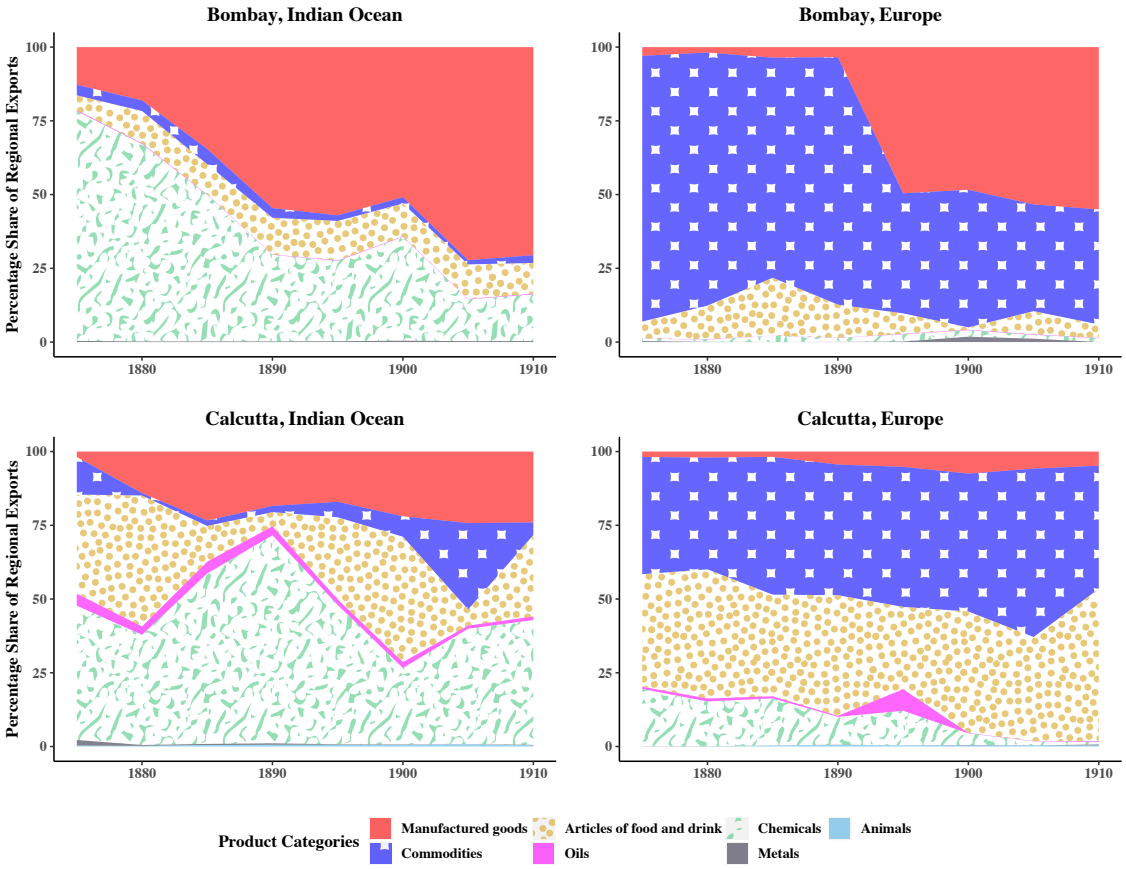


Figure 4.9: Share of exports by category for top two regional destinations, 1875 – 1910

Evidence from figure 4.9 highlights the differences in how industry was organised in each city, as well as the differences in each city's trading relationship with the European core and the Indian Ocean periphery. First, similarly reflecting the prevailing dominance of Calcutta as the economic and political capital of India for most of the 19th century, the period of 'dual dominance' was also one of Bombay catching up to Calcutta. Given Calcutta's larger trade and greater influence by European commerce, Calcutta's exports remained more diversified throughout the period, and therefore less specialised in one sector. Bombay's manufacturing sector exports grew at a faster rate since the port's trade was not based on a long–established trade in primary commodities to an industrialising Europe. Therefore the shares of Bombay's manufacturing trade expanded with the growth of its industry since it did not have a well–established trade prior to the arrival of the first cotton textile mills.

Second, the social and economic organisation of industry in either city is also reflected in the composition of trade to each region. For both cities, manufacturing took up a larger share of exports to the Indian Ocean, whereas both cities still appear to be specialised in exports of commodities to Europe. As previously discussed, European entrepreneurs owned most of the factories

and managed most of the trade in Calcutta, therefore the port's exports were based on entrepreneurs familiarity with their home market. Since Calcutta's trade was mostly controlled by Europeans, as shown previously in figure 4.8, Calcutta's trade composition continued to be based on products demanded in Europe, which were mostly raw commodities. In contrast to the European–controlled trade and industry in Calcutta, Bombay's industry and trade was more in the hands of Indian entrepreneurs. Local businessmen came to Bombay from across the Indian Ocean establishing cotton textile manufacturing while also retaining ties to their home communities. Given locally controlled industry and community ties, the rapid expansion of Bombay manufacturing to destinations of the Indian Ocean in comparison to Calcutta's export to the Indian Ocean can be understood in the context of industrial ownership and the particular merchant and trading communities.

Comparing the composition of trade for both cities to either regional destination, growth in the manufacturing sector was based primarily on trade with partners in closer proximity of the Indian Ocean. Although exports to European countries made up a larger share of both cities' trade, products remained concentrated on exports of raw materials. While the domestic market for manufactures from Bombay and Calcutta was important in the development of large–scale industry in both cities, foreign markets also mattered, "the fact that it was costly to develop the structure of commercial information and institutions to reduce business risk to a reasonable level also explains why foreigners tended to steer clear of investments in industries whose markets depended primarily on domestic demand."[62] From figure 4.9, of the foreign markets that were key to early industrial production, trading partners of the Indian Ocean were the most important, to a greater degree than exports to Europe, even if Europe was the main destination market.[63]

The rise of most large–scale industrial factories in either city derived from entrepreneurs already well–established in foreign trade. As the economic orientation and foundation for the two ports was based on external trade, "most firms which came to straddle different industries had been started primarily by international traders, contractors, and financiers...managing agency houses with strong industrial interests continued to have strong interests in external trade...industry which was not backed by a large trading and financing organisation was not destined to succeed."[64] Hence the economic and social organisation of entrepreneurs, merchants, and traders based at either port was largely oriented towards foreign trade. This suggests that manufacturing industries in each

62. Morris, "Cambridge Economic History of India," pp. 557.

63. Paul R. Krugman, "First nature, second nature, and metropolitan location," *Journal of Regional Science* 33, no. 2 (1993): 129–144.

64. Amiya Kumar Bagchi, "Elites in South Asia," chap. European and Indian Entrepreneurship in India, 1900 - 1930, ed. Edmund Leach and S. N. Mukherjee, vol. 1, 11 (Cambridge, England: Cambridge University Press, 1970), pp. 239 – 241.

city were established on the basis of serving external markets rather than the subcontinent. How those industries were established, and the commercial interests of those that engaged in trade and in industry is reflected in the composition of trade.

Although the decomposition of exports is analysed to infer the composition and distribution of trade, particularly in manufacturing at the port, the size of a city's trade does not necessarily mean that production was located there. Indeed most commodities were not produced at the port, but in the agricultural hinterland of the presidency outside of it. Similarly, as previously illustrated in table 4.4 showing the share of manufacturing and factory employment by presidency or province, and figure 4.1 showing the share of each city's exports in total Indian trade, although the vast majority of manufacturing and factory employment was based in Bombay and Calcutta, and the vast majority of total Indian trade passed through the two cities, it is not representative of all India's trade. Despite the fact that trade at the port cities includes production that occurred elsewhere and was only shipped from Bombay or Calcutta, the natural tendency of large–scale manufacturing and processing was to be based in the cities, as this was the period of 'dual dominance'. Hence general inferences of Indian trade made on the basis of the decomposition of specifically the export trade of Bombay and Calcutta, although broadly representative, are not entirely so.

4.7 Decomposition 2: Classification by level of differentiation

The picture of international trade that emerges from a decomposition of Bombay and Calcutta's exports differs from how colonial port cities of the Indian Ocean have traditionally been characterised, which is as single commodity exporters of raw materials from the colonial hinterland to the global core of Europe. While exports of raw materials continued to dominate the trade of the port cities, a granular look at the data reveals important differences in trends. First, destinations of the Indian Ocean were a sizeable and significant region for the port's growing trade, with the share of exports to the Indian Ocean nearly equal to that of Europe in the case of Bombay. Second, despite the dominance of exports in raw materials, exports of manufactured goods took up a rapidly growing share for both Bombay and Calcutta. Third, trade in manufactured goods composed the largest share of exports to destinations of the Indian Ocean. This suggests that an integrated Indian Ocean market played an important role in the industrialisation of the two port cities despite the cities' focus on a limited variety of exports in raw materials to Europe. A granular look at trade from Bombay and Calcutta offers a more dynamic picture of industrialisation in the period of 'dual dominance' that grew through local markets and networks across the Indian Ocean.

Since trade in manufactured goods composed a smaller share of both cities' total trade, but a

larger share of local trade around the Indian Ocean, evidence demonstrated previously suggests that there are differences in exports that vary according to the type of good in addition to the destination. Destination should be the standard measure by which trade costs vary since it is largely a function of distance, which is a key factor to trade costs.[65] To more explicitly examine exports of the two port cities, looking more specifically at the distribution of goods according to level of product differentiation, the set of 3 and 4–digit SITC products is classified into four categories based on level of differentiation and the level of labour skill involved in production. The methodology for the classification of the four categories of industries corresponds to a similar methodology used for the general classification of types of traded goods, including the *Recueil consulaire* for Belgium and the Indian Industrial Policy Statement.[66] The First Indian Industrial Policy Statement was designed to more explicitly lay out the role of government in promoting industrialisation in India. In designing such a policy, they identified and classified Indian export industries into four categories that broadly, though not entirely, aligned with levels of differentiation based on the *Recueil consulaire*. Table 4.9 describes the classification of four categories of Indian exports and the number of SITC 3 and 4 digit products that fall into each category.

Table 4.9: Classification of goods according to differentiation and number of SITC items in each category for Bombay and Calcutta

Category	Indian Industrial Comm.	Tableau général	1–digit SITC	Bombay	Calcutta
4	Strategic importance	Capital intensive, high diff.	6, 7	23	16
3	High importance	High skilled manuf.	6, 8	39	15
2	Basic importance	Semi-skilled manuf.	3, 4, 5	23	12
1	Private (Small–scale)	Semi-raw/processed goods	0, 1, 2, 4, 9	54	32

Notes: Items encoded according to the 3 and 4–digit SITC classification. 7 export sector categories taken from assigned categorisation in the annual series *Trade of the Bombay Presidency*, the *Trade of the Bengal Presidency*, and the *Statistical Abstracts for British India*. Some category titles from both SITC classification and archival trade record classification have been abbreviated, having removed phrases including "... and related material" and "... and related products".

Generally, the 1–digit SITC code also corresponds to one of the four categories shown in the table, however this is not always the case since undifferentiated goods can also be high quality. Therefore the methods of classification are intended to broadly align across all three types described. While some classifications refer to level of differentiation, others to level of skilled labour input, or by product type.

The first category is the least differentiated of goods, comprising labour–intensive staple commodities. This corresponds to category 4 goods in the Industrial Policy statement, which consisted

65. Anne-Celia Disdier and Keith Head, "The Puzzling Persistence of the Distance Effect on Bilateral Trade," *Review of Economics and Statistics* 90, no. 1 (2008): 37–48.

66. Industrial Policy Statement of the Government of India, 6 April 1948

of items such as, "salt, sugar, wheat, rice, minerals, and hides."[67] Since the products are the least differentiated of goods, their quality is generally though not exclusively lower.[68]

The second category consists of differentiated semi–skilled industrial goods and textiles. This consists of various qualities of cotton textile yarn and thread, and corresponds to category 3 in the Indian Industrial Policy Statement referring to, "industries of basic importance...including cotton and woollen textiles."[69] Category 3 includes semi–skilled and skilled manufacturing goods with substantial capital inputs, or products of high industrial importance, which includes finished piece good textiles and apparel, finished metal products, as well as intermediate goods such as manufactured iron and steel. The fourth category includes the most highly differentiated goods, or strategic industries, comprised of capital intensive items, such as transport equipment, ship–building, machines and machine tools.

The methods of classification shown in table 4.9 are similar to what appears in the archival trade records, which includes 7 categories according to product type from category 1 being "Animals", category 2 being "Articles of food and drink", to category 7 being "Articles manufactured", which includes finished products and consumer goods such as "tents", "walking sticks", and "toys and games". From table 4.9, the classification of goods is broadly balanced in both cities between generally less differentiated goods in categories 1 and 2, and more highly differentiated goods in categories 3 and 4. For both cities, a more conservative approach to assigning goods between less differentiated products in categories 1 and 2, or more highly differentiated products in categories 3 and 4 has generally put more goods in the lower of the two categories. As colonial port cities, despite any trend in increased exports of manufactured goods, they still remained primarily focused on commodities and raw materials. Even still, across all 4 categories there is broad representation of all product types in both cities.

Based on the reclassification of products according to the methodology in table 4.9, figure 4.10 demonstrates the share of export value for each of the 4 categories for Bombay and Calcutta. The figure demonstrates broad consistency with that illustrated previously when looking at the 7 sectors assigned from the archival trade records. Despite differences in the number of products consistently defined over time in each city, the trend in composition of export value shares is similar to what has been observed according to the seven categories from figures 4.5 and 4.6. Category 1–type goods make up the largest share of export value for both cities in the beginning of the period.

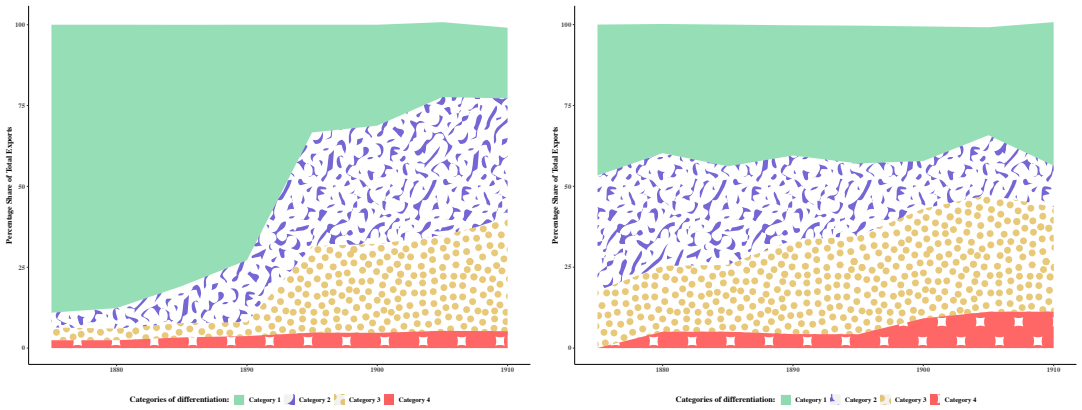
67. Holland et al., *Report of the Indian Industrial Commission*.
68. S. S. M. Desai, *Economic History of India*, 1st ed. (Ramdoot, Dr. Bhalerao Marg, Girgaon, Bombay: Himalaya Publishing House, June 1980), pp. 101.
69. Ibid.

Calcutta shows a gradual increase in the proportion of manufactured goods in figure 4.6, which broadly corresponds to the growth of category 3 and 4–type goods in panel 4.10:B. The trend in export composition is similar for Bombay, which demonstrates a steep rise in the total export value of manufactured goods around 1895 in figure 4.5. Similarly, in panel 4.10:A, Bombay shows a rapid rise in the export of category 2 and 3–type goods in 1895, broadly corresponding to the rapid growth in the "manufactured goods" sector from the archival trade reports.

As previously discussed in table 4.9, not all 1–digit SITC goods strictly align with the reclassification into four categories. For example, the item "Jute, processed" under the broad category of "jute" in the Calcutta archival trade reports are classified as "commodities". Converting these items to SITC codes, it has been assigned as number 654 corresponding to "Fabrics, woven of jute or other textile based fibres". From table 4.9, under the 1–digit SITC code, this generally has put it under category 3. Hence moving from figure 4.6 of the composition of Calcutta's exports by the 7–sector classification to the reclassification of products in panel 4.10:B, the gradual expansion of category 3 goods is drawn from some goods that are listed as commodities in the archival trade record, and others that were categorised as manufactures. Consequently, while "manufactured goods" composes 20% of export value for Calcutta by the end of the period according to the archival trade record classification in figure 4.6, the combined value of category 3 and 4 type goods from Calcutta compose 43% of export value.

For both cities, the most highly differentiated capital intensive goods in category 4 represent the smallest share of export value, generally less than 10% over the period. Consistent with what has been observed previously when looking at the data in 7 categories, the composition of exports are characteristic of a colonial port city that predominantly specialised in the export of raw materials and commodities in lower categories. However both cities also increased diversification of exports, with the share of category 3 and 4–type goods expanding, corresponding to the increase in the manufactured goods sector, as defined in the archival trade record.

Combining both dimensions of product type and export destination for the two major regional markets of Europe and the Indian Ocean, which composed approximately two–thirds and one–quarter of the total Indian export market from table 4.7, figure 4.11 shows similar results in the categorisation of goods observed previously in figure 4.9. The share of exports for any level of processing or differentiation in categories greater than 1 is a larger share to destinations in the Indian Ocean rather than to Europe. For exports to Europe, both port cities export approximately half the entire value in category 1–type goods, although for both cities the share of category 1 export still declines over the period.



(a) Bombay

(b) Calcutta

Figure 4.10: Share of export value in 4 categories of product differentiation, 1875 – 1910

Evidence from figure 4.11 is consistent with the composition and trends seen in figure 4.9, which similarly show a much larger share of exports in manufactured goods to destinations across the Indian Ocean compared to any other sector of exports. Similarly, although Europe imports more "commodities" and "articles of food and drink" from the two port cities, the share of "manufactured goods" also expands, as seen in the expanding share of category 3 and 4–type goods from figure 4.9. Additionally, between figures 4.9 and 4.11 Bombay exports demonstrate a much clearer distinction in the categories of goods being traded to Europe or the Indian Ocean compared to Calcutta, where there are differences in the types of goods exported by regional destination, but this distinction is less evident than with Bombay.

Between figures 4.10 and 4.11 the composition of and trends in export categories demonstrates consistency in the reclassification according to table 4.9. Analysis of both classifications has shown firstly that there was a growing manufacturing export sector from both cities, whether it was classified as "manufactured goods" in the archival trade record, or if it was classified as category 3 or 4–type goods.

Second, both systems of classification have demonstrated that there was a clear distinction in the types of goods that were traded to Europe, versus the types of goods that were traded across the global periphery of the Indian Ocean. While trade to Europe took in nearly two–thirds of the total export value of both port cities, this remained in primary staple commodities, classified as "commodities" in the archival trade record, or category 1–type goods from the reclassification. This suggests that the colonial port cities of the Indian Ocean operated in two distinct roles. In relation to Europe, Bombay and Calcutta remained colonial port cities of the global periphery, economically specialised in the export of staple commodities to the global core. However separately, in

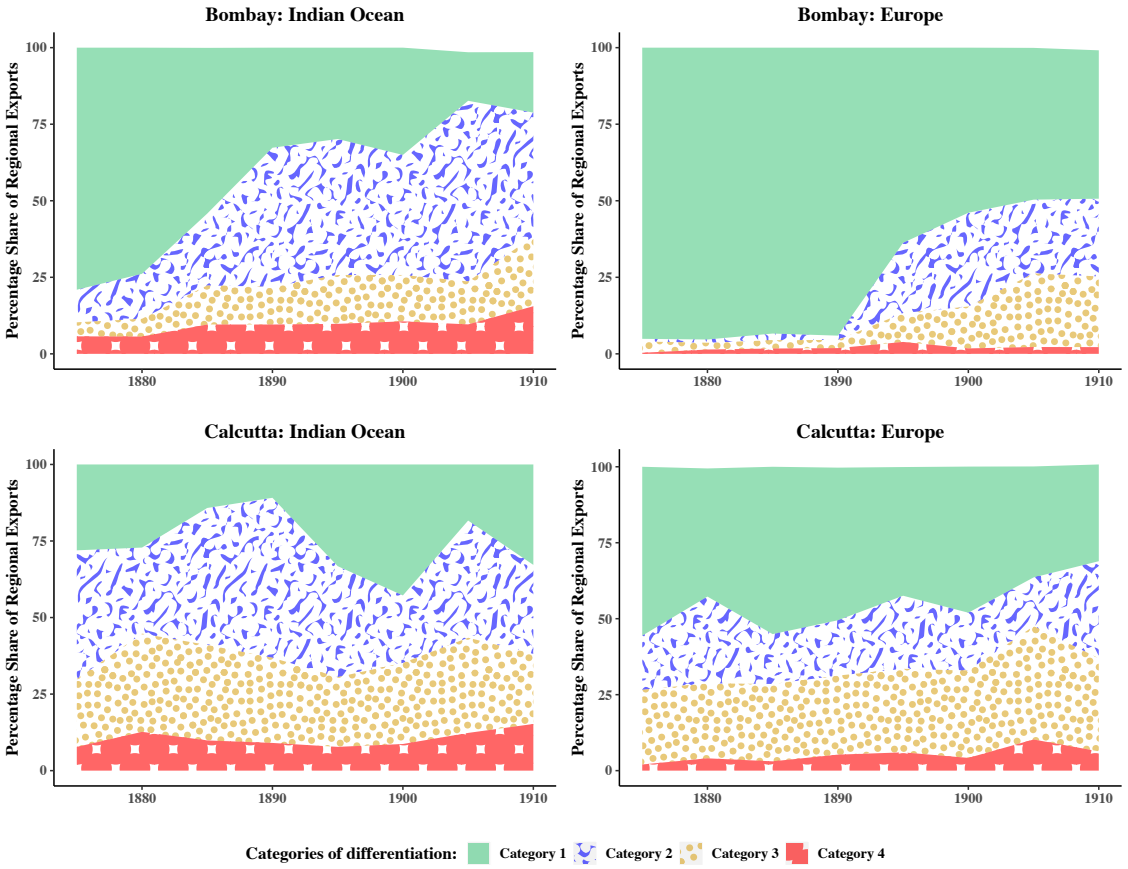


Figure 4.11: Share of export value by 4 categories of product differentiation to top two regional destinations, 1875 – 1910

relation to other countries of the global periphery of the Indian Ocean, Bombay and Calcutta were core cities based on commerce across the Indian Ocean, and industrial exports.

4.8 Trade according to product differentiation

Analysis of the composition of exports according to product type and destination suggest that Bombay and Calcutta traded in distinct types of goods based on the regional destination. However there are several other variables that affect trade flows between countries, including distance between trade partners and their economic size. Any potential regional bias previously observed in the categories and types of exports could be due to these factors. Hence, although previous analysis has identified two distinct regional markets based on the type of products, to verify whether this geographical bias holds when controlling for these other factors, a standard gravity model is employed in each of the four classifications of Bombay and Calcutta exports.

Trade records for both cities distinguish trade to a destination port within a country, however export records are largely restricted to country–level data. As previously shown in figures 4.7 and

4.8, data includes exports to potential destinations for every five years from 1875 to 1910. Since GDP data is limited for the period of study, population of the destination country is used as a measure of size, and distance is measured for each bilateral pair between Bombay or Calcutta and the primary port city within the destination country.[70] In each year, the number of goods exported to a destination is limited to the number of actively exported products. The poisson pseudo–maximum likelihood model allows for the inclusion of destination–year observations with zero trade. To approximate the variable costs of trade, in the absence of direct information on freight rates, the greater circle distance in kilometres between Bombay or Calcutta and a destination port is used as a proxy for trade costs.[71]

In addition to the standard variables of economic size and distance in the gravity model, the variables of interest are the geographic regions to which goods are exported. Indicator variables are included according to regional geographies and types of trading relationships, such as whether or not the destination country was a part of the Indian Ocean or the British Empire. Primarily defined geographically, an indicator for the Indian Ocean is included to observe how trade with the immediate surrounding region contributed to Bombay and Calcutta's industrial development as a market for manufactured goods. To compare trade within the Indian Ocean to other regions, indicator variables for Europe, as well as for Asia and Africa outside of the Indian Ocean are also included. Since nearly the entire Indian subcontinent was colonised by Great Britain for the duration of the period, bilateral trade with other colonies of the British Empire are also treated separately, since colonial ties have been widely observed as influencing bilateral trade flows.[72]

Equation 4.1 is a regression of the total value of exports in each of the four categories of goods described above for Bombay and Calcutta's trade, with C referring to classification of goods, d is destination country, and t for each year. The log of distance and population are included as D and P, respectively, in addition to the set of indicator variables of interest affecting the distribution of trade. Lastly, v includes parameters allowed to vary according to the dependent variable. The gravity model takes the following form:

$$logExports_{dt}^{C} = \beta_0 + \delta_t + \lambda_1 logD + \lambda_2 logP + \beta_1 IO + \beta_2 Europe + \beta_3 UK + \beta_4 Empire + v_{dt}^{C} \tag{4.1}$$

70. Huberman, Meissner, and Oosterlinck, "Technology and Geography in the Second Industrial Revolution: New Evidence from the Margins of Trade."

71. Gene Grossman, "The Regionalisation of the World Economy," chap. Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World?, ed. Jeffrey A. Frankel (Chicago: University of Chicago Press, 1998), 29–31.

72. Kris James Mitchener and Marc Weidenmier, "Trade and Empire," *Economic Journal* 118, no. 533 (November 2008): 1805–1834; Niall Ferguson and Moritz Schularick, "The Empire Effect: The determinants of country risk in the first age of globalisation, 1880 - 1913," *Journal of Economic History* 66, no. 2 (June 2006): 283–312.

Results from equation 4.1 for both exports of Bombay and Calcutta are shown in table 4.10. The results confirm that the effect of distance varied by the degree of product differentiation. For both cities, the effect of distance on category 1–type goods is lower than for category 2, indicating that unmanufactured primary commodities had the widest distribution compared to more highly differentiated products with some degree of manufacturing, consistent with the characterisation of colonial India's peripheral economy which specialised in the export of category 1 raw materials to destinations of Europe at far distances. For all types of semi–manufactured and manufactured goods in categories 2 through 4, distance effects show a lower elasticity for more highly differentiated goods, demonstrating that exports of manufactured goods depended on proximity to sell products. Doubling the distance would decrease trade from Bombay by 12.5% for category 2 goods, but only reduce that of category 4 products by 8.6%. Distance coefficients for both cities also represent the far reach of Indian goods, with low absolute value coefficients demonstrating the limited extent to which Indian exports were diminished by distance. This is consistent with previous evidence from figure 4.11 showing that a larger share of category 1 exports went to destinations in Europe at greater distances than destinations in the Indian Ocean, Asia, or Africa, in closer proximity. With the majority of both cities' exports going to Europe, as illustrated in figures 4.7 and 4.8, this is consistent with low effects of distance on reducing the value of exports.

Comparing results between Bombay and Calcutta trade in table 4.10 confirms results of the two distinct geographic spheres of exports. Overall, coefficients on distance are lower for Calcutta than Bombay, indicating that Calcutta traded more widely and with countries at further distances than Bombay, a feature that has been previously observed by the share of exports according to regional destinations and by volume of exports of cotton and jute textiles, showing a higher share of Calcutta exports going to Europe compared to Bombay.

The reason for Calcutta's greater trade ties to Europe was due to the predominance of European traders and entrepreneurs in Calcutta, which was due to the port's longer history as the colonial capital and commercial centre of British India, "Calcutta, in spite of the position and consequent expense of the port 120 miles from the open sea...is the undisputed centre of the great jute, tea, and coal industries...it is a noteworthy fact that Bengali, or indeed Indian, capitalists have taken very little part, otherwise than as mere investors, in the starting, and none at all in the management of jute mills...British capital and expert skill have been freely poured into the Calcutta industries owing to the advantages of this location, while for almost 40 years past, these industries in the United Kingdom has stood still."[73] Based on previous evidence from the decomposition of Bombay and

73. Holland et al., *Report of the Indian Industrial Commission*, pp. 10 – 12.

Table 4.10: Determinants of total value of trade for Bombay and Calcutta exports by "level of differentiation", 1875 – 1910

Bombay	Category 1	Category 2	Category 3	Category 4
Log Distance	–0.095**	–0.125***	–0.097**	–0.086*
	(0.047)	(0.046)	(0.043)	(0.045)
Log Population	0.139*	0.141*	0.119	0.125
	(0.076)	(0.076)	(0.073)	(0.075)
Indian Ocean	2.044**	2.263**	2.261**	1.983**
	(0.812)	(1.069)	(0.957)	(0.897)
Europe	2.199**	2.307**	2.200**	1.841**
	(0.780)	(1.048)	(0.933)	(0.865)
Asia	1.632*	2.123*	1.757*	1.286
	(0.835)	(1.093)	(0.991)	(0.909)
Africa	0.243	0.772	0.662	0.316
	(0.963)	(1.081)	(1.010)	(0.975)
British Empire	0.337	0.178	0.424	0.559
	(0.352)	(0.396)	(0.435)	(0.415)
Constant	–1.119	0.115	–0.781	–0.614
	(4.197)	(4.221)	(4.067)	(4.204)
Calcutta				
Log Distance	–0.034*	–0.123***	–0.040**	–0.033**
	(0.021)	(0.022)	(0.019)	(0.017)
Log Population	0.079***	0.110***	0.121***	0.129***
	(0.019)	(0.023)	(0.017)	(0.028)
Indian Ocean	0.801***	0.882***	0.452***	0.898***
	(0.157)	(0.220)	(0.138)	(0.274)
Europe	0.859***	0.974***	0.315**	0.696***
	(0.176)	(0.200)	(0.123)	(0.252)
Asia	0.401**	0.611**	0.135	0.485
	(0.171)	(0.221)	(0.148)	(0.269)
Africa	–0.087	–0.470	–0.575***	–1.754***
	(0.209)	(0.320)	(0.191)	(0.616)
British Empire	0.879***	0.809***	0.544***	0.898***
	(0.148)	(0.175)	(0.126)	(0.222)
Constant	0.585	3.203**	0.568	2.406
	(1.223)	(1.333)	(1.145)	(1.707)
Observations	896	896	896	896
Method of estimation	PPML	PPML	PPML	PPML

Notes: Dependent variable in each column is the log total value of exports to country*d* at a given level of differentiation. Method of estimation for both cities is Poisson PML. Time dummies included but not reported. Sample includes 1875, 1880, ...,1910. Robust standard errors clustered over destination country are reported in parenthesis. *** indicates statistical significance different from zero at the 1 per cent level; ** indicates the 5 per cent level; and * indicates 10 per cent level.

Calcutta exports analysed in sections 5 and 6, the lower distance coefficients align with previous evidence on Calcutta's trade, which shows the same trend of lower elasticity of distance for more highly differentiated goods, but with lower coefficients across categories. This suggests a wider distribution of Calcutta's trade as a result of differences in the histories of the two ports in the period of 'dual dominance'.

The broader distribution of Calcutta exports compared to Bombay is also illustrated by the 5 regional geography variables in table 4.10. With the 5 variables identifying trade to the primary regional and colonial trade partners from equation 4.1, the coefficients in table 4.10 refer to the marginal effect of trading to one of the regional destinations compared to any other destination that has not been identified, which in this case is either destinations of North and South America, or the Pacific. Hence comparing results from the two port cities, the larger coefficients for Bombay to destinations of Europe and the Indian Ocean compared to Calcutta's trade to those same regions indicates a greater bias in Bombay exports to those two regions, whereas the marginal effect on regional dummy coefficients for Calcutta was less profound, signified by lower coefficients, thus a lower marginal difference. This has been similarly demonstrated by the share of exports by region. While Calcutta traded more to Europe than Bombay did, Calcutta also traded more to other regions such as other parts of Asia, Africa, and the Americas, whereas Bombay's trade partners were primarily in Europe and the Indian Ocean. Across all categories, trade to Europe or the Indian Ocean is significantly greater than other regions even when controlling for distance.

Comparing both Bombay and Calcutta's trade to the two primary destinations of Europe and the Indian Ocean demonstrates consistency in exports according to product type. Both cities export more to Europe in lower categories of products in categories 1 and 2, whereas they export more to trading partners of the Indian Ocean in categories 3 and 4. Bombay exports approximately 15% more in category 4–type goods to the Indian Ocean than to Europe (1.983 – 1.841 = 0.142), whereas it exports 17% more in category 1–type goods to Europe compared to the Indian Ocean (2.199 – 2.044 = 0.155). For Calcutta, it is 22% more in category 4 to the Indian Ocean (0.898 – 0.696 = 0.202), and 6% more to Europe in category 1 (0.859 - 0.801 = 0.058).[74]

Comparing results on the composition of trade by product categories and regional destinations for Bombay and Calcutta confirms the evidence of distinct regional markets based on certain types

74. Additional similarities in patterns of trade are observed in trade to Asia outside of the Indian Ocean, which refers to countries of Northeast Asia, such as China and Japan. Marginal increases are significantly observed in lower categories of goods, with neither city showing significantly greater trade to Northeast Asia for category 4–type goods. While exports from Bombay are significantly greater to Northeast Asia in category 3, the marginal increase is lower compared to trade to Europe or the Indian Ocean, indicating that Bombay traded less of category 3–type goods to Northeast Asia, though still significantly more than to the Americas or the Pacific.

and categories of exports. Bombay and Calcutta were colonial ports of the global periphery that remained focused on the export of primary commodities that fall under category 1–type goods in the era of high imperialism. It also highlights differences in the external markets for each city, with Bombay primarily trading with Europe and the Indian Ocean, while Calcutta traded more broadly with other regions of the world, and with other colonies of the British Empire. While this describes the overall character to the economy, it overlooks important shifts taking place at the same time. With the rise of large–scale manufacturing, largely based on cotton and jute textiles that fall under categories 2 and 3–type goods, there was also a rise of other industries that primarily relied on local distribution within the Indian Ocean, rather than with India's largest trading partners in Europe. This local distribution of manufactured exports was key to supporting industries in both port cities, as demonstrated in table 4.10.

4.9 Intensive margin of trade

The previous section has looked at the geographic distribution of Bombay and Calcutta's trade according to levels of product differentiation. Adapting the method used in equation 4.1, this section explicitly examines each margin of trade. For each of the four categories, the regression takes the following form:

$$\text{Intensive Margin} = log\left(\frac{Exports_{dt}}{N^{dt}}\right) = \beta_0 + \delta_t + \lambda_1 logD + \lambda_2 logP + \beta_1 IO + \beta_2 Europe + \beta_3 UK + \beta_4 Empire + \varepsilon_{dt} \quad (4.2)$$

$$\text{Extensive Margin} = logN_{dt} = \beta_0 + \delta_t + \lambda_1 logD + \lambda_2 logP + \beta_1 IO + \beta_2 Europe + \beta_3 UK + \beta_4 Empire + \varepsilon_{dt} \quad (4.3)$$

Where N refers to the number of goods exported from either port city to a destination country d in period t. Compared to equation 4.1, the independent variables of interest remain the same, which are regional identifiers for trade to the Indian Ocean, Europe, Asia, Africa, and other colonies of the British Empire, to comparatively assess how Bombay and Calcutta's integration with the Indian Ocean contributed to the port's industrial development compared to other forms of economic integration. The dependent variable for equation 4.2 looks at the total value of a good divided by the number of varieties within a category being exported, the intensive margin, while equation 4.3 is focused only on the range of goods being exported, the extensive margin.

Table 4.11: Determinants of intensive margin (Total value/number of goods) for Bombay and Calcutta exports by "level of differentiation", 1875 – 1910

Bombay	Category 1	Category 2	Category 3	Category 4
Log Distance	–0.079*	–0.110**	–0.063*	–0.044*
	(0.046)	(0.043)	(0.040)	(0.020)
Log Population	0.146***	0.145	0.124	0.129
	(0.026)	(0.075)	(0.071)	(0.073)
Indian Ocean	1.984***	2.245**	2.243**	1.965**
	(0.317)	(1.071)	(0.946)	(0.877)
Europe	2.213***	2.335**	2.233**	1.858**
	(0.304)	(1.048)	(0.922)	(0.843)
Asia	1.597***	2.146**	1.767	1.283
	(0.327)	(1.091)	(0.980)	(0.884)
Africa	0.139	0.779	0.618	0.258
	(0.431)	(1.077)	(0.993)	(0.950)
British Empire	0.419**	0.259	0.458	0.638
	(0.210)	(0.394)	(0.416)	(0.401)
Constant	–1.590	–0.272	–1.285	–1.111
	(1.509)	(4.186)	(4.015)	(4.177)
Calcutta				
Log Distance	–0.016	–0.199***	–0.058***	–0.015
	(0.019)	(0.077)	(0.015)	(0.015)
Log Population	0.076***	0.111***	0.120***	0.129***
	(0.019)	(0.023)	(0.017)	(0.028)
Indian Ocean	0.808***	0.867***	0.420***	0.900***
	(0.155)	(0.219)	(0.136)	(0.269)
Europe	0.841***	0.977***	0.286**	0.701***
	(0.174)	(0.199)	(0.122)	(0.248)
Asia	0.378**	0.607***	0.109	0.485*
	(0.170)	(0.220)	(0.148)	(0.265)
Africa	–0.037	–0.432	–0.563***	–1.710***
	(0.208)	(0.319)	(0.189)	(0.613)
British Empire	0.868***	0.812***	0.524***	0.924***
	(0.148)	(0.175)	(0.126)	(0.222)
Constant	0.231	2.962**	1.021	1.946
	(1.207)	(1.322)	(1.141)	(1.673)
Observations	896	896	896	896
Method of estimation	PPML	PPML	PPML	PPML

Notes: Dependent variable in each column is the ratio of the value of exports to the number of goods exported to country d at a given level of differentiation. Method of estimation is Poisson PML. Time dummies included but not reported. Sample includes 1875, 1880, ...,1910. Robust standard errors clustered over destination country are reported in parenthesis. *** indicates statistical significance different from zero at the 1 per cent level; ** indicates the 5 per cent level; and * indicates 10 per cent level.

As previously discussed, analysis of the relative contribution of each margin of trade bears significant implications for economic growth. While several studies have shown that the extensive margin has played a central role in the growth of exports for developing countries, other studies have shown that the export growth of most countries has been based on the intensive margin.[75] While the variety of goods exported has been widely assessed as strategic to a country's economic development, growth on the intensive margin is also important for retained bilateral trading relationships and the competitiveness of a country's exports in foreign markets. Indeed the frailty of export relationships is an important factor underlying the long–run export growth across countries. A country's lack of competitiveness in global markets is not because it struggles to start new bilateral relationships, but rather is due to differences in the ability of a country's export products to survive in international markets.[76] Hence the intensive margin, how much of a particular product category is exported, is a measure of the survival and competitiveness of Bombay and Calcutta manufactured goods to various regional markets. The results of the intensive margin for Bombay and Calcutta are shown in table 4.11.

As previously observed from table 4.10, the effect of distance on the intensive margin significantly reduces exports. A similar trend in the distance effect on trade flows with higher categories of products is also observed on the intensive margin where distance has less of an effect on category 1–type goods for commodities and raw materials. Subsequently for goods of higher quality with a degree of processing in category 2, the distance effect is larger. Between categories 2 to 4, distance shows a lower elasticity for more highly differentiated goods in both cities. The results on distance effects are consistent with evidence from figure 4.11, with the largest regional destination for exports from both Bombay and Calcutta going to Europe, and the largest share of exports to Europe being in category 1 products. Hence commodities and raw materials traveled further distances to Europe, whereas products of any degree of processing and manufacturing were not as broadly traded. This also demonstrates the dichotomy in the trading relationship of colonial India, which was mostly seen as a source of raw materials for a rapidly industrialising Europe. However at the same time, India was becoming an industrial exporter to other countries around the Indian Ocean.

This notion is similarly supported by the regional indicator variables. Consistent results be-

75. Elhanan Helpman, Marc Melitz, and Yona Rubinstein, "Estimating trade flows: Trading partners and trading volumes," *Quarterly Journal of Economics* 123, no. 2 (May 2008): 441–487; Timothy J. Kehoe and Kim J. Ruhl, "How important is the new goods margin in international trade?," *Journal of Political Economy* 121, no. 2 (April 2013): 358–392; Gabriel J. Felbermayer and Wilhelm Kohler, "Exploring the intensive and extensive margins of world trade," *Review of World Economics* 142, no. 4 (2006): 642–674.

76. Tibor Besedes and Thomas J. Prusa, "The role of extensive and intensive margins and export growth," *National Bureau of Economic Research Working Paper Series* 13628, no. 1 (November 2007): 1–23.

tween the two cities is observed between Europe and the Indian Ocean. In categories 1 and 2, both cities export more to Europe than to the Indian Ocean, with Bombay exporting 25.7% more on the intensive margin in category 1, and 9% more in category 2 to Europe.[77] Calcutta exports 3.4% more to Europe in category 1, and 12% more in category 2.[78] However in categories 3 and 4, both cities export more to the Indian Ocean, with Bombay exporting 1% more to the Indian Ocean in category 3, and 11.3% more on the intensive margin in category 4.[79] For Calcutta, the geographic bias in exports is 14.3% in category 3, and 22% more in category 4 towards the Indian Ocean.[80] Consistency in the geographic orientation of trade based on product type between both port cities demonstrates the dichotomy in spheres of trade, as suggested by the effect of distance. Both cities exported raw materials at greater distances to Europe, and exported more highly differentiated manufactured goods more locally across the Indian Ocean region.[81]

Overall trends and patterns of trade according to level of product differentiation on the intensive margin are similar to evidence previously observed for trade flows. Both cities show a clear distinction in the geographic distribution of trade based on the level and type of product, with more trade going to Europe in lower categories of goods, and more trade going to the Indian Ocean in higher categories. The similar patterns between total trade and the intensive margin of trade demonstrates that whichever countries the two cities traded with in a certain product category, they also traded more on the intensive margin in that same category.

4.10 Extensive margin of trade

Widespread evidence has shown the importance of trade on the extensive margin for an exporting country's increased welfare and development. Several studies have shown how the product variety of exports has played a central role in models of trade and growth.[82] Additionally studies of economic development have shown that export diversification contributes to economic growth by

77. For category 1: 2.213 – 1.984 = 0.229; for category 2: 2.335 – 2.245 = 0.009.
78. For category 1: 0.841 – 0.808 = 0.033; for category 2: 0.977 – 0.867 = 0.11.
79. For category 3: 2.243 – 2.233 = 0.010; for category 4: 1.965 – 1.858 = 0.107.
80. For category 3: 0.420 – 0.286 = 0.134; for category 4: 0.900 – 0.701 = 0.199.
81. Contrasting patterns of exports between the two cities are observed in trade to other colonies of the British Empire, consistent with results from table 4.8. Bombay's trade to other colonies of the British Empire is not significant except in category 1, whereas Calcutta's intensive trade is in several categories the largest to other colonies of the British Empire. The large marginal effect of Calcutta's intensive trade to the British Empire illustrates the different roles and origins of each port city. Calcutta's historical function, trade ties, and large–scale industry being founded by European entrepreneurs and in service to European and British colonial markets has a significant effect on the intensity of exports. In contrast, Bombay's industrialists were Indian or were from other coastal communities of the Indian Ocean, rather than European. Hence in the same pattern of entrepreneurs trading to external markets that they were most familiar with, Bombay significantly traded more in the Indian Ocean in more highly differentiated products.
82. Krugman, "Increasing Returns, Monopolistic Competition, and International Trade"; Broda and Weinstein, "Globalisation and the Gains from Variety."

overcoming export instability, the negative impact of terms of trade in primary products, and protecting from price variation in product markets.[83] Other studies have shown how the expansion of the product basket in exports reduces unit production prices, increases productivity, and improves skill and productivity via knowledge spillovers.[84] Table 4.12 illustrates the results of equation 4.3 on the extensive margin of trade for Bombay and Calcutta.

First, consistent with results from previous tables and with the standard gravity model, table 4.12 shows that trade on the extensive margin is negatively related to distance. However in contrast to the trend of lower distance coefficients in higher categories of goods, distance does not demonstrate a monotonic decline on the extensive margin with more highly differentiated export categories.[85] This suggests that although distance reduces the variety of products exported, the variety is not distinctly affected by distance based on the level of product differentiation.

Additional contrasts in the distance effect compared to results from total trade flows and the extensive margin are differences between cities. Although Calcutta showed a lower effect of distance compared to Bombay across product categories in tables 4.10 and 4.11, in table 4.12 there is not a distinctly lower elasticity to distance for Calcutta than for Bombay in terms of the variety of products exported. Therefore although Calcutta traded more at further distances on the intensive margin, both traded a similar variety of goods at any distance.

Second, turning to the regional geography variables, consistent evidence from tables 4.10 and 4.11 shows higher coefficients for Bombay's trade to the Indian Ocean, Europe, and Asia compared to Calcutta on the extensive margin, indicating that Bombay was more specialised in exporting varieties of products to the Indian Ocean and Europe, while the distribution of varieties of Calcutta's exports was more evenly disbursed globally. In contrast to previous evidence which showed a clear dichotomy between greater trade to Europe in the lower two categories, and greater trade to the Indian Ocean in the higher two categories, table 4.12 shows consistently more varieties of goods exported to the Indian Ocean compared to Europe across all categories.

While Bombay and Calcutta were beginning a process of early industrialisation through cotton and jute textile manufacturing, in which products typically would be categorised as 2 or 3, there was also an expansion in other types and varieties of goods produced and exported at higher levels

83. Lederman and Maloney, "Natural Resrouces, Neither Curse nor Destiny"; Heiko Hesse, "Export diversification and economic growth," *World Bank Commission on Growth and Development Working Papers*, no. 21 (2008): 1–23.

84. Elhanan Helpman and Paul R. Krugman, *Market Structure and Foreign Trade: Increasing returns, imperfect competition, and the international economy* (Cambridge, MA: MIT Press, 1986); Ricardo Hausmann, Jason Hwang, and Dani Rodrik, "What you export matters," *Journal of Economic Growth* 12, no. 1 (2007): 1–25.

85. Huberman, Meissner, and Oosterlinck, "Technology and Geography in the Second Industrial Revolution: New Evidence from the Margins of Trade," Although this contrasts with evidence from the intensive margin and total trade flows, it is consistent with similar studies on the extensive margin.

Table 4.12: Determinants of extensive margin (Number of goods) for Bombay and Calcutta exports by "level of differentiation", 1875 – 1910

Bombay	Category 1	Category 2	Category 3	Category 4
Log Distance	–0.163**	–0.236**	–0.212**	–0.220***
	(0.066)	(0.099)	(0.087)	(0.050)
Log Population	0.104	0.106	0.093	0.097
	(0.079)	(0.087)	(0.081)	(0.083)
Indian Ocean	2.406**	2.389**	2.396**	2.153**
	(0.965)	(1.060)	(1.040)	(1.089)
Europe	2.122**	2.057*	1.977*	1.767
	(0.953)	(1.055)	(1.025)	(1.077)
Asia	1.879*	1.909*	1.727	1.367
	(1.009)	(1.114)	(1.079)	(1.134)
Africa	0.798	0.734	0.929	0.709
	(1.148)	(1.139)	(1.136)	(1.191)
British Empire	–0.300	–1.054**	0.228	–0.113
	(0.383)	(0.436)	(0.599)	(0.619)
Constant	–1.674	–0.286	–0.905	–0.766
	(4.290)	(4.520)	(4.387)	(4.434)
Calcutta				
Log Distance	–0.173***	–0.253***	–0.204***	–0.253***
	(0.052)	(0.082)	(0.053)	(0.082)
Log Population	0.101	0.102	0.123**	0.124***
	(0.059)	(0.070)	(0.059)	(0.034)
Indian Ocean	1.061*	1.097	1.053*	0.922**
	(0.593)	(0.688)	(0.548)	(0.374)
Europe	0.771	0.960	0.866*	0.694**
	(0.539)	(0.626)	(0.489)	(0.342)
Asia	0.629	0.699	0.643	0.522
	(0.559)	(0.669)	(0.540)	(0.375)
Africa	–0.791	–1.232	–0.631	–2.321***
	(0.552)	(0.742)	(0.535)	(0.758)
British Empire	0.968**	0.749**	0.837***	0.582*
	(0.381)	(0.362)	(0.323)	(0.308)
Constant	0.079	2.306	–0.059	2.992
	(3.570)	(3.736)	(3.373)	(2.257)
Observations	896	896	896	896
Method of estimation	PPML	PPML	PPML	PPML

Notes: Dependent variable in each column is the number of items exported to country *d* at a given level of differentiation. Method of estimation is Poisson PML for both cities. Time dummies included but not reported. Sample includes 1875, 1880, ...,1910. Robust standard errors clustered over destination country are reported in parenthesis. *** indicates statistical significance different from zero at the 1 per cent level; ** indicates the 5 per cent level; and * indicates 10 per cent level.

of product differentiation requiring more skilled input. While it appears from table 4.12 that the two port cities either were not competitive or locked out of markets for varieties of high–value manufactured goods in the global core of Europe, it found export markets for increasing varieties of more highly differentiated manufactured goods in the Indian Ocean. Trade with the Indian Ocean in the era of high imperialism was therefore crucial to the foundation and development of industry in colonial India.

Results on the extensive margin of trade for Bombay and Calcutta confirms similar evidence previously illustrated from the overall trade flows in table 4.10, the intensive margin in table 4.11, and the decomposition of trade data by regional destination and product categories in figures 4.9 and 4.11, which is that there was a geographic bias in the distribution of exports based on the level of skill in the manufacturing process and level of product differentiation. The trading relationship of the two port cities with the global core of Europe was characteristic of a traditional colonial economy that specialised in staple exports of commodities from the colonial hinterland. However as the two cities began industrialising in the period of 'dual dominance', they did so by focusing on exports of highly differentiated, capital–intensive, large–scale factory products to an integrated Indian Ocean market that was a part of the global periphery, rather than to the global core of Europe.

4.11 Robustness checks

Although the robustness of results can be confirmed to a degree through the construction of two separate datasets for exports of Bombay and Calcutta and the consistency in findings between the two, a potential concern is that the findings are dependent on the categorisation of goods. To check for this at the individual product level, the same model shown in equation 4.2 is taken, except that the dependent variable for the intensive margin $log\left(\frac{Exports_{dt}}{N^{dt}}\right)$ is replaced with the total exports $Exports_{dt}$ of each product type to country d in time t. To check for any potential issues in categorisation, individual goods are examined separately, showing the effects of distance on trade. The distance and population coefficients are reported in table 4.13 to compare the effects of each on individual product types, and in the case of distance to illustrate how the trade–cost elasticity depends on variable trade costs.

The results in table 4.13 are in line with those that have been reported using the aggregated

86. Titles for items have been slightly abbreviated or modified from the original titles given in the SITC classification in order to fit the table onto the page. The full titles for items can be found corresponding to the SITC codes in appendix table 4.14.

Table 4.13: Firm–Level Estimations of Distance and Population for 20 Industries, 1875 – 1910[86]

		Calcutta		Bombay	
Industry	SITC	Distance	Population	Distance	Population
Category 1					
Cereal grains	481	–2.590***	0.336**	–1.400***	0.145**
		(0.066)	(0.147)	(0.068)	(0.070)
Tea	741	–2.763***	0.135	–2.247***	0.260
		(0.201)	(0.097)	(0.020)	(0.179)
Seeds	230	–1.422***	0.048	–0.094***	0.126**
		(0.328)	(0.181)	(0.004)	(0.053)
Wood and Cork	2482	–0.959***	0.181	–0.923***	0.074
		(0.060)	(0.134)	(0.163)	(0.157)
Wool thread	268	–1.624***	0.413***	–1.413**	1.383**
		(0.122)	(0.140)	(0.672)	(0.655)
Category 2					
Cotton fabrics, woven	652	–0.898*	0.983***	–0.181***	0.007
		(0.475)	(0.161)	(0.005)	(0.036)
Dyeing, tanning, and colouring materials	53	–2.529***	0.654***	–0.306***	0.140*
		(0.233)	(0.123)	(0.009)	(0.080)
Bricks, tiles, used in building	6646	–2.638***	0.730***	–0.366*	0.137**
		(0.050)	(0.089)	(0.216)	(0.064)
Leather	6118	–1.082***	0.757***	–0.525***	0.019
		(0.014)	(0.212)	(0.156)	(0.042)
Perfumery	553	–2.607***	0.660***	–0.963***	0.213**
		(0.035)	(0.145)	(0.095)	(0.069)
Category 3					
Articles of apparel and clothing	084	–0.910***	0.214	–0.217***	0.075**
		(0.182)	(0.176)	(0.055)	(0.032)
Printed books, pamphlets	8921	–1.376***	0.568**	–0.532***	0.041
		(0.200)	(0.219)	(0.037)	(0.030)
Manufactures of metals, nes	069	–0.131	0.682***	–0.416***	0.035
		(0.529)	(0.261)	(0.042)	(0.040)
Shawls, scarves, mantillas	8471	–0.460***	0.138	–0.985***	0.245***
		(0.097)	(0.352)	(0.272)	(0.083)
Bags and sacks	6581	–1.038***	0.796***	–0.393**	0.029
		(0.222)	(0.224)	(0.174)	(0.031)
Category 4					
Machinery and transport equipment	7932	–0.557***	0.850***	–0.646	0.454
		(0.149)	(0.280)	(0.253)	(0.778)
Professional, scientific, instruments	8745	–0.456***	0.016	–1.108**	0.419**
		(0.102)	(0.071)	(0.465)	(0.180)
Toys and games	8942	–2.237***	0.051	–0.059*	0.169
		(0.223)	(0.109)	(0.036)	(0.130)
Carriages, carts, and transports containers	7861	–0.280***	0.010	–0.143***	0.008
		(0.061)	(0.090)	(0.019)	(0.078)
Furniture	821	–3.053***	0.211**	–0.471***	0.071*
		(0.477)	(0.091)	(0.045)	(0.042)

categories.[87] Homogenous goods in lower categories have higher absolute value coefficients on distance compared to more differentiated products in higher categories. This trend holds for individual products observed at various levels of SITC specification. Producers of standardised goods, such as grains and wool, were restricted to customers closer to home, as distance is shown to have a much larger effect on the total value of exports in these categories than in higher categories.[88] In these industries export growth was mainly on the intensive margin, deepening sales to existing markets at the expense of expanding the number destinations. For more highly differentiated products in categories 3 and 4, the distance coefficients are lower on average compared to the first two categories, showing higher value exports at greater distances for these products.

Additionally, as it has been commonly found in previous tables, population is shown to be positive, contributing to higher exports for either an individual product or category, however the effect is not always significant. This has similarly been observed across nearly all products in table 4.13, confirming previous results and inferences that although the relationship between size and trade flows remains positive, it is not a strong indicator within the colonial periphery, since port cities of the global periphery would still trade with other colonies despite having low populations at the port and across the wider colonial hinterland.

Although the results from table 4.13 confirm the overall trend in trade–cost elasticity for different product varieties, proving that there is no loss of information using the categories in table 4.10, results from the tables on the intensive and extensive margins of trade in tables 4.11 and 4.12 show how trading relationships affected trade flows. Despite the fact that more highly differentiated goods show higher trade–cost elasticity by distance in table 4.13, trade partners at closer distances, such as those across the Indian Ocean are associated with higher levels of exports in more differentiated categories. Therefore although table 4.13 confirms trade–cost elasticity by distance, and confirms the methodology of product categorisation, it also demonstrates that despite the ability to trade more highly differentiated goods at further distances, exports of large–scale manufacturing were shipped more locally around the Indian Ocean.

87. Dependent variable in each row is total value of exports of product k to country d for eight years, 1875, 1880, ... 1910. Method of estimation is Poisson PML. Time dummies, item dummies, and other controls from the gravity model are included but not reported. Sample includes 1875, 1880, ... 1910. Robust standard errors clustered over destination countries are reported in parenthesis. *** indicates statistical significance different from zero at the 1 per cent level; ** indicates the 5 per cent level; and * indicates 10 per cent level. Reported SITC codes are aggregates at the 1 and 2–digit level due to insufficient observations to run Poisson PML on individual products, and due to differences in terminology of some products between Bombay and Calcutta trade statistics.

88. Distance coefficients are similar for several products as they have been categorised in (Huberman, Meissner, and Oosterlinck, "Technology and Geography in the Second Industrial Revolution: New Evidence from the Margins of Trade"). Additionally coefficients are similar to firm–level coefficients in (Matthieu Crozet and Pamina Koenig, "Structural Gravity Equations with Intensive and Extensive Margins," *Canadian Journal of Economics* 43, no. 1 [2010]: 41–6 2)

4.12 Conclusion

Which narrative of the colonial Indian economy predominated in the era of high imperialism? As the period is characterised by the distinct economic division between an industrialising European core and a commodity exporting periphery in Asia and Africa, the prevailing narrative has been that the port cities of Asia and the Indian Ocean economically functioned as colonial entrepots. That is, as nodal points economically and politically linking the colonial hinterland to the overseas imperial power.[89] At the same time, this period has also been defined within the historical literature as a period of 'dual dominance' in colonial India, characterised by the distinctive economic agglomeration, centralisation, and growth of the two primary port cities. By analysing a disaggregated dataset of the composition of and destinations for each city's exports, this paper finds that Bombay and Calcutta operated in both roles as peripheral exporters of staple commodities, as well as industrialising core economies. What really determined which framework dominates depended on the geographic perspective and trading relationship within which the cities' are viewed. In relation to Europe, the economic relationships of Bombay and Calcutta remained that of a traditional entrepot specialising in the export of a narrow set of primary commodities. However when framed in relation to trade within the global periphery, the two port cities were manufacturing hubs and exporters of a wide variety of highly differentiated manufactured goods to countries within the Indian Ocean region.

By collecting disaggregated granular trade data of exports specifically produced and sent from each port, this paper has identified several other industries and trading relationships beyond the predominant core–periphery framework that has traditionally defined the colonial economy of the period. What emerges are much more diversified port city economies that were more than just nodal points within the colonial periphery. Bombay and Calcutta traded more to the Indian Ocean in more highly differentiated product categories, while they traded more to Europe in less differentiated categories, thus demonstrating a dichotomy in the trading relationship with each region depending on the type of product exported. Additionally both cities exported more varieties of products to the Indian Ocean than to any other region of the world across all categories. This paper has shown that despite the cities' primary function as exporters of staple commodities, a process of rapid industrialisation that emerged in the period of 'dual dominance' was based on local trade within the Indian Ocean, making the colonial port cities in some ways characteristic of an economically dominant core, but within the global periphery.

89. Huff, "Export-led growth, gateway cities, and urban systems development in pre-World War II Southeast Asia."

Results on the geographic dimension to each city's trade margins has important implications for understanding economic growth and development in colonial India and the Indian Ocean. Substantial research on the impact of both the intensive and extensive margins of trade have shown that the impact of the variety of exports on economic growth is large.[90] Hence analysis of the margins of trade according to regional geography demonstrates the importance of local trade networks and market integration of the Indian Ocean in contributing to economic growth for the highly urbanised port cities of the region. However differences in the geographic biases of trade margins between the two cities suggests the greater extent to which Bombay's growth was more dependent on and integrated with local trade around the Indian Ocean, relative to Calcutta's more global trade networks. This suggests the potentially significant role of local entrepreneurs in contributing to Bombay's industrialisation, as they established large–scale manufacturing for export on the basis of their familiarity with external markets around the Indian Ocean. In contrast, with the foundation of Calcutta's industry established by European entrepreneurs, the city's trade ties were wider, but more dependent on European financing and control.

The origins, expansion, and distribution of large–scale manufacturing in both cities contributes to an understanding of the process of industrialisation in India over the course of the twentieth century. As previously mentioned, urbanisation is not only a proxy for economic growth, but is a carrier of growth.[91] Indeed it was the early textile industries located in Bombay and Calcutta which subsequently contributed to forming the basis of later Indian industrialisation policy in the twentieth century, "the industrialisation that began in colonial India catalysed the formation of 'industrial districts', and the new generation of manufacturing industries and highly skilled services that were concentrated in the two cities."[92] The rise of large–scale factories at the major entrepots eventually formed the foundation of a broader industrialisation in the twentieth century, as they would later become the subject of a focused economic policy to industrialise the country. The Indian Industrial Policy Report of 1918, which has been used in this paper as a template for the categorisation of exports according to level of strategic importance and product differentiation, was intended to assess and develop an agenda for, "the promotion of industries and commerce in India."[93] In the report they cited the strategic importance of existing industry in Bombay and Calcutta, "these two large cities contain trading interests which involve such extensive relations...as to render necessary the appointment of special officers working under the provincial Directors of

90. Broda and Weinstein, "Globalisation and the Gains from Variety."

91. Jeffrey G. Williamson, "When, where, and why? Early industrialisation in the poor periphery," *National Bureau of Economic Research Working Paper Series* 16344, no. 1 (September 2010): 1–47.

92. Roy, *The Economic History of India*, pp. 183.

93. Holland et al., *Report of the Indian Industrial Commission*, pp. 145.

Industry."[94] Additionally, they refer to the importance of export markets across the Indian Ocean, "official Indian trade agencies in other countries of East Africa and Mesopotamia are likely to have considerable business...for the export industries."[95] While this report only sets out a policy for Indian industrialisation after the First World War and after the period of 'dual dominance', it qualitatively refers to and indicates a growing strategic industrial sector based at the two port cities, the development of which has been more thoroughly and quantitatively assessed in this paper in terms of the size of the industrial sector, its concentration at the ports, and its primary geographic distribution around the Indian Ocean.

Although this paper has identified a distinct regional bias in the type of products exported, highlighting a neglected but important trade operating alongside the predominant narrative of the traditional core–periphery framework, the export of large–scale manufacturing was still small compared to each city's primary trade and functions as exporters of staple commodities. Although the share of trade in category 1 goods shrinks over the period, it still composes nearly half of total trade alone, with the combined share of categories 1 and 2 composing the majority share of trade for both cities over the period. Despite the increasing divergence of the intensive and extensive margins of trade between the Indian Ocean and Europe in more highly differentiated product categories, even at its greatest, the most highly differentiated product category 4 only composes 5% of Bombay's trade, and 11% of Calcutta's trade. Hence although this paper finds a significant regional bias in exports according to product type and degree of manufacturing, the export of large–scale manufactured goods across the global periphery of the Indian Ocean was still a smaller and secondary trade compared to the much larger core–periphery trading relationship between the two port cities and Europe.

While Bombay and Calcutta's trade in large–scale manufactures was smaller, this paper has demonstrated the degree to which an integrated Indian Ocean market supported the rise of large–scale manufacturing at the ports. Considering the historical literature dedicated to the study of the unity of the Indian Ocean in terms of trade and cultural relations, this paper has shown some of the implications of an economically integrated Indian Ocean. For Bombay and Calcutta, while the predominant narrative of the two cities as traditional colonial ports specialising in the export of staple commodities to Europe remains true, there was also a growing manufacturing sector that was based on exports to an economically integrated Indian Ocean market that existed outside of the traditional conceptualisation of the global periphery in the era of high imperialism.

94. Ibid., pp. 141.
95. Ibid., pp. 146.

4.13 Appendix

SECTION 1

Classification of products is done based on the annual records of the *Trade of the Presidency of Bombay* and *Trade of the Presidency of Bengal*, collected in five–year intervals for the years 1875, 1880, 1885, 1890, 1895, 1900, 1905, and 1910. The level of detail of the products listed in appendix table 4.14 corresponds to the SITC three and four–digit level of disaggregation. A recurrent problem with this type of exercise is the ability to distinguish genuinely new products from new titles given to existing products, and other products listed in a new entry, but were in fact previously folded into another group. Another issue is the discrepancy between reporting of products between Bombay and Calcutta. While there is a direct correspondence in several of the titles of products between the two city's trade records, there are several other products where this is not the case. For example, jute manufactures had a much higher level of enumeration in Calcutta than jute manufactures exported from Bombay. However both Calcutta and Bombay exhibit a similar degree of enumeration of cotton manufactures. Nevertheless the standardisation process according to SITC classification between both cities still results in a number of distinct items being exported from one port that is not exported by the other, as previously illustrated in figure 4.2. The full list of items used in analysis are shown in table 4.14 along with the categories that they were reported under in the archival classification, and the categories they fall under in the reclassification according to level of differentiation.

SECTION 2

In the classification of destinations, the focus has been on preserving the number of destinations, particularly colonial possessions, included in the archival record as much as possible. Since both cities traded to several countries and colonies across the Indian Ocean, these smaller islands and colonial possessions remain separately enumerated. However there are several cases in which colonial possessions are not explicitly enumerated, such as "British East Africa", which is treated as the "East Africa Protectorate", roughly corresponding to Kenya. Additionally, British colonial possessions are enumerated separately from other countries, such as "Hong Kong" and "China", which are maintained as separate entities. Archival trade records for both cities enumerate the major islands of Indonesia separately, such as Java, Sumatra, and Borneo, which have also been kept separate. The Ottoman Empire is treated in the archival records as "Turkey, Europe" and "Turkey, Asia", which for the purposes and interests of this paper have been kept separate, with "Turkey, Europe" considered Anatolia, and "Turkey, Asia" treated as part of the Indian Ocean, roughly corresponding to Iraq and the Levant. Population figures for colonial possessions and territories are linearly interpolated from the earliest records to years in which statistics were collected for the country. The complete list of destinations is:

Abyssinia, Aden, Algeria, Arabia, Argentina, Australia, Austria-Hungary, Bahrein Islands,

Belgium, Brazil, British Borneo, British East Africa, British Guiana, British West India islands, Bulgaria, Canada, Cape of Good Hope, Celebes and other Islands, Ceylon, Chile, China, Colombia, Congo, Costa Rica, Cuba, Cyprus, Danish West Indies, Denmark, Dominican Republic, Dutch Borneo, Dutch West Indies, Ecuador, Egypt, Federated Malay States, France, French West Africa, French West Indies, German East Africa, Germany, Gibraltar, Greece, Guatemala, Haiti, Holland, Hong Kong, Hungary, Indochina, Islands in the Pacific, Italian East Africa, Italy, Japan, Java, Korea, Libya, Madagascar, Maldives, Malta, Mauritius, Mexico, Morocco, Natal, New Caledonia, New Guinea, New Zealand, Nicaragua, Norway, Oman, Panama, Persia, Peru, Philippines, Portugal, Portuguese East Africa, Portuguese West Africa, Reunion, Romania, Russia, Sandwich Islands, Seychelles, Siam, Sierra leone, Somaliland, Spain, St. Helena, Straits Settlements, Sumatra, Surinam, Sweden, Taiwan, Tunisia, Turkey–Asia, Turkey– Europe, United Kingdom, United States of America, Uruguay, Venezuela.

As the main analysis has focused on the distribution of export products listed in table 4.14 according to geographic regions, aggregating countries from the list of countries into the larger geographic regions is done according to figure 4.12. The map is intended to broadly illustrate the regional definitions employed in this study, however the map is drawn from present–day countries and boundaries, hence there are some geographic approximations that are not precise to the boundaries of the regions as it has been used in the main analysis of this paper.

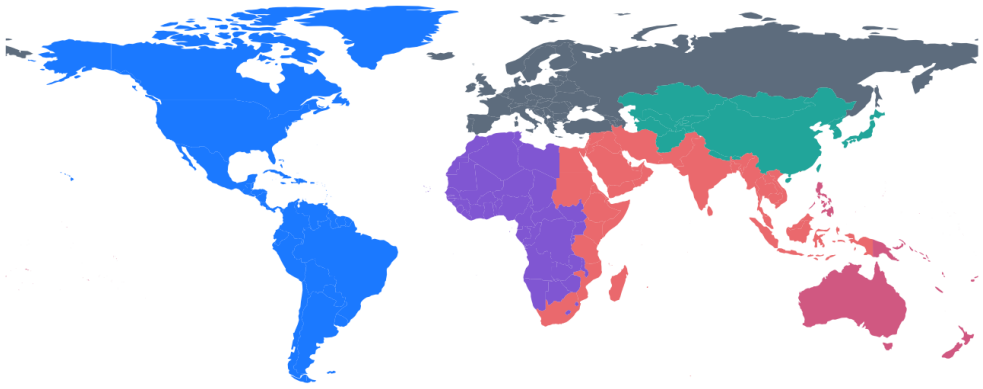


Figure 4.12: Regional destinations

The figure highlights the boundaries of the Indian Ocean in comparison to the other regions that it borders. As the main analysis in tables 4.10, 4.11, and 4.12 include a comparison of the marginal effects of each port's trade to the Indian Ocean, Europe, Asia, or Africa, the omitted regional categories are North and South America, and the Pacific. Australia is included as part of the Pacific even though the western half of the country is along the Indian Ocean coast, since nearly all of Bombay and Calcutta's trade to Australia went to Sydney and Melbourne in Eastern Australia, as reported in the archival records which includes the city and country of destination. Instead Australia and New Zealand are included under the British Empire, along with all other dominions and colonial possessions of Great Britain. However Great Britain itself is included as part of Europe. The selection of geographic regions in the main analysis is intended to give a roughly balanced representation of destinations based on the size of the Indian Ocean region.

Table 4.14: List of goods exported and degree of differentiation, 1875 – 1910

Num.	SITC	Item	Cat.	Archival Category
1	011	Animals of the bovine species (including buffaloes), live	1	Animals
2	041	Wheat and meslin, unmilled	1	Food and bev.
3	053	Dyeing, tanning and colouring materials	2	Chemicals
4	054	Vegetables, fresh or simply preserved; roots and tubers, nes	1	Food and bev.
5	069	Manufactures of metals, nes	3	Metals
6	071	Coffee and coffee substitutes	1	Food and bev.
7	075	Spices	1	Food and bev.
8	084	Articles of apparel and clothing accessories	3	Manufactures
9	087	Professional, scientific, controlling instruments, apparatus, nes	4	Manufactures
10	112	Alcoholic beverages	1	Food and bev.
11	121	Bacon, ham, other dried, salted or smoked meat	1	Food and bev.
12	122	Tobacco, manufactured	2	Chemicals
13	211	Hides and skins, excluding furs, raw	1	Commodities
14	223	Seeds and oleaginous fruit, whole or broken, for other fixed oils	1	Food and bev.
15	230	Butter	1	Food and bev.
16	232	Natural rubber latex; rubber and gums	1	Commodities
17	240	Cheese and curd	1	Food and bev.
18	245	Fuel wood and wood charcoal	1	Commodities
19	261	Silk	3	Manufactures
20	263	Cotton	3	Manufactures
21	264	Jute, other textile bast fibres, nes, raw, processed but not spun	2	Commodities
22	268	Wool and other animal hair (excluding tops)	1	Commodities
23	269	Rags, scrap twine, cordage, rope and cables etc	1	Commodities
24	287	Ores and concentrates of base metals, nes	2	Metals
25	322	Coal, coke and briquettes	1	Commodities
26	350	Fish, dried, salted or in brine; smoked fish	1	Food and bev.
27	411	Animal oils and fats	1	Oils
28	421	Rice in the husk or husked, but not farther prepared	1	Food and bev.
29	422	Rice, semi-milled or wholly milled	1	Food and bev.
30	430	Barley, unmilled	1	Food and bev.
31	451	Rye, unmilled	1	Food and bev.
32	452	Oats, unmilled	1	Food and bev.
33	459	Buckwheat, millet, etc, and other cereals, unmilled, nes	1	Food and bev.
34	470	Cereal flours (non-wheat or meslin)	1	Food and bev.
35	481	Cereal grains, worked or prepared, not elsewhere specified	1	Food and bev.
36	531	Synthetic dye, natural indigo, lakes	2	Chemicals
37	533	Pigments, paints, varnishes and related materials	2	Chemicals
38	541	Medicinal and pharmaceutical products	2	Chemicals
39	551	Essential oils, perfume and flavour materials	2	Oils
40	553	Perfumery, cosmetics, toilet preparations, etc	2	Chemicals
41	554	Soap, cleansing and polishing preparations	1	Chemicals
42	577	Nuts edible, fresh or dried	1	Food and bev.
43	611	Leather, leather manufactures, nes, and dressed furskins	3	Manufactures
44	612	Refined sugar etc	1	Food and bev.
45	641	Paper and paperboard	3	Manufactures

Num.	SITC	Item	Cat.	Archival Category
46	652	Cotton fabrics, woven, unbleached, not mercerized	2	Manufactures
47	659	Floor coverings, etc	2	Oils
48	665	Glassware	3	Manufactures
49	673	Iron and steel bars, rods, shapes and sections	3	Metals
50	678	Tube, pipes and fittings, of iron or steel	3	Metals
51	682	Copper bars, rods, angles, shapes, sections, wrought	3	Metals
52	682	Copper	2	Metals
53	684	Aluminium	2	Metals
54	685	Lead	2	Metals
55	694	Nails, screws, nuts, bolts, rivets, etc, of iron, steel or copper	3	Metals
56	696	Cutlery	3	Metals
57	712	Steam engines, turbines	4	Manufactures
58	721	Agricultural machinery and parts thereof, nes	4	Manufactures
59	741	Tea	1	Food and bev.
60	751	Pepper of "piper"; pimento of "capsicum or pimenta"	1	Food and bev.
61	811	Hay and fodder, green or dry	1	Animals
62	812	Bran, sharps and other residues derives of cereals	1	Food and bev.
63	813	Oilcake and other residues (except dregs)	1	Oils
64	819	Food waste and prepared animal feed, nes	1	Animals
65	821	Furniture and parts thereof	4	Manufactures
66	895	Office and stationary supplies, nes	4	Manufactures
67	896	Works of art, collectors' pieces and antiques	3	Manufactures
68	897	Gold, silver ware, jewelry and precious materials, nes	2	Commodities
69	941	Animals, live, nes, (including zoo animals, pets, insects, etc)	1	Animals
70	1111	Drugs, Opium and poppy	1	Chemicals
71	2320	Natural rubber latex; natural rubber and gums	1	Commodities
72	2450	Fuel wood and wood charcoal	1	Commodities
73	2482	Wood, sawn, planed, tongued, grooved, etc	1	Commodities
74	2614	Silk worm cocoons and silk waste	1	Commodities
75	2652	True hemp, raw or processed, tow and waste	1	Commodities
76	2659	Coir (coconut fibres) and coir waste	1	Commodities
77	2671	Regenerated fibre suitable for spinning	3	Manufactures
78	2731	Marble, travertine, building stone, etc, roughly worked	1	Commodities
79	2877	Manganese ore and concentrates	1	Metals
80	2911	Bones, ivory, horns, coral, shells and similar products	1	Animals
81	2919	Skins and parts of birds with feathers or down, etc	1	Animals
82	2922	Natural gums, resins, lacs and balsams	1	Commodities
83	2924	Plants and trees used in perfumery; in pharmacy; etc	1	Commodities
84	2926	Live plants, bulbs, etc	1	Commodities
85	3344	Fuel oils, nes	1	Oils
86	3351	Petroleum jelly and mineral waxes	2	Chemicals
87	3353	Mineral tar pitch, pitch coke	1	Commodities
88	4243	Coconut (copra) oil	1	Food and bev.
89	4245	Castor oil	1	Oils
90	4314	Waxes of animal or vegetable origin	2	Chemicals

Num.	SITC	Item	Cat.	Archival Category
91	5169	Organic chemicals, nes	2	Chemicals
92	5221	Chemical elements	2	Chemicals
93	5233	Salts of metallic acids	1	Food and bev.
94	5334	Varnishes and lacquers; distempers etc	3	Manufactures
95	5621	Mineral or chemical fertilizers, nitrogenous	1	Chemicals
96	5922	Albuminoid substances; glues	2	Chemicals
97	5989	Prepared culture media for development of micro-organisms	1	Commodities
98	6118	Leather, specially dressed or finished, nes	3	Manufactures
99	6122	Saddlery and harness, of any material, for any kind of animal	3	Manufactures
100	6354	Manufactures of wood for domestic or decorative use	2	Commodities
101	6359	Spools, cops, bobbins, sewing thread reels, etc, of turned wood	3	Manufactures
102	6511	Yarn spun from noil or other waste of silk, not for retail sale	2	Manufactures
103	6513	Cotton yarn	2	Manufactures
104	6541	Fabrics, woven, of silk, of noil or other waste silk	3	Manufactures
105	6545	Fabrics, woven of jute of heading 2640	3	Manufactures
106	6575	Other articles made from yarn, twine, cordage, rope or cable	3	Manufactures
107	6581	Bags, sacks of textile materials, for the packing of goods	3	Commodities
108	6582	Tarpaulins, sails, tents, camping goods, etc, of textile fabrics	4	Manufactures
109	6584	Other furnishing articles of cotton	3	Manufactures
110	6592	Carpets, carpeting and rugs, knotted	4	Manufactures
111	6612	Cement	2	Manufactures
112	6613	Road and paving setts, curb and flagstones, of natural stone	3	Manufactures
113	6618	Construction materials, of cement or fibre-cements, etc	4	Commodities
114	6624	Building bricks	2	Manufactures
115	6645	Cast, rolled glass (flashed or wired), worked, in rectangles	4	Metals
116	6646	Bricks, tiles, etc of pressed or moulded glass, used in building	2	Manufactures
117	6664	Porcelain or china house ware	4	Manufactures
118	6665	Articles of domestic or toilet purposes, of other kind of pottery	3	Manufactures
119	6673	Precious and semi-precious stones, not mounted, set or strung	1	Commodities
120	6712	Pig iron, cast iron, spiegeleisen, in pigs, blocks, lumps, etc	3	Metals
121	6731	Wire rod of iron or steel	3	Metals
122	6732	Bars, rods, forget, cold formed, etc	3	Metals
123	6741	Universal plates of iron or steel	2	Metals
124	6747	Tinned sheets, plates of steel (not of high carbon or alloy steel)	3	Metals
125	6812	Metals of platinum group, or semi-manufactured	3	Metals
126	6973	Cooking apparatus, plate warmers, non-electrical, iron, steel	3	Metals
127	6997	Anchors and grapnels and parts, of iron or steel	4	Metals
128	7263	Machinery, accessories for type-setting, for printing, etc	4	Manufactures
129	7271	Machinery for the grain industry; working cereals, parts	4	Metals
130	7281	Mach-tools for working wood, or carving materials	1	Commodities
131	7361	Drilling and boring machines, metalworking	4	Manufactures
132	7641	Electrical line telephonic and telegraphic apparatus	4	Manufactures
133	7861	Containers for carriage by modes of transport	4	Manufactures
134	7919	Parts, nes railway, tramway locomotives, 7911-7915	4	Manufactures
135	7932	Ships, boats and other vessels	4	Manufactures

Num.	SITC	Item	Cat.	Archival Category
136	8471	Shawls, scarves, mantillas, veils and the like	3	Manufactures
137	8745	Measuring, controlling and scientific instruments, nes	4	Manufactures
138	8921	Printed books, pamphlets, maps and globes	4	Manufactures
139	8942	Children's toys, indoor games, etc	4	Manufactures
140	8946	Firearms, nes	4	Manufactures
141	8982	Musical instruments, nes	4	Manufactures
142	8993	Candles, matches, combustible products, etc	2	Manufactures
143	8994	Umbrellas, canes and similar articles and parts thereof	4	Manufactures
144	8997	Basketwork, wickerwork; brooms, paint rollers, etc	4	Manufactures
145	8998	Buttons and button moulds, studs, etc; blanks and parts	3	Manufactures
146	9510	Artillery weapons, other military firearms and projectors	4	Manufactures
147	9610	Coin (other than gold coin), not being legal tender	3	Metals
148	9809	Food preparations, nes	1	Food and bev.
149	89972	Brushes, brooms, mops, etc, of vegetable materials	3	Manufactures

4.14 Bibliography

primary sources

Annual Statement of the trade and navigation of the Bengal Presidency. Report General on External Commerce, issuing body 17 - 23. Government at the Education Society's Press, London: India Office, 1875, 1880, 1885, 1890, 1895, 1900, 1905, 1910.

Annual Statement of the trade and navigation of the Presidency of Bombay. Report General on External Commerce, issuing body 17 - 23. Government at the Education Society's Press, London: India Office, 1875, 1880, 1885, 1890, 1895, 1900, 1905, 1910.

Statistical Abstract relating to British India from 1875/6 to 1884/5. Annual Series 20. Eyre and Spottiswoode, London: House of Commons Parliamentary Papers, 1886.

Statistical Abstract relating to British India from 1877/8 to 1886/7. Annual Series 22. Eyre and Spottiswoode, London: House of Commons Parliamentary Papers, 1888.

Statistical Abstract relating to British India from 1881/2 to 1889/90. Annual Series 25. Eyre and Spottiswoode, London: House of Commons Parliamentary Papers, 1891.

Statistical Abstract relating to British India from 1885/6 to 1894/5. Annual Series 30. Eyre and Spottiswoode, London: House of Commons Parliamentary Papers, 1896.

Statistical Abstract relating to British India from 1888/89 to 1897/98. Annual Series 33. Stationary Office, Wyman and Sons, London: House of Commons Parliamentary Papers, 1899.

Statistical Abstract relating to British India from 1892/3 to 1901/2. Annual Series 37. Stationary Office, Wyman and Sons, London: House of Commons Parliamentary Papers, 1903.

Statistical Abstract relating to British India from 1895/96 to 1904/05. Annual Series 40. Stationary Office, Wyman and Sons, London: House of Commons Parliamentary Papers, 1906.

Statistical Abstract relating to British India from 1903/04 to 1912/13. Annual Series 48. Stationary Office, London: House of Commons Parliamentary Papers, 1915.

Statistical Abstract relating to British India from 1912/13 to 1921/22. Annual Series 57. Stationary Office, London: House of Commons Parliamentary Papers, 1925.

SECONDARY SOURCES

Acemoglu, Daron, and Jaume Ventura. "The World Income Distribution." *Quarterly Journal of Economics* 117, no. 2 (May 2002): 659–694.

Albornoz, Facundo, Hector F. Calvo Pardo, Gregory Corcos, and Emanuel Ornelas. "Sequential Exporting." *Journal of International Economics* 88, no. 1 (February 2012): 17–31.

Amrith, Sunil S. *Crossing the Bay of Bengal: The furies of nature and the fortunes of migrants*. Cambridge, MA: Harvard University Press, 2013.

Bagchi, Amiya Kumar. "Elites in South Asia." Chap. European and Indian Entrepreneurship in India, 1900 - 1930, edited by Edmund Leach and S. N. Mukherjee, 1:223–256. 11. Cambridge, England: Cambridge University Press, 1970.

Balakrishna, R. *Regional Planning in India*. 1st ed. Bangalore City: Bangalore Printing / Publishing Company, 1948.

Benetrix, Agustin S., Kevin H. O'Rourke, and Jeffrey G. Williamson. "The spread of manufacturing to the poor periphery, 1870 - 2007." *National Bureau of Economic Research Working Paper Series* 18221, no. 1 (July 2012): 1–78.

Besedes, Tibor, and Thomas J. Prusa. "Ins, Outs, and the Duration of Trade." *Canadian Journal of Economics* 39, no. 1 (February 2006): 266–295.

———. "The role of extensive and intensive margins and export growth." *National Bureau of Economic Research Working Paper Series* 13628, no. 1 (November 2007): 1–23.

Broadberry, Stephen, Johann Custodis, and Bishnupriya Gupta. "India and the great divergence: An Anglo-Indian comparison of GDP per capita, 1600 - 1871." *Explorations in Economic History* 55, no. 1 (2015): 58–75.

Broda, Christian, and David E. Weinstein. "Globalisation and the Gains from Variety." *Quarterly Journal of Economics* 121, no. 2 (May 2006): 541–585.

Burton, Antionette, Madhavi Kale, Isabel Hofmeyr, Clare Anderson, Christopher J. Lee, and Nile Green. "Sea Tracks and Trails: Indian Ocean Worlds as Method." *History Compass* 11, no. 7 (2013): 497–502.

Chandavarkar, Rajnarayan. *The Origins of Industrial Capitalism in India: Business Strategies and the Working Classes in Bombay, 1900 - 1940*. Cambridge, England: Cambridge University Press, 1994.

Crozet, Matthieu, and Pamina Koenig. "Structural Gravity Equations with Intensive and Extensive Margins." *Canadian Journal of Economics* 43, no. 1 (2010): 41–6 2.

Desai, S. S. M. *Economic History of India*. 1st ed. Ramdoot, Dr. Bhalerao Marg, Girgaon, Bombay: Himalaya Publishing House, June 1980.

Disdier, Anne-Celia, and Keith Head. "The Puzzling Persistence of the Distance Effect on Bilateral Trade." *Review of Economics and Statistics* 90, no. 1 (2008): 37–48.

Eaton, Jonathan, Samuel Kortum, and Francis Kramarz. "An Anatomy of International Trade: Evidence from French Firms." *Econometrica* 79, no. 5 (September 2011): 1453–1498.

Feenstra, Robert C. "New Product Varieties and the Measurmenet of International Prices." *American Economic Review* 84, no. 1 (March 1994): 157–177.

Felbermayer, Gabriel J., and Wilhelm Kohler. “Exploring the intensive and extensive margins of world trade.” *Review of World Economics* 142, no. 4 (2006): 642–674.

Ferguson, Niall, and Moritz Schularick. “The Empire Effect: The determinants of country risk in the first age of globalisation, 1880 - 1913.” *Journal of Economic History* 66, no. 2 (June 2006): 283–312.

Frost, Mark Ravinder. “Wider Opportunities: Religious Revival, Nationalist Awakening, and the Global Dimension in Colombo, 1870 - 1920".” *Modern Asian Studies* 36, no. 1 (2002): 937–67.

Giovanni, Julian di, and Andrei A. Levchenko. “Putting the parts together: Trade, vertical linkages, and business cycle comovement.” *American Economic Journal: Macroeconomics* 2, no. 2 (April 2010): 95–124.

Goswami, Omkar. “Calcutta, The Living City.” Chap. Calcutta’s Economy, 1918 - 1970: The Fall from Grace, edited by Sukanta Chaudhuri, 2:88–96. Oxford, UK: Oxford University Press, 1990.

Green, Nile. “Maritime Worlds and Global History: Comparing the Mediterranean and Indian Ocean though Barcelona and Bombay.” *History Compass* 11, no. 7 (2013): 513–523.

Grossman, Gene. “The Regionalisation of the World Economy.” Chap. Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World?, edited by Jeffrey A. Frankel, 29–31. Chicago: University of Chicago Press, 1998.

Hausman, Jerry. “Exact Consumer’s Surplus and Deadweight Loss.” *American Economic Review* 71, no. 1 (1981): 662–676.

Hausmann, Ricardo, Jason Hwang, and Dani Rodrik. “What you export matters.” *Journal of Economic Growth* 12, no. 1 (2007): 1–25.

Hazareesingh, Sandip. “Interconnected synchronicities: The production of Bombay and Glasgow as modern global ports, c. 1850 - 1880.” *Journal of Global History* 4, no. 1 (March 2009): 7–31.

Helpman, Elhanan, and Paul R. Krugman. *Market Structure and Foreign Trade: Increasing returns, imperfect competition, and the international economy*. Cambridge, MA: MIT Press, 1986.

———. *Trade Policy and Market Structure*. London: MIT Press, 1989.

Helpman, Elhanan, Marc Melitz, and Yona Rubinstein. “Estimating trade flows: Trading partners and trading volumes.” *Quarterly Journal of Economics* 123, no. 2 (May 2008): 441–487.

Hesse, Heiko. “Export diversification and economic growth.” *World Bank Commission on Growth and Development Working Papers*, no. 21 (2008): 1–23.

Hofmeyr, Isabel, Preben Kaarsholm, and Bodil Folke Frederiksen. “Print Cultures, Nationalisms, and Publics in the Indian Ocean.” *Journal of the International African Institutue* 81, no. 1 (2011): 1–22.

Holland, Sir T. H., KCSI, KCIE, D.Sc., and FRS. *Report of the Indian Industrial Commission*. Parliamentary Papers. Calcutta: Indian Industrial Commission, 1918.

Huberman, Michael, Christopher M. Meissner, and Kim Oosterlinck. “Technology and Geography in the Second Industrial Revolution: New Evidence from the Margins of Trade.” *Journal of Economic History* 77, no. 1 (March 2017): 39–71.

Huff, Gregg. "Export-led growth, gateway cities, and urban systems development in pre-World War II Southeast Asia." *Journal of Development Studies* 48, no. 10 (August 2012): 1431–1452.

———. "Globalisation, natural resources, and foreign investment: A view from the resource rich tropics." *Oxford Economic Papers* 59, no. 5 (2007): 127–158.

Hummels, David, and Peter J. Klenow. "The variety and quality of a nation's exports." *American Economic Review* 95, no. 3 (June 2005): 704–723.

Hunter, William Wilson. *The Indian Empire: Its Peoples, History, and Products*. London: W. H. Allen / Co., 1893.

Jog, N. G. "The Oxford India Anthology of Business History." Chap. Challenging European Monopolies: The story of Scindia Shipping, edited by Medha M. Kudaisya, 274–281. 27. Oxford, UK: Oxford University Press, 2011.

Kehoe, Timothy J., and Kim J. Ruhl. "How important is the new goods margin in international trade?" *Journal of Political Economy* 121, no. 2 (April 2013): 358–392.

Klinger, Bailey, and Daniel Lederman. "Export discoveries, diversification, and barriers to entry." *Economic Systems* 35, no. 1 (2011): 64–83.

Krugman, Paul R. "First nature, second nature, and metropolitan location." *Journal of Regional Science* 33, no. 2 (1993): 129–144.

———. "Increasing returns and economic geography." *Journal of Political Economy* 99, no. 3 (1991): 483–499.

———. "Increasing Returns, Monopolistic Competition, and International Trade." *Journal of International Economics* 9, no. 1 (February 1979): 469–479.

———. "Trade, accumulation, and uneven development." *Journal of Development Economics* 8, no. 2 (1981): 149–161.

Krugman, Paul R., and Anthony J. Venables. "Globalisation and the inequality of nations." *Quarterly Journal of Economics* 110, no. 4 (November 1995): 857–880.

Lederman, Daniel, and William F. Maloney. *Does what you export matter? In search of empirical guidance for industrial policies*. Washington DC: The World Bank, 2012.

———. "Natural Resrouces, Neither Curse nor Destiny." Chap. Trade Structure and Growth, edited by Daniel Lederman and William F. Maloney, 15–40. 2. Washington DC: World Bank Publications, 2007.

Markovits, Claude. *Merchants, Traders, Entrepreneurs: Indian business in the colonial period*. Basingstoke, Hampshire: Palgrave Macmillan, 2008.

———. "The Oxford India Anthology of Business History." Chap. Premier Industrial Centres: Bombay and Calcutta, edited by Medha M. Kudaisya, 1:282–297. 28. Oxford, UK: Oxford University Press, 2011.

Markusen, James R. "Expansion of trade at the extensive margin: A general gains-from-trade result and illustrative examples." *Journal of International Economics* 89, no. 1 (April 2013): 262–270.

Meissner, Christopher M., and John P. Tang. "Upstart Industrialisation and Exports: Evidence from Japan, 1880 - 1910." *Journal of Economic History* 78, no. 4 (December 2018): 1068–1102.

Mitchener, Kris James, and Marc Weidenmier. "Trade and Empire." *Economic Journal* 118, no. 533 (November 2008): 1805–1834.

Morris, Morris D. "Cambridge Economic History of India." Chap. 7, edited by Dharma Kumar and Meghnad Desai, 2:551–676. Cambridge, England: Cambridge University Press, 1983.

Oonk, Gijsbert. *Global Indian Diasporas: Exploring Trajectories of Migration and Theory*. Amsterdam, Netherlands: Amsterdam University Press, 2007.

Park, Richard L. "Administration and Economic Development in India." Chap. Administrative Coordination and Economic Development in the Districts of India, edited by Ralph Braibanti and Joseph J. Spengler, 134–151. 4. Durham, NC: Duke University Press, 1963.

Patel, Simin. "Cultural intermediaries in a colonial city: The Parsis of Bombay, 1860 - 1921." PhD diss., Oxford University, 2015.

Ray, R. K. *Industrialisation in India: Growth and Conflict in the Private Sector, 1914 - 1947*. Delhi, 1979.

Roy, Tirthankar. *The Economic History of India*. Vol. 1. Oxford, UK: Oxford University Press, 2011.

———. "The Oxford India Anthology of Business History." Chap. Milestones in the Rise of Indian Industry, edited by Medha M. Kudaisya, 1:225–234. 24. Oxford, UK: Oxford University Press, 2011.

Rutnagur, Sorabji M. *Bombay Industries: The Cotton Mill. A review of the progress of the textile industry in Bombay from 1850 to 1926 and the present constitution, management, and financial position of the spinning and weaving factories*. Bombay: Indian Textile Journal, 1927.

Seth, Vijay K. *Ascent and Decline of Native and Colonial Trading: Tale of Four Indian Cities*. New Delhi: Sage Publications, 2019.

Sethia, Tara. "The rise of the jute manufacturing industry in colonial India: A global perspective." *Journal of World History* 7, no. 1 (Spring 1996): 71–99.

Sinha, Aseema. *The Regional Roots of Development Politics in India: A Divided Leviathan*. Bloomington: Indiana University Press, 2005.

Tomlinson, Jim. *Dundee and the empire: 'Juteopolis', 1850 - 1939*. Vol. 1. Edinburgh, Scotland: Edinburgh University Press, 2014.

Twomey, Michael J. "Employment in Nineteenth Century Indian Textiles." *Explorations in Economic History* 20, no. 1 (1983): 37–57.

Vink, Markus P.M. "Indian Ocean Studies and the 'New Thalassology'." *Journal of Global History* 2, no. 1 (2007): 41–62.

Williamson, Jeffrey G. *Trade and Poverty: When the Third World Fell Behind*. Cambridge, MA: MIT Press, 2011.

———. "When, where, and why? Early industrialisation in the poor periphery." *National Bureau of Economic Research Working Paper Series* 16344, no. 1 (September 2010): 1–47.

Chapter 5

Conclusion

5.1 Indian Ocean history in the long–run

Although this thesis has focused on a relatively narrow timeframe in the history of the Indian Ocean, by studying the region in the era of high imperialism between 1870 to 1914, this thesis evaluates a crucial turning point to understanding Indian Ocean history in the *longue durée*, and the implications that such a framework had on the regional economy. The question of whether or not the arrival of European colonialism from approximately 1800 represented the end of Indian Ocean history, or whether it was simply a temporary aberration in a much longer history, has been broadly addressed in this thesis by applying the framework of maritime world history to the regional economy at the height of European imperialism, a period in which the Indian Ocean region was entirely absorbed into the global periphery. As the primary form of analysis for maritime world historians has been the identification and study of long–distance trade routes across disparate regions connected by the ocean, this thesis has similarly studied the Indian Ocean economy according to such routes. However, rather than simply determining the existence of linkages and networks during the colonial period, this thesis has focused instead on a quantitative analysis of trade to construct an empirical 'model' of the Indian Ocean economy, one that not only empirically assesses how the era of high imperialism fits into the history of the Indian Ocean, but also how such long–run, long–distance trade routes influenced the region's economic development.

This thesis has shown that the traditional transoceanic linkages and maritime frameworks that have defined the history of the Indian Ocean up until the arrival of European imperialism persisted throughout the colonial period. Additionally, by analysing the economic effects of trade routes and forms of unity across the ocean, this thesis has broadly demonstrated that Indian Ocean unity

was a significant factor in contributing to regional economic growth in terms of driving market integration, lowering trade costs, and serving as a significant destination market for large–scale industrial exports for the region's primary port cities. However since this thesis has demonstrated the continuity of frameworks of maritime world unity and the implications of such a unity on an Indian Ocean economy beyond the era of high imperialism, and since maritime world history is often understood only in the *longue durée*, the question subsequently becomes when or even if such a maritime framework to the region's history, and particularly the region's economy, ever ended?

As the effects of colonialism have lasting consequences on the economies of post–colonial nation–states of the region today, the 'model' of the Indian Ocean economy that has been evaluated in this thesis bears significant implications that may continue to inform and shape perspectives on regional trade and and frameworks for economic growth in the future.[1] China's international trade and infrastructure development plan, the Belt and Road Initiative (BRI), is designed with the objective of increasing the economic integration in countries across Europe, Asia, and Africa, and is an example of how historically–based, transoceanic and transcontinental frameworks to economic integration and development continue to influence conceptualisations of regional trade policies and agreements in the twenty–first century.[2] Similarly, the Trans–Pacific Partnership (TPP) was intended to create a fully economically integrated free trade area spanning the entire Pacific Ocean.[3] As this thesis has shown the historical continuity and economic significance of frameworks of Indian Ocean unity throughout the modern period, an analysis of the Indian Ocean economy in the era of high imperialism illustrates three important lessons that can inform, and are reflected in current geopolitical strategies and perspectives of international trade agreements and infrastructure developments, which are: the persistence of historical trade routes in economic development, the significance of perspectives of maritime geography, and the importance of the Indian Ocean in the global economy.[4]

First, this thesis is about the history and persistence of long–distance trade routes. It has looked at the role of historic trade routes overseas in contributing to regional market integration, relative

1. Daron Acemoglu and James Robinson, "The colonial origins of comparative development: An empirical investigation," *American Economic Review* 91, no. 5 (December 2001): 1369–1401; Daron Acemoglu, Simon Johnson, and James A. Robinson, "Reversal of fortune: Geography and institutions in the making of the modern world income distribution," *Quarterly Journal of Economics* 117, no. 4 (November 2002): 1231–1294; Daron Acemoglu, Simon Johnson, and James A. Robinson, "The Rise of Europe: Atlantic Trade, Institutional Change, and Economic Growth," *American Economic Review* 95, no. 3 (June 2005): 546–579.

2. *Action plan on the Belt and Road Initiative*, Action plan (Beijing, China: The State Council of the People's Republic of China, 2015).

3. C. L. Lim, Deborah Elms, and Patrick Low, "The Trans-Pacific Partnership: A Quest for a Twenty-first Century Trade Agreement," chap. What is "high-quality, twenty-first century" anyway?, ed. C. L. Lim, Deborah Elms, and Patrick Low, 1 (Cambridge: Cambridge University Press, 2012), 1–18.

4. Barry Eichengreen and Douglas A. Irwin, "Trade blocs, currency blocs, and the reorientation of world trade in the 1930s," *Journal of International Economics* 38, no. 1 (1995): 1–24.

trade costs on various routes within and between the Indian Ocean and other regions, and the margins of trade to different destination regions for the major industrialising port cities. Drawing from British, French, and Dutch colonial trade statistics for individual cities across the Indian Ocean, this thesis has established quantitative measures on the economic significance and historical persistence of such long–distance trade routes that have formed so much of the foundation of maritime world studies.[5] Determining the importance of these historic trade routes is based on their relative contribution to the process of regional market integration. Analysis of market integration and relative trade costs from chapters 2 and 3 have broadly confirmed the claim made by Indian Ocean historians that while "preexisting interregional networks were utilised, moulded, reordered, and rendered subservient by Western capital and the more powerful colonial states...they were never torn apart."[6]

The broader implications of the persistence of historical trade routes shows that the history of long–distance trade patterns across the Indian Ocean continued to operate and influence the process of industrialisation in the region in the modern era, even as such routes were absorbed into a larger process of globalisation centred around an industrialising Europe. The persistence of linkages across the Indian Ocean in the modern era contributed to supporting the export industry of two major colonial entrepots in the region, Bombay and Calcutta, as evaluated in chapter 4. While the persistence of these historical structures and networks may have been overlooked by colonial administrators in the Indian Ocean in the early twentieth century, this thesis has demonstrated their continued significance to the process of market integration and the development of industry in the global periphery under colonialism. Perhaps more importantly for the future is that policymakers and diplomats recognise the importance of historical and traditional trade routes beyond post–colonial or national boundaries, and how such routes should serve as the foundation upon which modern forms of economic integration, trade, and infrastructure policies and projects are designed, such as how China's plans for the Belt and Road Initiative are based upon and inspired by the ancient silk road trade routes.[7]

5. K. N. Chaudhuri, *Trade and Civilisation in the Indian Ocean: An Economic History from the Rise of Islam to 1750* (London: Cambridge University Press, 1985), pp. 7 - 8.

6. Sugata Bose, *A Hundred Horizons: The Indian Ocean in the Age of Global Empire* (Cambridge, MA: Harvard University Press, 2006), pp. 14.

7. As part of promoting the BRI, China evokes the symbolism and imagery of the famous ancient trade route by naming both initiatives after the Silk Road. The Silk Road Economic Belt maps closely to the ancient overland historical trade routes that connected the three continents, with the development of modern infrastructure including roads, rail, pipelines, and communication networks. The second plan involves the development of ports overseas to expand connectivity across the Indian Ocean, referred to as the 21st Century Maritime Silk Road. In doing so, China rhetorically appeals to the spirit and principles of the route, as they state, "more than two millennia ago the diligent and courageous people of Eurasia explored and opened up several routes of trade and cultural exchanges that linked the major civilisations of Asia, Europe, and Africa, collectively called the Silk Road by later generations. For thousands of years, the Silk Road spirit of peace and cooperation, openness and inclusiveness, mutual learning and mutual benefit, has been passed

Second, this thesis is about frameworks of maritime world history. Although historical long–distance trade routes have been the basic form of analysis in this thesis, the primary inspiration for evaluating trade routes and regional integration according to maritime regions is more broadly related to the growing literature on Indian Ocean history, and maritime world history in general. Since Fernand Braudel's history of the Mediterranean world, historians have provided new perspectives to understanding social and cultural organisation and historical processes that are not defined by land, but by the seas. Although historical in their analysis, the identification of trade routes and linkages across the seas has formed the initial basis upon which such forms of maritime unity have been studied.[8] As studies of maritime world history have developed, particularly for the Mediterranean and Indian Ocean worlds, other forms of unity have emerged beyond trade networks. Historical trade routes have been studied in terms of material culture and practices, migration, and the exchange of ideas, but they have never formed the basis of an economic study.[9] Yet maritime world historians have often posed the question of whether or not such trade networks and linkages could form the basis for building a 'model' of the maritime world economy.[10] Since the general focus of maritime world history has been on studying the early modern period, constructing a quantitative 'model' of the maritime world economy would be difficult, given the limitations on data availability for the time period, and the need for any data to be consistently collected over a very large geography, encompassing several countries.

However more recent studies including Bose (2006) and Amrith (2013) have begun exploring Indian Ocean unity in the modern period.[11] It is based on this recent literature of Indian Ocean unity in the modern period, in the era of high imperialism, which presents an opportunity to address the questions initially posed by Mediterranean and Indian Ocean historians of whether or not a quantitative model of the maritime world can be constructed and analysed on the basis of

---

from generation to generation, promoted the progress of human civilisation, and contributed greatly to the prosperity and development of the countries along the Silk Road. Symbolising communication and cooperation between the East and the West, the Silk Road Spirit is a historic and cultural heritage shared by all countries around the world." (*Action plan on the Belt and Road Initiative*) Although plans for the BRI will change the pathways, structure, and organisation of trade and the economies of the countries involved, by drawing from the rhetoric of "reviving the ancient Silk Road trade route" instead of naming the initiative after a future imagery or vision of how global trade and economic integration will be remade under the BRI, it suggests that the plans are intended to rebuild and reinforce trade routes and pathways as they had traditionally, historically, and naturally evolved.

8. Fernand Braudel, *The Mediterranean and the Mediterranean World in the Age of Philip II*, vol. 1 (London: Harper Row, 1966), pp. 276 - 295.

9. Chaudhuri, *Trade and Civilisation in the Indian Ocean: An Economic History from the Rise of Islam to 1750*, pp. 1 - 6.

10. "Have we here enough material to measure the Mediterranean, to construct a comprehensive, quantitative 'model' of its economy? As a unit it could then be compared to other 'world economies' either bordering on or connected to the Mediterranean." (Braudel, *The Mediterranean and the Mediterranean World in the Age of Philip II*, pp. 418 - 419)

11. Bose, *A Hundred Horizons: The Indian Ocean in the Age of Global Empire*; Sunil S. Amrith, *Crossing the Bay of Bengal: The furies of nature and the fortunes of migrants* (Cambridge: Harvard University Press, 2013).

trade routes and networks. By comparatively evaluating the process of market integration between different types of bilateral city pairs in chapter 2, and the relative trade costs on different routes as done in chapter 3, both chapters provide a quantitive assessment of measures of maritime unity that functions as a model of the Indian Ocean economy, which can be compared to other, similarly constituted maritime worlds. The effect of an integrated Indian Ocean market in supporting large–scale manufacturing at the region's major port cities is assessed in chapter 4, showing that manufacturing exports from Bombay and Calcutta heavily relied on an integrated Indian Ocean market to support industrial production of more highly differentiated goods. A study that would not have been possible in the early modern history of the Indian Ocean due to the paucity of regular, annual data on trades, trade costs, and commodity prices, has only been made possible by the recent endeavours of Indian Ocean historians exploring forms of transoceanic unity in the modern era.[12]

Through analysis of trade statistics collected for individual cities across the Indian Ocean, this thesis has shown that long–distance historical trade routes overseas and maritime perspectives to history continued to operate as factors shaping Indian Ocean integration and industrialisation. Evidence across chapters suggests that the oceans and the seas were not, in fact, barriers between colonial entities or regions.[13] Instead the oceans functioned as the primary factor driving trade, integration, and ultimately supporting manufacturing and industrialisation at the major Indian Ocean port cities. While the significance of economic unity across the Indian Ocean for regional trade and industrialisation may have been overlooked under more traditional perspectives of historical economic development according to territorial and continental empires, nations, or regions, this thesis has demonstrated the continued significance of maritime perspectives to understanding regional economic development. Maritime perspectives are only beginning to change the spatial

12. In *La Méditerranée* Braudel discusses his initial idea, addressing his question on whether or not it is possible to construct a quantitative model of the Mediterranean economy on the basis of the size of cities, and the price and quantity of trades between ports, "It was my original idea that the many dimensions of the Mediterranean in the sixteenth century should be suggested through a series of examples, by selecting certain important and indicative details: a city of 700,000 inhabitants, Constantinople; a grain fleet which every year, good or bad, ferried a million quintals of wheat or other cereals; the 3,000 or so tons of wool which in 1580 lay on the quaysides of Leghorn...But this would mean leaving enormous blank spaces between the specs of colour; at best, it would only give an impressionistic notion of the distance that separates our world from that of the sixteenth century. Today, on the other hand, I am more attracted towards the language of what economists call 'national accounting'. I should like to try and draw up a tentative balance sheet of the Mediterranean in the sixteenth century not in order to judge its relative mediocrity or modernity but to determine the relative proportions and relationships between the different sectors of its activity, in short, to form a picture of the major structures of its material life: a difficult and hazardous project. The risks involved will be apparent to any economist who has studied the economies of underdeveloped countries which have never been fully penetrated by the monetary economy. The same was true everywhere in the sixteenth century. And the variety of moneys, real and artificial, complicate any calculations, even when precise data is available, which of course it usually is not." (Braudel, *The Mediterranean and the Mediterranean World in the Age of Philip II*, pp. 419 - 420)

13. Michael Pearson, *The Indian Ocean* (London: Routledge, 2003), pp. 1 - 12.

conceptualisation of free trade areas for policymakers in the twenty–first century; in the case of China's Maritime Silk Road based around the Indian Ocean, and the United States' Trans–Pacific Partnership based around the Pacific Ocean, both proposals acknowledge the importance of economic integration based around large, maritime regions for future economic development.

Third, this thesis is about the history of the global periphery. In general, due to the difficulty in collecting data for countries of Asia and Africa, the economic history of these regions tends to focus on colonial–based units of analysis.[14] Part of the objectives of this thesis has been to evaluate economic unity according to maritime geography as well as to study trade routes and networks as they existed beyond externally imposed colonial boundaries and sub–continental regional definitions. While the primary role and the main economy of several former colonial states of Asia and Africa were based on staple commodity exports to Europe, this thesis has sought to look at the colonial economies beyond their primary roles, and instead based on historical pre–colonial trade routes, and the small but growing manufacturing industries at the major port cities in the late nineteenth and early twentieth centuries. In doing so, this thesis finds the persistence of historical trade routes and networks overseas, and identifies how such transoceanic patterns of unity and integration contributed to growing export manufacturing in an era in which the region's economy was entirely dominated by commodity exports to Europe.[15]

An analysis of trade routes, trade costs, and trade margins, each studied in chapters 2, 3, and 4 respectively, demonstrates that there was a much more dynamic economy operating across the Indian Ocean beneath the primary peripheral commodity export economy. The trades and industries of the Indian Ocean were based around the "bazaar nexus occupying the intermediate tier of a three–tiered system – with European capital at the top and the world of peasants, peddlers, and pawnbrokers below – provided the critical link across the Indian Ocean during the nineteenth century."[16] The networks and linkages of the bazaar economy, involving trades and exchanges between merchants, financiers, and entrepreneurs from across the Indian Ocean world provided the basic framework for studying Indian Ocean unity as the intermediate tier of the regional economy, below the first and primary tier of the commodity export trade with Europe. The broad characterisation and the vast majority of research on the colonial economy has been framed as being almost entirely

14. Roman Studer, "India and the Great Divergence: Assessing the Efficiency of Grain Markets in Eighteenth and Nineteenth Century India," *Journal of Economic History* 68, no. 2 (2008): 393–437; Dave Donaldson, "Railroads of the Raj: Estimating the Impact of Transportation Infrastructure," *LSE Asia Research Centre Working Papers*, no. 41 (2010): 1–54; Gregg Huff, "Export-led Growth, Gateway Cities and Urban Systems Development in Pre-World War II Southeast Asia," *Journal of Development Studies* 48, no. 10 (August 2012): 1431–1452.

15. Jeffrey G. Williamson, *Trade and Poverty: When the Third World Fell Behind* (London: MIT Press, 2011), pp. 45 - 58.

16. Bose, *A Hundred Horizons: The Indian Ocean in the Age of Global Empire*, pp. 14.

based on the first tier.[17] However this thesis has shown the importance of the intermediate tier to colonial economic development, as it contributed to a distinctively integrated regional market, and as it contributed to the growth of industrial exports at the region's major entrepot cities.

What had previously been neglected as an economy of the global periphery in the nineteenth and early twentieth centuries only began to be noticed as a competitive rival to businesses and industries of the global core during the Great Depression.[18] However in the twenty–first century, the region has become the focus of the global economy and geopolitical attention, as the United States planned for an 'Asia pivot' through the TPP, and as China plans to integrate the economies of Europe, Asia, and Africa through the BRI. As the two largest economies of the twenty–first century build international partnerships and regional trade agreements across the region, historical and transoceanic linkages have taken on new importance as the centre of the global economy shifts back to Asia and the Indian Ocean. New linkages and alternative geographies to Asia see it more than just the largest continental landmass, but instead it is seen in the diversity of its economic, cultural, social, and historical linkages with the rest of the world. By focusing on the historical economic relationships within Asia – not in relation to developed or industrialised regions of the world – this thesis has identified the persistence and significance of such trade structures based entirely within the former global periphery of Asia and Africa that, like the ancient Silk Road trade routes, will become increasingly important in the twenty–first century. As the themes of historical trade routes, maritime geographies, and an Asia–centred economy have moved from the realm of historical study to the forefront of international relations, this thesis has demonstrated the relevance of all three themes to Asian economic history.

17. Kris James Mitchener and Marc Weidenmier, "Trade and Empire," *The Economic Journal* 118, no. 533 (November 2008): 1805–1834; Daron Acemoglu, Simon Johnson, and James Robinson, "The Rise of Europe: Atlantic Trade, Institutional Change, and Economic Growth," *American Economic Review* 95, no. 3 (June 2005): 546–579; Niall Ferguson and Moritz Schularick, "The Empire Effect: The Determinants of Country Risk in the First Age of Globalisation, 1880 - 1913," *Journal of Economic History* 66, no. 2 (June 2006): 283–312.

18. A report of the British government in 1934 expressing their perspective on the nature of the trading relationship between Britain and the colonies, "a United Kingdom predominantly industrial and overseas dependencies primarily engaged in the production of raw materials for use in the United Kingdom industries and food supplies for consumption in the United Kingdom."; *Report of the Interdepartmental Committee on the Industrial Development of the Colonial Empire, Article 3.* Despite the proposed nature of the trading relationship between Britain and the Asian colonies, colonial administrators were surprised at the recent growth in size and scale of large–scale manufacturing exports from the colonial port cities, as in the case of Singapore, "the present position of Singapore as a manufacturing and industrial town is quite impossible to ascertain from any official publication or from any Government or Municipal office; we doubt whether anyone even knows exactly what articles are being manufactured here and we know that the number of such articles is surprising."; "Correspondence between the Straits Settlements Singapore Association and the Honourable Colonial Secretary, Straits Settlements, regarding proposed appointment of commission of enquiry into the trade of the colony" Straits Settlements Trade Commission, Singapore, 12 November 1930; Similar surprise and ambiguity in accounting for the size of the manufacturing industry at the colonial Asian port cities is cited as a general problem, "there are factories of very considerable importance engaged in the manufacture of products of large and increasing dimension...in general there is an absence of total statistics."; The Dominions Office and Colonial Office Lists (London, 1933), pp. 310 - 311.

5.2 A MODEL OF MARITIME WORLDS

In their analysis of the Mediterranean and Indian Ocean worlds, Braudel and Chaudhuri posed, and to a degree pursued, the question of whether or not it was possible to quantitatively measure and build a 'model' of a maritime world economy according to long–distance trade routes that could then be compared to similarly constituted maritime worlds. Such an endeavour was never formally undertaken by either of them due to the limitations of data, as they believed that the maritime world history for both regions ended in modern period. However they did theorise about what such a 'model' would look like based on their study of long–distance trade routes.

This thesis has firstly intended to provide one form of such a quantitative 'model' based on trade, and secondly to explore the continuity of frameworks of Indian Ocean history throughout the modern period. Through the collection of trade statistics and price data for several local markets across the Indian Ocean, this thesis has firstly constructed an empirical 'model' to the Indian Ocean economy. This 'model' has subsequently been evaluated through three 'measures' of the maritime economy: market integration, trade costs, and trade margins, each evaluated in the three analytical chapters of this thesis. This has allowed it to be compared to other maritime worlds, and to be assessed based on its contribution to early industrialisation in the major colonial Asian port cities. From this analysis, this thesis finds secondly that Indian Ocean historical and economic unity continued throughout the modern period, and that based on the persistence of an economically integrated and distinct maritime region during the colonial period, such transoceanic networks and linkages significantly contributed to the development of export industries at the primary Indian Ocean port cities.

The findings from this thesis suggest that frameworks of maritime unity remain applicable in the *longue durée* of Indian Ocean history stretching throughout the modern period. As such, this has implications for the region's contemporary economic development, some of the implications of which have been analysed in this thesis. Yet given the continuity and persistence of Indian Ocean historical unity despite the political, technological, social, and economic changes that took place in the colonial period, such *histoire événementielle* does not give a clear indication of an end period to Indian Ocean history. As such, there either remains scope for maritime world historians to further explore Indian Ocean history over the twentieth–century. Otherwise, perhaps such forms of unity in the *longue durée* have never in fact ended, in which case the framework of an Indian Ocean economy remain applicable today. In light of recent developments for competing visions of Asian economic integration in the twenty–first century, perhaps the model of the Indian Ocean

economy that this thesis has been dedicated to analysing is not only comparable as a unit of historical economic analysis for the late nineteenth and early twentieth centuries, but also as a model of the regional economy that can be compared temporally to the future of the global economy in the twenty–first century.

References

Acemoglu, Daron, Simon Johnson, and James Robinson. "The Rise of Europe: Atlantic Trade, Institutional Change, and Economic Growth." *American Economic Review* 95, no. 3 (June 2005): 546–579.

Acemoglu, Daron, Simon Johnson, and James A. Robinson. "Reversal of fortune: Geography and institutions in the making of the modern world income distribution." *Quarterly Journal of Economics* 117, no. 4 (November 2002): 1231–1294.

———. "The Rise of Europe: Atlantic Trade, Institutional Change, and Economic Growth." *American Economic Review* 95, no. 3 (June 2005): 546–579.

Acemoglu, Daron, and James Robinson. "The colonial origins of comparative development: An empirical investigation." *American Economic Review* 91, no. 5 (December 2001): 1369–1401.

Action plan on the Belt and Road Initiative. Action plan. Beijing, China: The State Council of the People's Republic of China, 2015.

Amrith, Sunil S. *Crossing the Bay of Bengal: The furies of nature and the fortunes of migrants*. Cambridge: Harvard University Press, 2013.

Bose, Sugata. *A Hundred Horizons: The Indian Ocean in the Age of Global Empire*. Cambridge, MA: Harvard University Press, 2006.

Braudel, Fernand. *The Mediterranean and the Mediterranean World in the Age of Philip II*. Vol. 1. London: Harper Row, 1966.

Bromhead, Alan de, Alan Fernihough, Markus Lampe, and Kevin H. O'Rourke. "When Britain turned inward: Protection and the shift towards Empire in Interwar Britain." *National Bureau of Economic Research Working Papers* 1, no. 23164 (2017): 1–60.

Chaudhuri, K. N. *Trade and Civilisation in the Indian Ocean: An Economic History from the Rise of Islam to 1750*. London: Cambridge University Press, 1985.

Donaldson, Dave. "Railroads of the Raj: Estimating the Impact of Transportation Infrastructure." *LSE Asia Research Centre Working Papers*, no. 41 (2010): 1–54.

Eichengreen, Barry, and Douglas A. Irwin. "Trade blocs, currency blocs, and the reorientation of world trade in the 1930s." *Journal of International Economics* 38, no. 1 (1995): 1–24.

Ferguson, Niall, and Moritz Schularick. "The Empire Effect: The Determinants of Country Risk in the First Age of Globalisation, 1880 - 1913." *Journal of Economic History* 66, no. 2 (June 2006): 283–312.

Huff, Gregg. "Export-led Growth, Gateway Cities and Urban Systems Development in Pre-World War II Southeast Asia." *Journal of Development Studies* 48, no. 10 (August 2012): 1431–1452.

Lim, C. L., Deborah Elms, and Patrick Low. “The Trans-Pacific Partnership: A Quest for a Twenty-first Century Trade Agreement.” Chap. What is "high-quality, twenty-first century" anyway?, edited by C. L. Lim, Deborah Elms, and Patrick Low, 1–18. 1. Cambridge: Cambridge University Press, 2012.

Mitchener, Kris James, and Marc Weidenmier. “Trade and Empire.” *The Economic Journal* 118, no. 533 (November 2008): 1805–1834.

Pearson, Michael. *The Indian Ocean*. London: Routledge, 2003.

Petri, Peter A., Michael G. Plummer, and Fan Zhai. “Policy Analysis in International Economics.” Chap. Introduction in *Trans-Pacific Partnership and Asia Pacific Integration: A Quantitative Assessment*, 98:1–4. Washington DC: Peterson Institute for International Economics, November 2012.

Schott, Jeffrey J., Barbara Kotschwar, and Julia Muir. “Policy Analysis in International Economics.” Chap. Introduction in *Understanding the Trans-Pacific Partnership*, 99:1–3. Washington DC: Peterson Institute for International Economics, January 2013.

Studer, Roman. “India and the Great Divergence: Assessing the Efficiency of Grain Markets in Eighteenth and Nineteenth Century India.” *Journal of Economic History* 68, no. 2 (2008): 393–437.

Williamson, Jeffrey G. *Trade and Poverty: When the Third World Fell Behind*. London: MIT Press, 2011.