

Essays on Development in Open Economies



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A thesis submitted for the degree of
Doctor of Philosophy

Michaelmas Term 2017

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Abstract

This thesis analyses the interaction between development and integration into global markets.

Chapter 1 studies whether international crop prices affect formal land tenure in Uganda. Higher agricultural prices induce farmers to increase their share of titled land. This effect results from the combination of an income effect, an incentive effect, and the interaction between social status and social capital. Prices have a positive impact on agricultural income and sales revenues. The effect of prices on land tenure is stronger when farmers have undertaken investment on the land, for the prices of export crops, and when farmers fear expropriation and land grabbing. In areas with lower social capital, land insecurity is higher. Elite groups in low-social-capital communities respond more to an increase in prices, whereas disadvantaged groups are better-off where social capital is higher.

Chapter 2 evaluates the adjustment cost to the DR-CAFTA free trade agreement in Honduras. The agreement produces a reduction in household income in Honduran regions more intensely exposed to trade. The result is driven by local labour market effects: workers are not able to relocate across locations or sectors, and a generalised reduction in wages pushes many out of the labour force or into less lucrative, informal-sector activities.

Chapter 3 investigates the relationship between migrant remittances and financial development across Italian provinces in the late Nineteenth-early Twentieth centuries. Remittances have a positive impact on the growth of bank deposits. Higher remittances are associated with increased GDP and a higher number of active bank branches, and therefore contribute to enhancing financial inclusion.

Chapter 4 is an empirical application of theoretical models of trade with product variety and firm heterogeneity, and measures the gains from trade predicted by these models for Italy between 1870 and 2000. The analysis accounts for gains from variety, firm selection effects, and technology spillovers, and allows the trade elasticity to vary over time, reflecting the main economic and political phases of Italian history.

Supervisors This thesis was co-supervised by Ferdinand Rauch (University of Oxford) and James Fenske (University of Warwick).

Total words This thesis contains approximately 76,000 words.

Statement of authorship Chapters 1 and 2 of my thesis are single-authored, and are fully my own work.

Chapter 3 is joint work with Matteo Gomellini and Francesco Vercelli from the Economics and Statistics Department of the Bank of Italy Research Centre. The three of us worked out the overall research design together. In terms of individual contributions, Matteo took care of the “Economic History” part of the chapter, and provided detailed background information about financial institutions and Italian migration during the late Nineteenth and early Twentieth centuries. Francesco, in turn, mastered the titanic task of tracking and collecting all the historical data we needed in the paper, and provided thoughtful comments on the empirical strategy and the interpretation of results. I implemented the analysis and the mechanisms section of the paper, and wrote up the chapter as included in this thesis.

Chapter 4 is again joint work with Matteo Gomellini. Overall, the research project was designed by both of us. Matteo summarised the most prominent historical developments in Italian trade policy and suggested that we considered time-varying trade elasticities in our exercise, whereas I took care of the empirical analysis of the paper, and wrote up the chapter as included in this thesis.

I am highly indebted to both my co-authors for their competent and friendly collaboration.

Acknowledgement of funding I acknowledge generous financial support in my first year from the Luca D’Agliano Research Centre, awarded by the Luigi Einaudi Foundation (Turin, Italy). At the University of Oxford, I acknowledge generous funding from the Economics Department, Jesus College, Exeter College, and the George Webb Medley Fund. I would also like to thank the Bank of Italy for selecting me as Bonaldo Stringher intern at their Research Centre.

Corrections This version of the thesis incorporates the minor corrections required for the award of the DPhil degree following the *viva voce* examination, held on 10 October 2017. The Examiners of this thesis were Prof. Douglas Gollin (University of Oxford) and Dr. Christine Valente (University of Bristol). The corrections were completed on 29 November 2017.

Declaration

The work in this thesis is based on research carried out by me at the University of Oxford between October 2013 and July 2017. No part of this thesis has been submitted for a degree at this, or any other, university.

Viviana Maria Eugenia Perego

(July 2017)

*né dolcezza di figlio, né la pieta
del vecchio padre, né 'l debito amore
lo qual dovea Penelopè far lieta,*

*vincer potero dentro a me l'ardore
ch' i' ebbi a divenir del mondo esperto
e de li vizi umani e del valore*

Dante, Inferno [XXVI], *Commedia*

Acknowledgements

As it marks the end of my studies, this thesis is dedicated to all the teachers that inspired me throughout this twenty-year-long journey.

In particular, Giuliana Marcucci, Maria Rosa Portioli, Daniela Bini, and Giovanni Missaglia spoke to my younger self and excelled at the challenging task of turning a girl into a woman and a citizen, cultivating my love for knowledge and triggering with their enthusiasm my desire to make the world a better place.

Since I was in university, I then have owed to Simone Ghislandi more than to anybody else: for trusting me in my early stages as a researcher, supporting and encouraging me in all my subsequent professional choices, and honouring me with his friendship and affection, which I will always cherish as a most precious gift.

Finally, I am immensely grateful to Abhijit Banerjee and Doug Gollin for reminding me with their example the reasons why I love Economics – and for embodying, with their outstanding professional profile and work ethic coupled with exceptional personal kindness and elegance, the type of economist and person I would love to become myself one day.

To my Supervisors, James Fenske and Ferdinand Rauch, goes my gratitude for accompanying me through the last four years, challenging me to always strive for improvement, and always being a reference point where to turn for advice.

The completion of this thesis also owes substantially to the invaluable support from a few of my peers at the Economics Department of the University of Oxford. Without the friendly, caring, and thoughtful presence of Daniel Brown, Pavel Lungenas, Thomas McGregor, Carlo Pizzinelli, I would not have been able to get where I am. I am grateful for the technical advice, the proofreading, the laughter, the insightful discussions, the patience, and for every single difficult or joyful moment we shared in the past four years. Throughout this time, I have also developed beautiful friendships and shared many memorable experiences with other students at the Department: my warm thoughts and best wishes go to Rachel Cassidy, Elwyn Davies, Manuel Fernandez, Ben Kett, Michael Koelle, Muhammad Mekhi, Simone Pedemonte, Daniela Scur, Hannah Uckat, Marc Witte, and to Friedrich Bergmann, Boris Georgiev, Andrea Incerpi, Juliana Milovich.

The list of the friends I have made elsewhere in Oxford is as long as the count of the days I have spent in this town, and to them go my gratitude for making me feel at home and with a family here, and my heartfelt wishes for the bright future and the personal and professional success they all fully deserve. Each of them enriched me and was a major source of inspiration and pride, but there are a few names that I cannot dispense with mentioning here. Pedro Aparicio, Jessica Boland, Rachita Daga, Karan Nagpal, Fozia Parveen, Marein Rahn, Vanessa Schreiber, Luigi Vigani were the first people I met at Jesus College, and have been a constant and loving presence all throughout my time there. Olanshile Akintola, Edoardo Borgomeo, Elena Butti, Chloé Deambrogio, Alejandro Espinosa, Santiago Izquierdo, Karen

McCallum, Rodrigo Mendoza, Martina Uccioli have crossed paths with me in various ways and at different times, but all mean so much to me and have contributed to making my time here worth remembering forever.

Back home, I have also been blessed with the friendship of many others, who have made my life a little brighter day after day. Micaela Levati is the sister of my heart, and our bond is just beyond any simple definition of friendship. Silvia Lussana, my small little carrot, has come into my life like a joyful storm of unexpectedly fresh air. From my time at Bocconi, I am still particularly close to Camilla Fabbri, Anna Gazzillo, Francesca Grazioli, Giada Ricca. Despite the distances in space and time that often keep us apart, Costanza Cazzaniga, Emanuela Furfaro, Marta Nava, Fiammetta Pulici, Emanuele Puzzo, Emanuele Rossi, Claudia Vinci are also in various ways always close to my heart.

Finally, my warmest thoughts go to my family, who have always backed my choices and fights with their enthusiasm, love, and (at times irrational) trust. Throughout these years, and through all the challenges and frustrations that somehow seem to be a necessary complement of the doctoral studies, the genuine and constant support by my parents Vicla and Franco, my brothers Valerio and Andrea, my grandparents Giancarla and Attilio, and Stefania, has really kept me going, and I owe them much more than words alone can describe.

With this DPhil, an era of my life ends, and a new one begins. If I am lucky enough to have by my side as many extraordinary people in the future as I have had so far, I cannot but look forward to what comes next.

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INTRODUCTION

DEVELOPMENT IN OPEN ECONOMIES

Overview This thesis is composed of four essays that contribute to the debate on whether and how economic openness benefits developing countries.

All chapters consider mechanisms that depend on the integration of an economy into international value chains, shedding light on some of the channels through which global markets shape the development path of low-income countries.

My first two chapters provide evidence on two developing economies (Uganda and Honduras, respectively), and address empirical, micro-level questions regarding household-level outcomes such as land tenure, living standards, and labour market indicators. These essays, which constitute the core of my thesis, are both fully my own work.

Chapters 3 and 4, on the other hand, are co-authored with researchers at the Bank of Italy, and deal with economic development from a historical perspective: in Chapter 3, I focus on Italian emigration in the late Nineteenth and early Twentieth centuries, when the country could still be rightfully classified as an emerging economy (Esteves & Khoudour-Castéras, 2011); in Chapter 4, I follow the Italian development path from unification until modern times. These two chapters also take a more macro-oriented stance, and try to answer questions related to financial development and the quantification of the gains from trade.

Chapters 1-3 share an empirical focus on within-country heterogeneity in the response to trade openness, together with the use of Bartik-inspired (1991) treatment variables that account for the local composition of production or of the labour force. Chapter 4, instead, consists in an application to real data of some recent results in international trade theory.

In the rest of this introduction, I provide a brief description of each individual chapter.

Chapter 1 In light of extensive evidence on the impact of property rights on productivity, investment, and labour supply,¹ my first chapter investigates how agricultural commodity prices affect individual demand for titled land in Uganda.

I use panel data on Ugandan farmers, and I perform fixed effects regression to assess whether agricultural prices affect household choices on the tenure of their land. Identification comes from a price index that weights international prices of agricultural commodities by the time-invariant structure of land use at the sub-county level, measured before the start of my sample period.

The main finding of the analysis is that higher commodity prices induce farmers to increase their share of titled land. I also provide evidence of an increase in the share of land purchased through formal channels, which by law should in principle require that the plots sold and purchased be titled. Results are stronger for farmers located closer to agricultural markets or to a main road, where the transmission from international to local prices is higher.

In the mechanisms section of the chapter, I hypothesise that my findings result from the interaction of an income effect and a composite incentive effect. The latter is in turn driven by the profitability of the crop mix harvested by farmers, the amount of existing investment on the land, and fear of expropriation, which I argue should increase when higher prices produce an uptick in land values. I also posit that the strength of these effects is a function of the social status of farmers, and of existing levels of social capital.

I support my hypotheses with evidence on a broad range of outcomes. First, I document a positive impact of crop prices on agricultural income and sales revenues, which enables farmers to acquire titled land despite its relatively higher cost in terms of both monetary expenses and bureaucratic procedures involved.

Then, I show that results on land certification are particularly strong when farmers have previously undertaken investment on their land, for example planting trees on their plots. Demand for titled land is also especially responsive to changes in the price of more lucrative cash crops sold on international markets, like bananas or coffee. Turning to the insecurity channel, I find that fear of expropriation is strongly correlated with farmers' demand for titled land, and that the effect of prices on tenure is stronger for those farmers who feel insecure on their land. I also show that, overall, higher prices increase land insecurity in areas with low

¹Cf. Besley (1995); De Soto (2000); Field (2007); Goldstein & Udry (2008).

social capital, which I proxy by the degree of ethnic homogeneity in the communities where farmers operate.

Finally, I find that, in areas characterised by low levels of social capital, more powerful individuals like the wealthy, those with political connections, or the better-educated, respond more to an increase in prices. The converse is true where social capital is higher: in these locations, women and ethnic minorities are more responsive to price variations.

Chapter 2 My second chapter evaluates the adjustment cost to trade liberalisation, studying the effect of the Dominican Republic-Central America Free Trade Agreement (DR-CAFTA) on household income and labour market outcomes in Honduras. DR-CAFTA is a free trade agreement signed in 2004 by the United States, five Central American countries, and the Dominican Republic. In this chapter, I study whether varying degrees of exposure to trade flows result in spatial inequalities across Honduran regions.

The analysis follows a quasi-differences research design (Wagstaff, 2010) with continuous treatment (Topalova, 2010). Identification comes from variation of a measure of trade exposure per worker at the regional level, which I build weighting national trade flows by the structure of regional labour force composition prior to negotiation of the agreement.

I find that household living standards in the regions most intensely exposed to trade were negatively hit by the trade agreement: regions that saw more sustained changes in trade flows (or were subject to more intense tariff variations) experienced a drop in household income and wealth.

The finding can be explained using a local labour market framework,² whereby workers cannot move without cost, and are therefore unable to follow the factor reallocations that comparative advantage would dictate. In the areas most intensely exposed to trade, in fact, DR-CAFTA resulted in a substantial wage shock for those employed in the tradable sector, but workers could not relocate and find better employment prospects elsewhere in the country. In this way, the wage shock remained confined to those locations, where it eventually cascaded over other sectors and even over the non-traded sector. In line with this evidence, I also do not find any hint of intersectoral reallocation of workers in trade-exposed locations, which would be instead expected if workers' mobility had arbitrated away the wage shock at the

²See e.g. Autor et al. (2016); Dix-Carneiro & Kovak (2015); Topalova (2010).

national level. Finally, I observe a movement of workers both out of the labour force and into low-earning, informal self-employment activities. As a consistency check, I also show that low-skilled workers, the productive factor predicted to benefit from free access of Honduran exports into the United States, were better-off in locations more exposed to trade, where their wages underwent more moderate variations with respect to their skilled counterparts.

Chapter 3 Chapter 3, co-authored with Matteo Gomellini and Francesco Vercelli, investigates the historical legacy of emigration on financial development. We focus on Italy during the “age of mass migration” (between the last decade of the Nineteenth century and the first of the Twentieth), when more than 14 million Italians migrated abroad. Specifically, we study whether the flow of remittances from Italian emigrants increased the amount of savings entrusted to financial institutions in the form of bank deposits.³

Our unit of analysis are Italian provinces, the second-lowest administrative level in the country. We obtain data on bank deposits from a unique dataset collecting the balance sheets of all Italian banks in our period of interest, which we complement with information on other financial intermediaries like postal savings banks and banks of issue. Lacking data on remittances at the provincial level, we build a measure that weights national remittance flows by the potential earnings of the emigrants from each Italian province, which we estimate using information on provincial migration and average wages in destination countries.

Given the high likelihood that more financially developed provinces were able to intermediate more remittances through formal channels, which would give rise to reverse causality concerns, our analysis is performed through instrumental-variable regression with location and year fixed effects. Our instrument is a measure that weights national remittances by the provincial migrant stock before our period of analysis.

We find a strong, positive impact of remittances on the growth of bank deposits in Italy. Results are driven by the performance of postal savings banks and commercial banks, the institutions that were respectively the most and the least successful in the collection of deposits before the age of mass migration started. We interpret the result as evidence that remittances favoured the spreading of a financial culture throughout the Italian peninsula. This interpreta-

³For similar approaches, cf. e.g. Aggarwal et al. (2011); Demirguc-Kunt et al. (2011); Esteves & Khoudour-Castéras (2011).

tion is also in line with the “induced financial literacy” hypothesis formulated by the literature on financial development (Brown & Fayad, 2013), which argues that receiving remittances through financial intermediaries makes it possible for potential customers to improve their understanding of financial products, and it increases their overall trust in the financial system.

We also find that higher remittances induced an increase in provincial GDP and the creation of a higher number of active bank branches. This evidence suggests that the link between remittances and financial deepening worked through both an income effect, produced by the increase in economic well-being, and a financial inclusion channel, through an increased familiarity with the financial system by previously isolated households.

Chapter 4 Chapter 4, co-authored with Matteo Gomellini, is an empirical application of recent developments in international trade theory. We measure the gains from trade predicted by models of trade with product variety and firm heterogeneity (so-called “quantitative trade models”), focussing on Italy in the period from 1870 to 2000.

We build an index of the gains from trade using a “sufficient statistic” that only depends on a small set of observables and parameters. Our measure is built over two components: (i) a static factor, which accounts for gains from variety and firm selection effects (Arkolakis et al., 2012; Krugman, 1980; Melitz, 2003); and (ii) a dynamic firm selection one, reflecting the technology spillovers produced by incumbents’ productivity growth on new entrants on the market (Sampson, 2016).

In the construction of the index, our main parameter of interest is the elasticity of imports to variable trade costs, which we estimate through gravity equations (Anderson, 2011) on Italian bilateral trade flows. To adapt our analysis to the historical setting of our paper, however, we allow the trade elasticity to vary over time, estimating our gravity equations separately on different periods that reflect the main economic and political phases in Italian history.

Our quantification of the gains from trade can be interpreted as the increase in GDP that would be obtained, given the assumptions of the quantitative trade models, moving from a counterfactual autarky scenario to the level of trade observed in the data. We show that these gains were quite substantial through most of Italian history, reaching an increase in GDP by 20 percent in certain years. Moreover, we note that the dynamic component was the driving force behind the overall evolution of the total gains from trade until the last few decades of

the Twentieth century. After that, it lost importance relative to its static counterpart, due to the slowing down of the growth rate of the economy.

Organisation of the thesis The next four chapters contain the essays just described. These are presented in the form of self-contained journal-style articles, and all include their own sections on literature review, methodology, data description, results, and comments. My original contribution to existing research is clearly outlined within each chapter too.

The last chapter will conclude the thesis, discussing the lessons and implications for future research that result from my work.

CHAPTER 1

CROP PRICES AND THE DEMAND FOR TITLED LAND: EVIDENCE FROM UGANDA

1.1 Introduction

This chapter explores how prices of agricultural commodities affect the individual demand for titled land, studying the land market activities of farmers in Uganda.

Given its focus on the rural context, the chapter addresses some of the mechanisms driving the large productivity differences between richer and poorer countries, which tend to be largely concentrated in agriculture (Caselli, 2005; Gollin et al., 2014; Restuccia et al., 2008). In particular, in light of extensive evidence on the impact of property rights on individual productivity, investment, and labour supply (Besley, 1995; De Soto, 2000; Field, 2007; Goldstein & Udry, 2008), identifying the channels that affect the diffusion of land titles is crucial to the study of development economics.

As is typical in many developing countries, Uganda combines a heavy reliance on primary sector production and weak institutions governing land market activity. 83 percent of the Ugandan population currently lives in rural areas, and agriculture consistently accounts for almost three quarters of employment and one third of total value added.¹ In recent years, the Ugandan government has also been active in promoting innovation and technological improvement in the sector, in an attempt to shift production from subsistence to more market-oriented activities. At the same time, the system of land property rights in the country is quite

I acknowledge helpful comments and suggestions from Daron Acemoglu, David Atkin, Abhijit Banerjee, Melissa Dell, Cheryl Doss, Esther Duflo, James Fenske, Rachel Glennerster, Douglas Gollin, Beata Javorcik, Nathan Nunn, Ferdinand Rauch, Natalie Quinn, Simon Quinn, Arthur Silve, Tavneet Suri, and participants in the Development Tea at the Massachusetts Institute of Technology, the Doctoral Meeting in Economics and Management at Montpellier University, the Research Workshop of the Centre for the Study of African Economies at the University of Oxford, the Informal Workshop in Quantitative Development Studies of the Department of International Development at the University of Oxford, the Pacific Conference in Development Economics at UC Riverside, the CSAE Conference on Economic Development in Africa at the University of Oxford. Diego Angemi, Ludovica Cherchi, and Francesca Grazioli provided valuable information on land tenure, land use, and administrative divisions in Uganda.

¹Data from the Food and Agriculture Organisation, 2015, and the World Development Indicators, 2013.

complex, and, despite the formal legal provision of various forms of land certificates, only 15-20 percent of land is actually certified (USAid, 2010). As a result, both political controversy and land-related conflicts are far from uncommon (see e.g. Deininger & Castagnini, 2006; Rugadya, 1999; Schwartz, 2008).

I use recent panel data on Ugandan farmers to investigate the effect of crop prices on various outcomes related to land tenure and land market activity. To abstract from potential endogeneity of local farm-gate prices, I focus on the price of agricultural commodities on world markets. My main regressor of interest is an index that aggregates international crop prices, weighted by a fixed measure of the initial structure of agricultural production in the sub-county where each household resides. I find that a 10 percent increase in aggregate prices increases farmers' share of titled landholdings by almost 6 percent of the outcome mean.

I interpret my findings as the outcome of a number of factors. First, titled land is expensive: for example, registering property in 2009 cost more than ten times the monthly income of the average Ugandan household.² Second, titled land is difficult to acquire: in Uganda, land authorities are the country's most corrupt commercial justice institution (Mwebaza & Gaynor, 2002), and administrative procedures can easily turn into a costly bureaucratic nightmare. In such a context, it is plausible that farmers may generally be deterred from dealing with land with titles. At the same time, in developing countries the land of the weaker is often vulnerable to outright takings or damages by the more powerful, especially when business interests are involved (Glaeser et al., 2016). The effect of higher agricultural commodity prices could thus be twofold. On the one hand, an increase in the value of farmers' produce might relax their budget constraints, allowing them to get the titled land they were previously unable to afford. On the other hand, as price shocks result in land value booms, which also substantially increase the scope for land grabbing, the desire to secure one's property becomes much more compelling.

To test for these mechanisms, I propose an analytical framework in which individual demand for titled land responds to prices through an income as well as an incentive effect. The latter is in turn driven by the profitability of the harvested crops, the amount of existing investment on the land, and fear of losing the land due to eviction or rent-seeking. I also posit that the strength of these effects is a function of the social status of farmer households, and that this reinforcing effect in turn depends on existing levels of social capital.

²The World Bank, Ease of Doing Business Indicators.

My results broadly confirm my hypotheses. As evidence of an income effect, I find that the value of farmers' sales and farming income responds positively to an increase in agricultural prices. As regards the incentive effect, I show that the link from prices to titled land is particularly strong when farmers have previously undertaken some sunk investment on their land, and that demand for titled land is especially responsive to changes in the prices of more lucrative crops like bananas, coffee, and cotton. At the same time, farmers tend to display higher levels of insecurity in response to changes in the price of these crops, being more concerned that somebody may challenge their access to the land. Insecurity is also strongly correlated with farmers' share of titled land – but it increases in response to prices only in areas with relatively lower social capital. Finally, I find no evidence overall that different subgroups of the population react differently to higher prices. However, they do when I split my sample between areas with higher and lower levels of social capital: in particular, the most powerful are able to acquire more titled land in low-social-capital areas, whereas it is the disadvantaged who fare better where social capital is higher.

The rest of the chapter is organised as follows. Section 1.2 summarises previous research on the effect of land property rights, institutional change, and demand for land certification, providing the motivation for my research and pointing out its contribution to the existing literature. Section 1.3 provides an account of the agricultural sector and system of land property rights in Uganda. Sections 1.4 and 1.5 respectively outline the empirical strategy of the analysis and describe the data, while Section 1.6 reports the main results and some robustness checks. Section 1.7 sketches an analytical framework to explain the observed results, which is then tested in Section 1.8. Finally, Section 1.9 concludes.

1.2 Related literature

The chapter can firstly be ascribed to the literature on the demand-driven evolution of land property rights and land registration. According to what has been called (Platteau, 1996) the “evolutionary theory” of land rights, when the gains from internalisation exceed its cost, economic efficiency justifies the replacement of communal land by private ownership rights (Demsetz, 1967). Among other mechanisms, this could happen through an increase in the value of land and an intensification of the competitive pressures over it. Competition may

increase for example due to sustained population growth, or, more relevant to my chapter, the commercialisation of agriculture: as labour and capital are imperfect substitutes for land, land rents are bid up as the agricultural sector expands. As a consequence, the gains of internalisation of the now valuable resource rise (Demsetz, 1967), which eventually leads to higher incentives towards the achievement of secure property rights. This is even more true in the context of an open economy, when a country's comparative advantage lies in agriculture.³

The potential benefits stemming from these patterns are both static and dynamic: once titles on land are established, the right to sell and mortgage one's property will result in allocative efficiency and higher investment. Where titles are missing or imperfectly enforced in fact, farmers are found to lack the incentives to efficiently use the land they are cultivating. This owes mainly to the possibility of expropriation (Feder & Feeny, 1991; Field, 2007; Goldstein & Udry, 2008; Omura, 2008), which makes farmers only partially internalise the benefit of productivity-enhancing investment on their land, but may also be determined by behavioural responses to the lack of ownership and title security (Banerjee et al., 2002). Moreover, investment incentives are also enhanced by the fact that selling titled land is usually easier, thanks to the transfer rights attached to certificates of property: if farmers undertake any land improvements, therefore, when the land is titled they are more able to sell it for a price that reflects their investment (Besley, 1995; Brasselle et al., 2002; Platteau, 1996). Finally, ownership security is also broadly believed to affect the availability of resources to finance investment, as the supply of credit frequently depends on the borrower's actual control on the land they pledge as collateral (De Soto, 2000; Feder & Nishio, 1999; Feder & Onchan, 1987).

The literature lends ample empirical support to the claim that land registration leads to better access to formal credit,⁴ higher land values,⁵ increased investment,⁶ and higher output and income.⁷ In addition, Galiani & Schargrodsky (2011) provide a detailed account of how the existence of secure land rights may have additional long-term consequences on overall productivity and poverty alleviation, via effects on the intra-household allocation of resources

³Theoretically, in a simple specific factors model of trade with two sectors (agriculture and manufacturing) and three factors of production (capital, labour, and land; cf. e.g. Hueckel, 1973, Jones, 1971), if land is specific to agriculture and the home economy specialises in the production of the agricultural good, any improvement in its terms of trade (an increase in the world price of the agricultural product relative to that of the manufactured good) results in resources flowing from manufacturing into agriculture.

⁴Binswanger & Rosenzweig (1986); De Soto (2000); Feder et al. (1988); Carter & Olinto (1996).

⁵Alston et al. (1996); Dowall & Leaf (1991); Feder et al. (1988); Jimenez (1982); Pender & Kerr (1999).

⁶Alston et al. (1996); Carter & Olinto (1996); Field (2005); López (1997).

⁷Feder et al. (1988); López (1997).

and on household labour, fertility, and health decisions. As regards Sub-Saharan Africa more specifically though, the evidence is slightly more nuanced: if Moor & Nieuwoudt (1998) and Roth et al. (1994a) conclude that tenure security has a significant and positive effect on certain types of investment and yield in Zimbabwe and Uganda, other authors find no relationship between land tenure and land improvement, output, or access to credit in Kenya and Somalia (Migot-Adholla et al., 1991; Pinckney & Kimuyu, 1994; Roth et al., 1994b). Well-known evidence from Ghana by Besley (1995), in turn, supports the idea that better land rights facilitate investment in certain areas but not in others, depending on the underlying socio-economic and demographic characteristics of different regions. Furthermore, many scholars emphasise the potential for increased inequality following intense growth in land values or land reform. For instance, certain vulnerable groups (most notably women and nomadic farmers) may be dispossessed of the use rights they formerly held under customary law; alternatively, the wealthier, better educated, and politicised elite might exploit their financial means, political connections, and information advantage to obtain land rights for themselves to the detriment of the poor (Feder & Nishio, 1999; Feder & Noronha, 1987; Platteau, 1996).

My paper lends evidence to the “evolutionary” theory of land rights, as well as to the inequality effects of land tenure. Furthermore, it significantly complements the literature by addressing the link between the pressure exerted by commodity prices and an increase in ownership of registered land, whereas existing research mostly takes this step as a given to focus on the outcomes of land certification once the process has been accomplished.

Evidence on the spread of land property rights and on its drivers is, in fact, surprisingly limited. The issue has been explored from a historical perspective by Feeny (1979; 1988) and Leacock (1954). Both authors provide evidence on the geographical and chronological relationship between commodity booms on international markets and the creation of a more efficient institutional framework and system of property rights, respectively focussing on Thailand, Burma, the Philippines and Québec in the late Nineteenth and early Twentieth centuries. For Sub-Saharan Africa, Fenske (2014) documents how the rubber trade transformed land rights and land disputes in Nigeria during the colonial period, increasing farm sizes and enhancing both sale and rental markets. Bruce (1986) also reports how the introduction of commercial crops in colonial Sub-Saharan Africa was conducive to the individualisation of tenure and

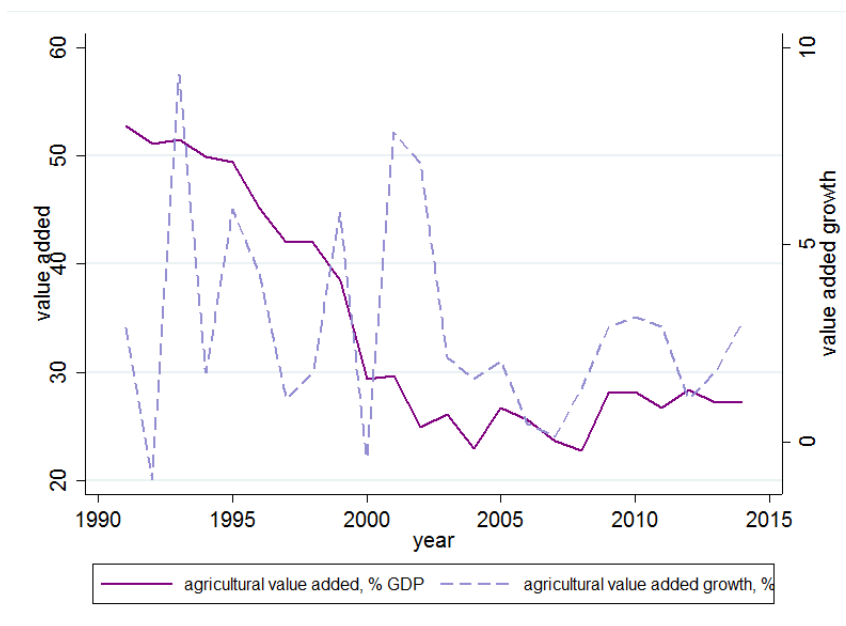
land sale transactions. None of these works, however, goes beyond a descriptive historical account of the co-evolution of commercialised agriculture and property rights.

My paper, on the contrary, is among the few to undertake a more formal empirical study of the determinants of individual demand for land registration.⁸ Among these, Bezu & Holden (2014) study the willingness to pay for land registration in the context of land reform in Ethiopia, and find that demand for certification depends on existing levels of tenure security, which is in turn a product of the effective implementation of previous rounds of land certification. In this sense, the focus of their research is more on reactions to the efficient *supply* of land titles and on policy reform, whereas my paper is rather concerned with the incentives of individual farmers to hold a piece of land with a certificate, in a setting where property rights *do* formally already exist and no major systemic change is being implemented.⁹ Closer in spirit to mine is the work of Alston et al. (1996) and Miceli et al. (2001), who also investigate how land registration demand responds to land value in Brazil and Kenya, respectively. Both studies, however, rely on cross-sectional survey data, whereas I am able to exploit panel variation that allows me to abstract from individual-level unobserved heterogeneity. Moreover, land value is proxied by distance from a market centre in Alston et al., and by an estimate of potential land productivity measured in terms of annual average rainfall in Miceli et al. My paper instead provides a detailed account of how exogenous shocks driven by market forces affect various determinants of demand, rather than of the effect of the intrinsic quality and profitability of land itself. In this sense, my work is more similar to a study by Collin et al. (2012), who analyse the demand for formal land titles in unplanned urban settlements in Tanzania, and disentangle the effect of increased property values and a higher perceived risk of expropriation. The main difference between their paper and mine is their focus on the urban housing market rather than on the rural agricultural sector, which makes the underlying mechanisms driving the results quite different. In particular, Collin et al. are concerned with the relationship between the provision of public infrastructure and the uptake of land tenure formalisation, as a policy response to the rapid urbanisation and the unchecked growth of unplanned, informal urban settlements. My

⁸As regards Uganda in particular, although the connection between trade, land appreciation, and modifications in the structure of land property is often mentioned in both academic papers and technical reports on the country (see e.g. Bomuhangi et al., 2011; Deininger & Castagnini, 2006; Deininger et al., 2011; Schwartz, 2008), the link has not been empirically tested yet.

⁹The “status quo” nature of the analysis is also especially relevant for my case study, to the extent that past research on the country (Roth et al., 1994a) showed that the positive effect of land tenure on investment tends to be stronger when registration is a voluntary act than when it is imposed by the government.

Figure 1.1: The performance of the agricultural sector, Uganda 1991-2014



Data source: The World Bank: World Development Indicators.

paper instead is centred on farming activities, and on how different structures of local production and varying social contexts affect the response of individual demand for titled, harvested land to more favourable conditions on agricultural markets.

1.3 Uganda

Uganda represents a good example of a low-income small economy, characterised by a strong specialisation in agriculture. Even though, as shown in Figure 1.1, the share of agriculture in total Ugandan GDP has nearly halved over time from more than 50 percent in 1991, the sector still accounts for around 30 percent of the country's production. The growth rate of the agricultural sector has been fluctuating substantially during the same period, but has remained around an average of about 3 percent. Moreover, agriculture represents the main employer of labour: the World Bank (World Development Indicators) estimates that in the last decade it has consistently accounted for nearly 70 percent of the labour force.

In the recent past, the Ugandan government has put in place a number of policies and programmes targeting the primary sector, to induce a transition from predominantly subsistence to commercial agriculture. In the last decade, the government's efforts have focussed on

research for technology development and scaling up, especially in the areas of seeds and planting materials, fertilisers, labour saving technology and mechanisation, and water distribution. Moreover, actions have been promoted with the objective of integrating smallholders in agricultural value chains, by supporting collaboration between agribusiness, farmers, advisers, and researchers.

As regards international trade, imports of capital equipment for agricultural production have been made duty-free, to boost productivity and investment (MAFAP, 2014). Since the early 1990s, moreover, Uganda has been pursuing a liberalised economic policy and an active export promotion strategy, based on minimum government intervention in commodity pricing, elimination of export taxes, exchange rate liberalisation, zero-rated duty and VAT exemption on exports, and no additional charges or levies. Uganda's exports, mostly composed of agricultural products,¹⁰ are duty- and quota-free in the European Union and US markets, and qualify for preferential tariff rates in the East African Community (EAC) and Common Market for Eastern and Southern Africa (COMESA).

The liberalisation of Uganda's economy has induced a progressive reduction in the influence of the government on agricultural prices. First, there are no more public trading companies competing against the private sector or acting as major buyers and guarantors of a minimum producer price. Second, international trade liberalisation has entailed the abolition of both export duties on agricultural products and of any bans or other restrictions on trade in food commodities. As such, the Food and Agriculture Organisation (FAO) claims that both domestic and international trade in all agricultural products is now entirely privately managed, and that all agricultural prices are completely determined by the market (MAFAP, 2014). For the purpose of my study, this means that prices in world markets are able to reach farmers in Uganda, affecting the value of their production and of their land.

As regards the distribution of land among the population, the country has long been characterised by inefficient land markets and weak de facto enforcement of land property rights, which results in a delay of innovations in agricultural production and widespread land-related disputes.¹¹ The correct functioning of land markets has become ever more crucial in the after-

¹⁰The Food and Agriculture Organisation estimates that the comparative advantage of the country lies in the production of fish, cotton, tea, and coffee (MAFAP, 2013).

¹¹Land markets in Uganda are plagued by growing tensions between landlords and tenants, government displacements, and ethno-political and intra-family conflict (Rugadya, 2009).

math of the world food price boom of 2007-08, when both domestic and foreign investors started pursuing large-scale land deals to engage in commercial agriculture (Bomuhangi et al., 2011). Smooth land markets would in fact ease transactions and allow the economy to better reap the benefits of a move away from subsistence agriculture. Furthermore, given that there tend to be large power imbalances between purchasers and current landholders (Bomuhangi et al., 2011), and that undocumented land is particularly vulnerable to expropriation, better-defined rights are a means to safeguard the livelihood of small farmers, whose subsistence relies on their landholdings.

The next subsection provides a detailed account of the system of land rights in the country.

1.3.1 Land tenure

The Ugandan law recognises five main land tenure regimes: public land, customary tenure, *mailo*, freehold, and leasehold.

Public tenure applies to lands for public use, including all designated wetlands, even if these fall within otherwise designated lands. These lands have restrictions on use, such as prohibitions against cultivation and other uses of wetlands.

Turning to private rights, the land market in Uganda is characterised by a vast prevalence of customary rights over other forms of tenure. According to World Bank estimates, 80 percent of the land is under unregistered customary ownership (Goldstein et al., 2016), which is governed by customs, rules, and regulations of the community (Ugandan Ministry of Lands, Housing and Urban Development, 1998). Historically, customary land in Uganda has been divided among clans, with clan leaders in turn allocating it to households, regulating transfers, and occasionally even controlling land investments (Goldstein et al., 2016). Although customary landholders initially did not have a formal title on the land they used, the 1995 Ugandan Constitution recognised and provided some degree of legal protection to unregistered land under customary tenure. The process was eventually completed with the 1998 Land Act, which formally recognised customary ownership and converted former occupants on customary land into owners. Customary owners can obtain a certificate of customary ownership that can be transferred through sale, rent, gift, or mortgage, and can be converted into a freehold title (cf. *infra*) through a well-defined process (Deininger et al., 2008).

Mailo tenure was established in the beginning of the Twentieth century by the British colonial government in the Central region and parts of Central-Western Uganda. The British allocated mile-square blocs of land, together with any smallholders occupying them, to the royal family and high-ranking officials of the Buganda kingdom in exchange for political co-operation. The original occupants were converted into tenants. After decades of social unrest, in 1928 the *busuulu* (ground rent) and *envujju* (tribute) laws eventually specified the respective rights of the *mailo* owners and tenants: tenants do not hold full ownership rights on the land, must pay a nominal rent to the *mailo* owner and face some restrictions on what they can do on the land (Bomuhangi et al., 2011). However, more recent reform has made it more difficult for *mailo* owners to evict the tenants, who may hold their user rights (*kibanja* tenancy) indefinitely. Starting from the 1998 Land Act, *bona fide* tenants who have peacefully occupied and used or developed a piece of land unchallenged by the owner for at least twelve years can apply for certificates of occupancy upon payment of an annual nominal rent of US\$ 1,000 (USD 0.6 approximately). A tenancy by occupancy may be inherited and, with the agreement of the landowner, even turned into a freehold title. Once issued, the certificate entitles the tenant to undertake any lawful transaction on the occupied land, subject to the consent of the landowner (Hunt, 2004).

Freehold tenure was originally peculiar to the kingdoms of Toro and Ankole in Western Uganda, and was set up by an agreement between these kingdoms and the British, who also issued adjudicated freehold to a small number of people and churches or religious institutions (Rugadya, 1999). The owner of a freehold title can hold the land for an unlimited period, may pass it on to their heirs upon their death, and has full powers to use and dispose of it in any way that is not prohibited by the law. The terms of the tenancy between the tenants and the titleholders are not negotiable and were fixed by law in 1937. Among the main differences between freehold and *mailo* is the fact that tenants on *mailo* land have security of tenure, whereas the same is not automatically true for tenants on freehold.

Finally, in the leasehold system, the owner of freehold, customary or *mailo* land (or the Uganda Land Commission in case of public land) grants the tenant exclusive use of the land for a specific lease period (usually of 5, 45, or 99 years), in return for an annual rent or service and under specified terms and conditions. The lessee is entitled to a certificate of title (USAid,

2010). Moreover, while other forms of tenure are reserved to Ugandan citizens, leaseholders may be non-Ugandans.

Land governance is delegated to Local Councils (LCs), local government bodies that are regularly elected by and from the local community. Among their competences, Local Councils are in charge of the registration and administration of land. District Land Boards and Offices for example are responsible for land allocation and administration, while Area Land Committees at the sub-county level facilitate title acquisition (Van Leeuwen, 2014). Land dispute resolution happens in Land Tribunals at the district level, while Local Council Courts, composed of Local Council members, serve as the first instance to adjudicate land disputes. In the event of dissatisfaction with their decision, parties can appeal to Magistrates Courts or Land Tribunals, which are both judiciary courts (Van Leeuwen, 2017).

Despite the legal provision of measures to facilitate the registration and management of land, only around 15-20 percent of the land in Uganda is registered (USAid, 2010). In practice, many have expressed doubts about the extent to which improved land regulations have been adequately publicised throughout the country (Rugadya, 1999), so that a significant portion of landholders might still be unaware of the possibility of registering their land, or lack precise information on the exact procedures required (Van Leeuwen, 2014). Moreover, the process for registering land is often onerous in terms of time and expenditures, and many landholders lack the capacity and resources needed to successfully complete it. Mwebaza & Gaynor (2002), who consider land markets in three Ugandan districts, also argue that landholders may not perceive titling as a significant benefit. This is generally due to widespread corruption and to a number of additional costs for processing documentation of transactions on land, attributable to extra payments demanded by officials when dealing with titled land.

Enforcement of land rights also seems to be far from perfect, as many authors document gaps and inefficiencies in the management of land rights and land-related controversies in practice. Foley (2007), for instance, points out that the existing networks of District Land Boards, District Land Offices, and Land Tribunals are usually under-resourced, under-staffed, and too sparse and weak to effectively deal with the demands of a well-functioning land system. Moreover, ambiguities in how the existing laws are written and frequent duplications of power often create institutional impasses, forcing the administration of justice to stall. This

is particularly true for customary tenure, which is formally recognised by the law but allows for certain practices that are in principle banned by the Ugandan Constitution and Land Act, like the patent discrimination of women (cf. Deininger, 2003; Foley, 2007; or Khadiagala, 2001). Joireman (2007) also notes that, for as much as the legal changes that enable the formalisation of informal property rights in Uganda are necessary to achieve institutional change in landholding practices, they often remain inadequate on their own due to a number of impediments, from lack of capacity to high corruption of land officials. This has slowed the process of titling customary landholding as well as the transfer or titling of freehold. The author reports of a number of cases of additional “fees” required to obtain proper documentation of land ownership or land transfer, unless one is willing to wait years for access to a certificate of title, or of unpunished land theft and allocation of multiple titles to the same plot.

All of the above might imply that having a certificate of title may not make a big difference to farmers in the country. Nonetheless, more recent ethnographic research conducted by Van Leeuwen (2017) among various communities in Uganda identifies a lack of titles as a major land issue. Moreover, although there seems to be evidence that those who purchase untitled land feel secure on their land (Mwebaza & Gaynor, 2002; Troutt, 1994), tenure insecurity appears to still be widely felt among certain groups of the population, particularly women landowners, tenant farmers in densely settled areas, and pastoralists (Rugadya, 2009). Indeed, the endemic presence of land disputes in Uganda is well documented in the literature.¹² In general, then, the narrow spread of the practice of land registration is to be viewed with some concern. This is especially true when the land itself becomes more valuable and hence more subject to dispute and to predatory behaviours, for example in case of increasing population pressure on resources, technological change, and, most importantly for the focus of the chapter, agricultural terms of trade appreciation (Feder & Feeny, 1991).

¹²Rugadya (2009) identifies various avenues for competing claims on land. These can occur as a result of ethnic rivalries, clashes between cultivators and pastoralists for the right of access to common grazing land and water, prospects of oil discovery in the Albertine Rift, returning of displaced households from refugees camps in civil conflict areas, degazettement (conversion of public land to private use), and forced evictions by landowners without appropriate compensation of tenants.

1.4 Empirical strategy

1.4.1 Outcome Variables

In light of the discussion on the Ugandan system of land rights in Section 1.3.1 above, I focus on the following types of land tenure:

- parcels with a formal certificate of title (henceforth, parcels with property rights). This refers to a written and signed official record of an agreement concerning the ownership of a parcel under *mailo*, freehold, or leasehold tenure. It registers the right to own the land, and to use and develop it for any purpose. A formal certificate of title also gives the owner the right to enter into any dealings (selling, renting, and using the land as collateral), to allow other people to use the land, and to bequest it;
- parcels with a certificate of customary ownership. The document, which must be issued by the local land board, is given to a person (or group) who owns a parcel under a customary system in order to recognise and guarantee their interest in the land. It gives the owner the right to rent the land for a limited period of time, to allow another person to use the land for a limited period, to use the land as collateral, divide it, sell it (under specified conditions), and bequest it;
- parcels with a certificate of occupancy. This title is a document issued to a *bona fide* tenant, which details the interests or claims of the occupant. Provided the legal owner of the land formally agrees, a tenant with a certificate of occupancy can give the parcel away, sublet it, bequest it, give it as security or create usage rights to another person;
- parcels with none of the above certificates. In this case, the parcel is either just left untitled, held under a short term rental or license agreement, or is used by squatters.

Given a land tenure type from the list above, the corresponding outcome variable for my analysis is the share of land under that type of tenure in farmers' total landholdings. In each period, a household's landholding may be composed of more than one parcel. A parcel is defined as a contiguous piece of land with uniform tenure and physical characteristics, entirely surrounded by either infrastructure or by other land with different tenure and/or physical characteristics. Given that in my data (cf. Section 1.5 below) it is not possible to track

individual parcels over time, I consider each outcome at the household rather than at the parcel level. In particular, for household i holding K parcels of land at time t , the outcome variable related to tenure type Y is computed as

$$y_{it} = \frac{\sum_{k=1}^K \tilde{y}_{kit} \times s_{kit}}{\sum_{k=1}^K s_{kit}}, \quad \tilde{y}_{kit} = \begin{cases} 1 & \text{if } k \text{ has tenure } Y \\ 0 & \text{otherwise} \end{cases} \quad (1.1)$$

where $\tilde{y}_{kit}$ is a binary variable for whether parcel k is held by household i at time t under tenure type Y , s is parcel size (in acres) and the term in the denominator is the size of total household landholdings.

1.4.2 The price index

Identification for my analysis comes from variation in world prices. Using international prices avoids the endogeneity stemming from local farm-gate prices, which are determined by local market conditions that may contemporaneously affect farmers' production decisions as well as their demand for land rights. In particular, I build an index that takes a geometric average of the international prices of various crops harvested in Uganda.¹³ Prices are weighted by local agricultural production of each crop prior to my sample period, which I estimate using crop-specific land use data at the sub-county level. Weighting prices by the structure of land use provides a measure of how much farmers in a certain area are exposed to fluctuations in the price of each specific commodity. In addition, using aggregate rather than individual weights conveniently allows me to account for the interdependence of farming decisions by households living in the same community. Finally, my weighting scheme should also ensure exogeneity of the index to land tenure outcomes, in a way that actual, individual crop cultivation could not achieve. Improved land titles could in fact affect farmers' decisions on how to cultivate their land, whereas an aggregate and predetermined weighting scheme rules out reverse causality.

Given a set of J crops and world prices p for each crop $j = 1 \dots J$, the price index faced by

¹³I have information on a set of nine major agricultural commodities: bananas, coffee, corn, cotton, ground nuts, rice, sorghum, soy beans, sugar cane; and two residual categories: cereals and other vegetable products. Together, these crops account for 25 percent of all agricultural land in Uganda in 2000 (data from FAOStat).

a household residing in sub-county s at time t is

$$P_{st} = \prod_{j=1}^J p_{jt}^{w_{sjt_0}}, \quad (1.2)$$

where w_{sjt_0} is the fixed share of land harvested with crop j in sub-county s in a reference year t_0 prior to my sample period. The index is then rescaled to obtain a value between 0 and 100.

Considering how secluded many rural communities in Uganda are, there is a non-negligible risk that international price shocks are not transmitted to local markets, making world prices a bad predictor of the ones actually faced by Ugandan producers. The concern is echoed by recent research by the Food and Agriculture Organisation (MAFAP, 2013), which shows that farm-gate prices in the country are often only weakly related to export prices. Nevertheless, in Appendix Section 1.A I provide descriptive evidence that, despite incomplete transmission, international prices can still be positively correlated with those faced by local farmers.

1.4.3 Estimation

To study how demand for titled land responds to changing agricultural prices, I follow a fixed-effects approach. Given a household-level land outcome y and my sub-county-level price index P , the regression equation for household i living in sub-county s at time t is

$$y_{ist} = \alpha + \beta \log P_{st-1} + x'_{ist} \gamma + \theta_t + \eta_i + \epsilon_{ist}, \quad (1.3)$$

where θ_t and η_i are respectively a year and a household fixed effect, and x' is a row vector of covariates.¹⁴ Standard errors are clustered at the sub-county level.

1.5 Data sources

Household data come from the Living Standards Measurement Study (LSMS) of the World Bank. The LSMS has a panel study of Uganda for the years 2009-10, 2010-11, 2011-12, which can be joined to the 2005-06 Ugandan household survey. Other than standard demographics, the LSMS surveys feature detailed information about each parcel of land owned or rented by

¹⁴Covariates are ethnicity, education, gender, age and age squared of the household head, region fixed effects. As a number of farmers migrate during the sample period, these fixed effects do not get systematically dropped in the fixed effects estimation.

households, and on any land market activity that occurred in a standard recall period. The only major downside of the dataset is that parcel identifiers are not constant across waves of the survey, hence it is not possible to track specific plots of land over time. This means that my outcome variables are measured at the household rather than parcel level: for example, instead of investigating whether over time a household acquires ownership rights on a specific plot, the analysis is performed on the share of land with property titles held by the same household (cf. Section 1.4.1).

Price data mostly come from the international price series of the International Financial Statistics (IFS) database collected by the International Monetary Fund (IMF). The indices maintained by the IMF track prices of internationally traded primary commodities, reporting benchmark prices that are representative of the global market, determined by the largest exporter of a given commodity. Every year, a price index measures the level of the commodity price relative to a reference year (2010 in my case). In this way, a price index is unit-independent, and can therefore be used to build aggregate measures over different commodities (cf. Section 1.4.2). For commodities that are not available in the IFS price data, I use additional price indices series from the US Bureau of Labour Statistics (BLS). More information on the specific price series used is available in Appendix section 1.A.

Finally, data on aggregated land use come from the Global Agro-Ecological Zones (GAEZ) project of the Food and Agriculture Organisation and the International Institute for Applied Systems Analysis (IIASA), which collects agro-ecological data for assessing agricultural resources and potential. I use GAEZ entry “*actual crop harvested area*” for rain-fed and irrigated cultivated land, which is reported as of the year 2000. The crops I am considering here are banana, coffee, corn, cotton, ground nuts, millet, palm oil, potatoes, pulses, rice, sorghum, soya beans, sugar cane, and a composite category “green vegetables”. As individual grid-cells in GAEZ are 5 arc-minute in size (equivalent to a 10 by 10 km square at the Equator), I am able to exploit variation in land use by sub-county, which is the lowest administrative level systematically and consistently available in my household data.¹⁵

¹⁵Sub-county size averages around 250 square km.

1.5.1 Descriptive statistics

Descriptive statistics are reported in Table 1.1. Farms in my sample are quite small, with total landholdings averaging around 3-4 acres in 2009-2011. This marks a sharp reduction compared to 2005, when average farm size was almost three times as high even after excluding outliers. As this pattern might potentially undermine the quality of my results, I explicitly account for this issue later in Section 1.6.1.

The vast majority of farmers' land is untitled, despite a sizeable increase in the share of land with a certificate of occupancy over time. In 2005, almost a quarter of the sample feel insecure about at least one of their parcels, meaning that the household is concerned that someone might dispute their property or use rights on the land. The percentage however drops significantly over time, more than halving by 2011. It has to be noted that plot tenure shares do not sum to 1 in 2009-2011: this is because, after 2005, information on plot tenure is less precisely collected, and there are missing values. To check that imperfect reporting on land tenure is not correlated with crop prices, in Appendix Table C.1 I run Equation (1.3) for a dummy variable for having missing values in land tenure information, and show that the coefficient on my price index is statistically insignificant.

Most of the land is acquired through bequest, especially in 2011 when almost two thirds of each farmer's landholdings are inherited. The share of land acquired by purchase is relatively stable at around 30 percent, while over time the relative importance of other types of land acquisition (like lease, gift, or outright trespassing) is substantially reduced.

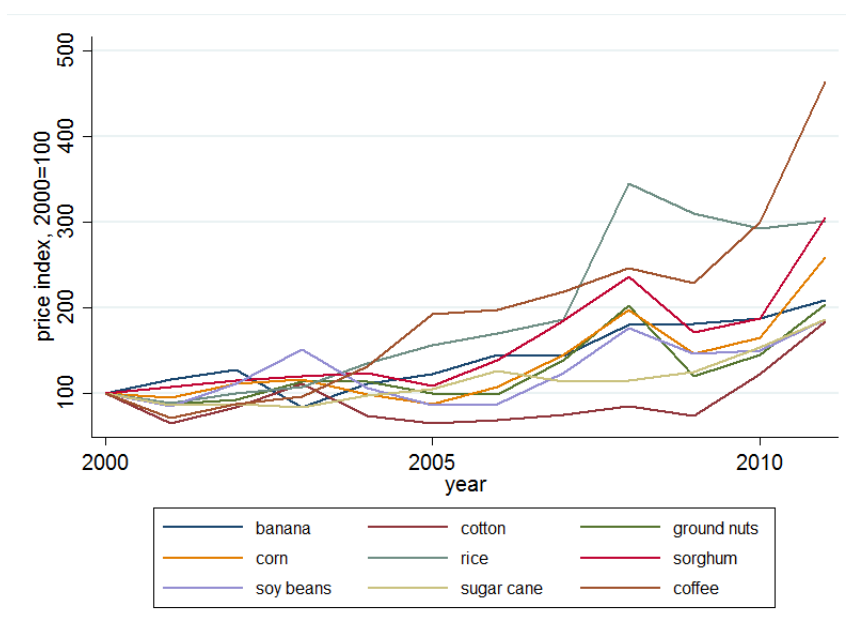
The table also reports on the harvesting of the main crops entering the price index in Equation (1.2). The most popular crops are bananas, coffee, corn, ground nuts and sorghum, whereas cotton, rice, soy beans and sugar cane are less prevalent.

Finally, the last row of the table presents descriptive statistics for my price index, and show that, overall, we are in a world of increasing prices.¹⁶ Figure 1.2 visualises recent time series for all the specific price indices involved in the analysis (here indexed with 2000=100 for ease of interpretation). The evolution of world agricultural prices follows a similar pattern for almost

¹⁶The very low standard deviation in year 2010 is easily explained. Recall that this is a sub-county measure, and that it is built using crop-specific price indices and sub-county-specific land use weights. As such, variation in the index is driven by how specialised each sub-county is in the production of each commodity, and by how much the price of different commodities changes over time with respect to the base year, 2010. In year 2010, however, the price indices for every commodity are equal to 100, so variation only depends on sub-county land use.

all staple crops, with a local peak around the years of the 2007-2008 world food crisis and a sharp rise in the early 2010s. The most pronounced variations can be observed for the rices of coffee, rice, and sorghum.

Figure 1.2: World crop prices, time series, 2000-2011



Notes: Base year: 2000.

Data sources: Commodity prices from Bazzi & Blattman (2014) and IMF International Financial Statistics, various years.

In Appendix Table D.2, I also report simple correlations between tenure types and measures of land-improving investment or income. Although the numbers are quite small overall, both property rights and certificates of occupancy are positively correlated with the use of pesticides and fertilisers, as well as with agricultural income; the converse is true for untitled land. These patterns, though clearly just descriptive, match the discussion about the benefits of land rights in Section 1.2 quite closely.

Table 1.1: Descriptive statistics

	2005	2009	2010	2011
total landholdings (acres)	11.200 (16.729)	3.913 (6.472)	3.771 (6.926)	3.062 (5.315)
property right (share)	0.047 (0.202)	0.103 (0.297)	0.108 (0.304)	0.055 (0.225)
cert. customary (share)	0.011 (0.101)	0.023 (0.147)	0.017 (0.127)	0.014 (0.117)
cert. occupancy (share)	0.004 (0.065)	0.079 (0.264)	0.059 (0.228)	0.115 (0.314)
no certificate (share)	0.938 (0.232)	0.682 (0.447)	0.721 (0.431)	0.750 (0.421)
perceived insecurity (yes/no)	0.224 (0.417)	0.156 (0.363)	0.113 (0.317)	0.107 (0.309)
purchased (share)	0.250 (0.392)	0.314 (0.440)	0.311 (0.443)	0.284 (0.435)
inherited (share)	0.417 (0.450)	0.553 (0.469)	0.579 (0.470)	0.624 (0.464)
other acquisition (share)	0.333 (0.424)	0.133 (0.306)	0.110 (0.286)	0.092 (0.274)
banana (yes/no)	0.547 (0.498)	0.538 (0.499)	0.582 (0.493)	0.574 (0.495)
coffee (yes/no)	0.301 (0.459)	0.282 (0.450)	0.327 (0.469)	0.314 (0.464)
corn (yes/no)	0.774 (0.419)	0.762 (0.426)	0.714 (0.452)	0.695 (0.460)
cotton (yes/no)	0.101 (0.302)	0.029 (0.168)	0.047 (0.212)	0.065 (0.246)
ground nuts (yes/no)	0.317 (0.465)	0.330 (0.470)	0.323 (0.468)	0.351 (0.478)
rice (yes/no)	0.052 (0.221)	0.035 (0.185)	0.050 (0.217)	0.043 (0.203)
sorghum (yes/no)	0.289 (0.453)	0.267 (0.442)	0.193 (0.395)	0.174 (0.379)
soy beans (yes/no)	0.040 (0.195)	0.055 (0.228)	0.069 (0.254)	0.094 (0.292)
sugarcane (yes/no)	0.044 (0.205)	0.047 (0.211)	0.035 (0.180)	0.027 (0.161)
price index (0/100)	3.004 (0.734)	17.580 (1.687)	22.982 (0.000)	73.364 (8.348)
Observations	1503	1456	1313	1003

Notes: Each cell reports the mean of each variable in the sample used for the main estimating equation. Standard deviations are in parentheses. Property right refers to a formal, written and signed official record of an agreement concerning the full ownership of a parcel of land. Customary ownership is a document given to a person who owns a parcel under a customary system in order to recognise and guarantee their interest in the land. Certificate of occupancy is a document issued to a *bona fide* tenant, which details the interests or claims of the occupant. No certificate refers to an informal short term agreement or squatting. Crop variables are dummies for whether the household harvests the crop in at least one of their parcels. Perceived insecurity is whether the farmer subjectively feels their use of a parcel of land may be threatened by a third party. Plot tenure shares do not sum to 1 in 2009-2011 due to missing values in data collection after 2005.

1.6 Results

I initially run pooled OLS analysis with sub-county fixed effects. Results are reported in Panel A of Table 1.2. The fact that P enters Equation (1.3) in logarithm means that the coefficients reported in the table measure the effect of percent increases in the price index on the outcome variable: here, a 10 percent increase in the price index produces a reduction in untitled land by 1 percentage point (Column 4), and an increase in the share of land with a certificate of occupancy (Column 3) by 0.54 percentage points.

When I run fixed effects analysis, results are very similar, and more precisely estimated. In Panels B and C of Table 1.2, a 10 percent increase in the price index still produces a reduction in untitled land of almost 1 percentage point (Column 4), which is driven by a parallel increase in the share of land with a formal certificate of property rights (Column 1) and with a certificate of occupancy (Column 3) of around 0.4 percentage points each. This represents an increase by roughly 5 and 6 percent of the overall mean in each type of tenure, respectively.

Predictably, results are stronger for households residing in communities which are better connected to markets. Table 1.3 reports the results from running regression (1.3) with the addition of two market-integration dummies and their interaction with the price index. In Panel A of the table, the market-integration indicator is a binary variable for whether a market selling agricultural produce is available within the community;¹⁷ in Panel B, the market-integration indicator takes the value 1 if the community has access to a trunk road.¹⁸ In both panels, the share of farmers' untitled land shrinks more when the household has better access to markets, reflecting the easier transmission of international prices to local ones - which makes the index in Equation (1.2) more representative of the prices actually faced by farmers.

¹⁷I classify as markets for agricultural products general markets, local cooperatives, periodic local markets, and "most common markets". In my data, these are defined as follows. General markets selling limited products refer to markets that sell a variety of goods and services, including farm output. These are not specialised farm-output markets and sell such goods only to a limited extent. Local cooperatives may be official cooperatives registered under the Co-operative Societies Act or informal cooperatives that are not registered but consist of a group of households/individuals that unite to buy or sell agricultural inputs or output and perform related activities jointly. A periodic local market is held at fixed locations at fixed intervals where producers, traders, and buyers even from distant locations converge and transact business. These markets are generally organised in open spaces with temporary structures built for the market-day and cater for the needs of both retailers and wholesalers. A "most common market" that sells output widely is a specialised market where most of farm output is available for sale.

¹⁸Trunk roads are main roads maintained by the central government and they usually connect districts to each other. They are six metres and above in width and can either be tarmac or *murrum* (laterite) roads.

Table 1.2: The effect of crop prices on farmers' share of titled land

	(1) property right	(2) cert. customary	(3) cert. occupancy	(4) no certificate
Panel A				
price	0.036 (0.027)	0.010 (0.007)	0.054*** (0.016)	-0.096** (0.037)
Observations	5,275	5,275	5,275	5,275
Outcome mean	0.072	0.016	0.06	0.785
Sub-county fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
HH fixed effects	NO	NO	NO	NO
Additional controls	NO	NO	NO	NO
Panel B				
price	0.044** (0.021)	0.014 (0.009)	0.043*** (0.016)	-0.090*** (0.030)
Observations	5,275	5,275	5,275	5,275
Number of HH	1,828	1,828	1,828	1,828
Outcome mean	0.072	0.016	0.06	0.785
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional controls	NO	NO	NO	NO
Panel C				
price	0.039** (0.018)	0.013 (0.009)	0.042*** (0.016)	-0.082*** (0.028)
Observations	5,275	5,275	5,275	5,275
Number of HH	1,828	1,828	1,828	1,828
Outcome mean	0.072	0.016	0.06	0.785
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional controls	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): share of land for which the household has a formal certificate of title; (2): share of land with a certificate of customary ownership; (3): share of land with a certificate of occupancy; (4): share of land without any certificate. Standard errors are clustered at the sub-county level. The outcome is linearly regressed on year fixed effects, the log of the lag of a price index, and sub-county (Panel A) or household (Panels B and C) fixed effects. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000.

Table 1.3: The interaction of prices and market integration

	(1)	(2)	(3)	(4)
	property right	cert. customary	cert. occupancy	no cert.
Panel A				
price	0.051*** (0.016)	0.011 (0.009)	0.040** (0.019)	-0.082*** (0.024)
price × market in LC1	0.019 (0.024)	0.014 (0.014)	0.014 (0.027)	-0.054** (0.027)
Observations	4,309	4,309	4,309	4,309
Number of HH	1,731	1,731	1,731	1,731
Outcome mean	0.076	0.016	0.051	0.796
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES
Panel B				
price	0.047*** (0.016)	0.007 (0.007)	0.034* (0.018)	-0.072*** (0.023)
price × trunk road in LC1	0.001 (0.026)	0.025** (0.011)	0.026 (0.026)	-0.066** (0.026)
Observations	4,389	4,389	4,389	4,389
Number of HH	1,755	1,755	1,755	1,755
Outcome mean	0.076	0.016	0.05	0.799
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): share of land for which the household has a formal certificate of title; (2): share of land with a certificate of customary ownership; (3): share of land with a certificate of occupancy; (4): share of land without any certificate. Standard errors are clustered at the sub-county level. The outcome is regressed on household and year fixed effects, and the log of the lag of a price index. Panel A includes a binary indicator for the presence in the community of a market selling agricultural produce, and an interaction of this with the price index. Panel B includes a binary indicator for the presence of a trunk road (tarmac or *murrum*) in the community, and an interaction of this with the price index. A community is defined as a Local Council of level 1 (LC1). Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000.

The fact that higher prices induce an increase in farmers' share of titled land could be the

product of at least three different dynamics. First, households could be registering their existing landholdings, acquiring certificates on previously untitled land. Second, they might be purchasing titled land, increasing their total landholdings together with their acreage of certified land. Third, they may be disposing of some of their untitled land, which would reduce the denominator of the titled land fraction while leaving the numerator unchanged.¹⁹ Although all of these possibilities speak of titled land being more highly valued by farmers when prices increase, their implications differ slightly. In particular, the third option would likely reflect a certain degree of strain on the part of farmers, who would be pushed by rising agricultural prices to dispose of some of their land, maybe selling it to big investors in pursuit of lucrative land deals. This is not an unlikely scenario: the IMF (2016) recently documented a boom in the number of land deals²⁰ in the years around the 2007-08 food crisis, which produced a massive increase in food prices and farmland value. The IMF reports that in 2009, at the peak of the rush for land, daily deals in the world involved on average 223 square miles of land, and that the majority of deals took place in Sub-Saharan Africa – especially so in areas with poor land governance.

Since, as commented in Section 1.4.1 above, my data do not allow me to track parcels over time, to partially address this concern I run Equation (1.3) on households' total land acreage: if my sample of small farmers were selling away their land to big investors or foreign companies, I would expect to see a reduction in their total landholding size when prices are higher. Results, reported in Column 1 of Table 1.4, tell however a different story, as prices do not appear to have an impact on total landholdings overall. It seems then that the effects observed in Table 1.2 might be due more to either titling of existing land or if anything to more active local land markets, with land sales and purchases among farmers cancelling each other out. To support this interpretation, in Column 2 of Table 1.4 I in turn analyse the share of land acquired by purchase (rather than through inheritance, lease, or squatting) – which legally requires that the object of the transaction be titled land. Here, a 10 percent increase in crop prices has a small but statistically significant effect on the share of purchased land of 0.2 percentage points. Of course, the evidence in Table 1.4 cannot be regarded as conclusive: for example, the legal

¹⁹ As it would be hard to imagine a farmer un-registering their land, a reduction in the share of titled land when prices are lower would instead be explained farmers not renewing their titles.

²⁰ The term "land deal" refers to a large-scale cross-border acquisition of land, typically at the expense of small-holder production or green space (IMF, 2016).

provision that land purchases only involve titled land may very likely not hold in practice. Absent any more detailed information, the table nonetheless suggests that my results are more likely to be due to a certain reshuffling of land among farmers, rather than to the systematic loss of land to bigger companies.

Table 1.4: More titles or less land?

	(1)	(2)
	total landholdings (ac)	purchased
price	0.273 (0.550)	0.022* (0.011)
Observations	5,275	5,275
Number of HH	1,828	1,828
Outcome mean	5.804	0.269
HH fixed effects	YES	YES
Year fixed effects	YES	YES
Additional Controls	YES	YES

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: Column (1): total household landholdings (acres); (2): share of land acquired by purchase. Standard errors are clustered at the sub-county level. The outcome is regressed on household and year fixed effects and the log of the lag of a price index. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000.

1.6.1 Robustness checks

Considering the four-year gap between 2005 and the next round of the household survey, and the sharp decline in farmers' total land acreage observed between 2005 and 2009 (cf. Section 1.5.1), I first address the possible bias arising from inclusion of year 2005 in my sample. It may in fact be possible that some unobserved event or trend (maybe precisely the global intensification of big land deals mentioned above) affects both the price index and the outcome variables in ways not accounted for by the simple 2005 year fixed effect in Equation (1.3). When I perform the analysis only on the 2009-2011 period (Appendix Table E.3), the effect of prices is indeed much stronger (by almost a degree of magnitude), but the qualitative interpretation of

results is broadly in line with the main evidence reported in Table 1.2, with an increase in the share of land under certificates of occupancy and a reduction in the share of untitled land.

To make sure that results do not depend on the specific way prices are aggregated in Equation (1.2), I also replicate the analysis using alternative specifications for the price index.

As a preliminary check, I build the price index as an arithmetic rather than geometric average of international price indices. Results, reported in Table E.4 in the Appendix, are somewhat lower in magnitude, but very similar to those of my main specification.

Having established that the use of a geometric rather than arithmetic aggregator does not affect the direction and size of my findings, I return to aggregating prices through a geometric average, which ensures better comparability of dimensions with different ranges, and then try a number of different weighting schemes in lieu of sub-county predetermined land use.

First, to account for the possibility that land use in 2000 may not adequately reflect the actual structure of agricultural production almost a decade later, I use as weights the average suitability of land for the production of the various crops for which I have price series. I compute sub-county level averages using again data from GAEZ, which also estimates soil suitability based on knowledge of crop requirements, prevailing soil conditions, and applied soil management, quantifying to what extent soil conditions match crop requirements under defined input and management circumstances.²¹ Results are reported in Appendix Table E.5 and go in the same direction as those in Table 1.2.

To address the concern that crop suitability may not be reflected in actual land use, I also instrument land use in 2000 with crop suitability for each crop, and use fitted values as weights in my price index. Appendix Table E.6 displays the outcome of the exercise, which delivers a set of coefficients even more in line with those in Table 1.2.

As a further check, I also construct my price index as the geometric average of the change in agricultural commodity prices over the past 5 years (returning to use weights equal to the sub-county-level share of land harvested with each crop), rather than just considering the first lag of prices, to account for the possibility that farmers might adjust their response to developments over a longer time span. Results, reported in Appendix Table E.7, are slightly less precisely estimated, and show a reduction in the share of land with formal certificates; this is however

²¹Specifically, I retrieve soil suitability estimates for rain-fed land, at intermediate input level, averaged over the baseline period 1961-1990.

compensated by a much higher increase in parcels with certificates of occupancy.

In a separate exercise, I also account for individual land use choices, exploiting information in the LSMS survey about the acres of land harvested with each crop by farmer households. I first consider contemporaneous land use (Appendix Table E.8). Then, to address the endogeneity of the choice on which crops to harvest, I also use time-invariant use of land, both at baseline in year 2005 (Appendix Table E.9) and as an average over the entire sample period (Appendix Table E.10). Here, some of the results do not stay statistically significant, but remain very similar to my main findings, both in terms of direction and magnitude.

Turning to the choice of functional form, I relax the linearity restriction imposed by OLS and fixed effect regression, and run Tobit regression with sub-county fixed effects, where the outcome variables are constrained between 0 and 1. Results are reported in Appendix Table E.11, and, notwithstanding their substantially higher magnitudes, have the same qualitative interpretation as the ones in Table 1.2 above.

As a final specification check, I address the possibility of asymmetries in the response of land titles to prices, and I analyse whether prices induce an increase, decrease, or no change in the share of titled land owned by farmers. To this end, I build a set of dummy variables for whether the household increased, decreased, or left unchanged the share of land under each outcome listed in Section 1.4.1 from one round of the household survey to the next, and then run regression (1.3). Appendix Table E.12 reports the results, and shows that an increase in the price index is associated to an increase in the likelihood of increasing one's share of land with a certificate of occupancy, a reduction in the likelihood of decreasing the share of land with a formal certificate of title, and a reduction in the likelihood of increasing the share of untitled land. All these results fit well the main evidence presented in Table 1.2.

1.6.1.1 Caveats

In the discussion above, I interpret my estimates as causal effects. For the model to identify causal effects, however, changes in prices need to be uncorrelated with changes in the outcome variables. As it is, my analysis is instead silent about the possibility of an interaction between my outcomes and any policies targeting the production of specific crops. For example, as observed in Figure 1.2 above, the prices of certain commodities underwent more dramatic

variations than others over time. The price index that I consider in Equation (1.2) is lagged, so it does not suffer from simultaneity bias, but it may well be that the Ugandan Government might have anticipated these trends, and somehow tried to exploit the rise in the international price of one or more of these commodities over time – for instance offering incentives to farmers engaged in their production. If this does not affect the weighting scheme of my price index (which is fixed in year 2000), it may nevertheless still interact with my land-tenure outcome variables. When interpreting the findings of this chapter, this possibility should therefore be accounted for.

Another caveat that needs to be made relates to the comparability of different sub-counties, which may not display parallel trends. To explore this possibility, in Appendix Table E.13 I estimate the main specification in Equation (1.3) including a lead variable of the price index. Here, all the estimated effects remain broadly unaffected in terms of direction, size, and statistical significance, but the lead variable is indeed significant in the regression for the share of land with a certificate of occupancy. Again, this is an issue worth considering when assessing the conclusions and implications that can be drawn from this chapter.

1.7 Mechanisms

What the chapter has shown so far is that increasing agricultural prices induce a higher demand for titled land by Ugandan farmers. To understand why this might be the case, this section now proposes an analytical framework highlighting a number of channels that may drive the results, before proceeding to test these hypotheses in the data.²²

A first, obvious candidate is the possibility that farmers are subject to an income effect. As mentioned above, the land registration process in Uganda was particularly lengthy and expensive during my sample period: the World Bank estimates that in 2009 there were 13 steps to registering property, which took 227 days on average and cost more than ten times the monthly income of the average Ugandan household.²³ The acquisition of titled land as such was also hampered by higher administrative costs for processing documentation of transactions and

²²While the discussion will be descriptive here, Appendix Section 1.F proposes an attempt at presenting the same mechanisms in a more formal fashion.

²³Data Source: The World Bank, Ease of Doing Business Indicators. Today the situation appears to have surprisingly improved, with a reduced number of steps required to complete the registration (10), which now take only 42 days and cost 2.6 percent of the value of the property, in line with the average for Europe and Central Asia.

extra payments demanded by corrupt officials (Mwebaza & Gaynor, 2002). Everything else equal, if an increase in crop prices made those selling agricultural commodities better-off, it would also enable them to afford the costs entailed by land certificates.

At the same time, it may also be that with higher prices farmers are not just more able to hold titled land, but may become even more *willing* to do so. This incentive effect would owe to the increased value of the land itself, which might in turn result in at least two chains of mechanisms. On the one hand, as land becomes more valuable thanks to the better earnings prospects that higher prices induce, the holder may want to be in control of any investment and transaction decisions on it, which to an important extent should be easier when the land is officially held under a formal tenure scheme. This argument is in line with empirical evidence for various African countries by Baland et al. (1999), Brasselle et al. (2002), Carter et al. (1994), Roth et al. (1994a), who all show that farmers tend to register land parcels with higher levels of investment, which have better profitability prospects that justify the registration expenditures. A possible counter-argument to this line of reasoning, however, could be that the cost of titling is not entirely independent of land value: other than fixed registration, processing, and handling fees, certain types of titles involve the payment of a stamp duty proportional to the value of the land (today this amounts for example to around 1 percent of the market value or ground rent of the land for transfer of *mailo* and acquisition of leasehold, cf. PELUM, 2012). With this in mind, it is not obvious that an increase in prices necessarily increases the returns to titling because of higher land values. Another possibility, nonetheless, is that for the very same increase in land value a number of different actors might develop an interest in the land, and try to unduly take possession of it – for example claiming exclusive rights to land originally held by those who are less informed, or lack the resources to apply for land registration. This is especially true when registration and titling are performed upon demand by individual landholders, and when the cost charged to the individual for registration is high (Feder & Nishio, 1999). Van Leeuwen (2014), for example, reports that it is relatively easy for co-villagers, big companies, and even the government in Uganda to evict farmers from land held without a formal certificate of title, which is then put to other uses without an appropriate compensation of those who get displaced. When land values swell, farmers may anticipate this behaviour, and respond by switching to a more formal land portfolio (again, either registering their own

plots or acquiring new titled ones).

Finally, the farmers' social context should have a strong role in shaping their capability to actually access titled land – and this effect should be even more relevant in a context of rising land values. Various authors (Feder & Nishio, 1999; Feder & Noronha, 1987; Platteau, 1996) point out the inequality threats that lie in land reform, as sections of local populations face a serious risk of being denied legal recognition of their rights during the registration process. Many also document how those obtaining titles or titled land in Africa tend to be “political friends”, to hold or have held political positions, to be better educated, to have larger holdings, and to be heavily engaged in non-farm activities.²⁴ Carter & Olinto (2003) argue that, given an estimated pattern of wealth-biased liquidity constraints, property rights reform will benefit only wealthier producers, and Goldstein & Udry (2008) have shown for Ghana that individuals holding powerful positions in a local political hierarchy have more secure tenure rights. These patterns, in turn, are also very likely to be affected by existing levels of social capital in farmers' social context of reference. I here intend social capital as networks, together with shared norms, values and understandings, that facilitate co-operation within or among groups in a community.²⁵ By definition, one would expect an economy with a high level of social capital to enable smoother, better-functioning land markets, and hence to improve the capability of even weaker groups to reap the benefits stemming from their land.

To summarise, the analysis in this section predicts that an increase in agricultural prices will induce individual demand for titled land to rise due to two main channels: (i) an income effect: rising crop prices enhance the farmer's *ability* to afford registered land; and (ii) an incentive effect: agricultural prices affect the farmer's *willingness* to secure their land, by the combined pressure of land value and land insecurity. Finally, these two effects are more strongly felt by certain groups of the population, in ways that depend on the quality of social capital in the communities where farmers operate. Table 1.5 collects the main hypotheses to be tested in the data, which I do in the next section.

²⁴See e.g. Roth (1993), and Roth et al. (1994b), for Somalia; Doornbos (1975), and Noronha (1985), for Uganda; Zubair (1987), for Nigeria.

²⁵Definition by the Organisation for Economic Co-operation and Development.

Table 1.5: Expected mechanisms

(1)	(2)	(3)
Mechanism	Channel	Expected effect
Income effect	Sales, income	Higher commodity prices increase farmers' sales and agricultural income.
Incentive effect	Land value	Past investment: higher prices induce more land titling in the presence of an investment on the land,
Incentive effect	Land value	Profitability: higher prices induce more land titling in the presence of a more profitable crop mix.
Incentive effect	Land value	Insecurity: higher prices induce more land titling when there is higher threat of land disputes.
Capabilities	Social status	Higher prices induce more land titling by farmers belonging to a privileged group.
Capabilities	Social capital	Insecurity: where social capital is higher, higher prices induce a reduction in perceived land insecurity.
Capabilities	Social capital	Social status: where social capital is higher, increasing prices induce more land titling by farmers belonging to disadvantaged groups.

Notes: The Table summarises the mechanisms to be tested in Section 1.8. Column (1): broad mechanism hypothesised; Column (2): channel through which the mechanism is expected to operate; Column (3): effect to be tested in the data and expected result.

1.8 Testing the mechanisms

1.8.1 The income effect

To test for the presence of an income effect, I explore the impact of agricultural prices on the self-reported average value of farmers' sales, farming income, and total agricultural income in my period of interest. To avoid the noise generated by self-reported monetary data, I winsorise the variables at the 10 top percentile,²⁶ and consider them in logs rather than in levels.

The regression I am running is therefore

$$\log V_{ist} = \alpha + \beta \log P_{st} + x'_{ist}\gamma + \theta_t + \eta_i + \epsilon_{ist}, \quad (1.4)$$

where V is either sales value, farming income, or total agricultural income per acre, and all other variables are defined as in Equation (1.3). Standard errors are always clustered at the sub-county level. Contrary to Equation (1.3), the price index is not lagged here. This reflects

²⁶Results are robust to alternative winsorisations.

the fact that, everything else equal, an increase in prices is mechanically going to affect farmers' revenues *today*.

Results are shown in Table 1.6. As both the outcome and the price variables are expressed in logarithms in Equation (1.4), the coefficient reported in Table 1.6 can be interpreted as the price elasticity of sales or income: this means that a one percent increase in agricultural prices increases farmers' revenues by 2.3 percent, and both their farming and total agricultural income by around 0.6 percent.

1.8.2 The incentive effect

Commodity prices might have an effect on farmers' incentives to seek land titles, depending on exposure to potential land grabbing and the value of their landholdings. The latter should in turn be a function of a number of "worth" variables, such as past investment or the profitability of the crop mix harvested on the land.

Table 1.6: The income effect

	(1)	(2)	(3)
	sales value (UGX)	farming income (UGX)	agricultural income (UGX)
price	2.347* (1.249)	0.578* (0.336)	0.638* (0.345)
Observations	3,534	3,856	4,106
Number of HH	1,610	1,732	1,799
Outcome mean	9.393	12.284	12.447
HH fixed effects	YES	YES	YES
Year fixed effects	YES	YES	YES
Additional Controls	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): log-sales value per acre (in Uganda Shillings). Column (2): log-farming income per acre (in Uganda Shillings). Column (3): log-agricultural income per acre (in Uganda Shillings). The outcome is regressed on household and year fixed effects and the log of a price index. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000. Outcome data are winsorised at the top 10 percentile. Standard errors are clustered at the sub-county level. The analysis for sales value is performed only on the years 2009, 2010, 2011.

Before moving to address each of these channels in detail, however, I try to assess whether

farmers expect price shocks to be long-lasting or not. Incentives are in fact unlikely to change much if individuals were to consider a price increase just as a temporary blip. Given that my data do not offer a straightforward way to assess price expectations, I test whether the price series of the commodities included in my price index *are* indeed persistent, assuming that farmers are able to learn from past experience and adapt their expectations accordingly. Standard tests fail to reject the null of a unit root for all price series (cf. Appendix Section 1.H), and I interpret the result as suggestive of persistence in price shocks. Although not conclusive, this evidence makes it plausible that farmers expect future prices to reflect current ones, and adjust their behaviours accordingly.

1.8.2.1 Past investment

I consider as past investment an indicator for whether, in the previous round of the household survey, farmers reported at least a plot of land with tree crops, or on which they used fertilisers (either chemical or organic) and/or pesticides. I then interact this indicator with the price index, and run the following regression:

$$y_{ist} = \alpha + \beta \log P_{st-1} + x'_{ist} \gamma + \delta I_{ist-1} \times \log P_{st-1} + \zeta I_{ist-1} + \theta_t + \eta_i + \epsilon_{ist}, \quad (1.5)$$

where all variables are defined as in Equation (1.3) and I is the past-investment indicator.

The coefficient of interest is now δ , which measures whether the effect of an increase in crop prices is more strongly felt by those who have already undertaken some investment on their land.

Results, shown in the top panel of Table 1.7, suggest that this is actually the case: where land has already been improved by either the presence of trees or the use of fertilisers or pesticides, farmers are more likely to reduce their share of untitled land, and to increase the share of land under formal property rights or certificates of occupancy.

Table 1.7: Past investment

	(1)	(2)	(3)	(4)
	property right	cert. customary	cert. occupancy	no cert.
<i>Panel A</i>				
price	0.009 (0.016)	0.020 (0.012)	-0.007 (0.016)	-0.039 (0.031)
price × investment	0.034** (0.015)	-0.008 (0.011)	0.064*** (0.016)	-0.056** (0.026)
Observations	5,054	5,054	5,054	5,054
Number of HH	1,758	1,758	1,758	1,758
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES
<i>Panel B</i>				
price	0.013 (0.016)	0.017 (0.011)	-0.007 (0.018)	-0.036 (0.031)
price × trees	0.031** (0.015)	-0.005 (0.010)	0.066*** (0.017)	-0.063** (0.026)
Observations	5,054	5,054	5,054	5,054
Number of HH	1,758	1,758	1,758	1,758
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES
<i>Panel C</i>				
price	0.045*** (0.015)	0.015 (0.011)	0.040*** (0.015)	-0.091*** (0.030)
price × pesticides/fertilisers	-0.025 (0.018)	-0.007 (0.011)	0.039* (0.023)	-0.004 (0.037)
Observations	4,861	4,861	4,861	4,861
Number of HH	1,708	1,708	1,708	1,708
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): share of land for which the household has a formal certificate of title; (2): share of land with a certificate of customary ownership; (3): share of land with a certificate of occupancy; (4): share of land without any certificate. Standard errors are clustered at the sub-county level. The outcome is regressed on household and year fixed effects, the log of the lag of a price index, the lag of an indicator for having at least one plot featuring certain types of investment on the land, and an interaction of the latter two. In Panel A, investment is identified by presence of trees or use of fertilisers and pesticides; in Panel B, investment is only presence of trees; in Panel C, investment is only use of fertilisers and pesticides. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000.

Clearly, results in Table 1.7A could just simply mean that farmers who are forward-looking

enough and have the financial means to devote some resources to land improvement may for the very same reason also be more likely to hold titled land. To better see the chain that goes from past investment to land value to acquisition of titled land, I also distinguish between long- and short-run investment, and consider investment in trees and in fertilisers/pesticides separately. Intuitively, if it were purely a matter of higher skills or wider resources, there should be no big difference between the numbers associated with the two types of investment. Vice versa, if having incurred a fixed, sunk cost on the land that makes it more valuable in the future had an effect per se, we would expect to find more sizeable effects for farmers that undertook investment in the form of planting trees (or of buying land already covered in trees). Panels B and C of Table 1.7 show that indeed most results are significant only for tree investment. An exception is the share of land under certificates of occupancy, which is responsive also to shorter-run investment in fertilisers and pesticides.

1.8.2.2 Profitability

To study the effect of crop profitability, I analyse the impact of the prices of certain selected commodities. A crop is chosen for the exercise if it meets the following requirements: (i) it accounts for a large share of Ugandan export value, so that I can focus on the commodities most likely to be affected by international prices; (ii) my price data feature a specific price series for the crop, rather than having it included in the price series for a more comprehensive category;²⁷ and (iii) a reasonable number of farmers report harvesting the crop in the household survey, to make sure the analysis is relevant for my sample.²⁸ This leaves me with banana, coffee, corn, and cotton. Together, these crops account for a quarter of total Ugandan exports at the beginning of my period of analysis, and roughly 10 percent of total agricultural production in the country.²⁹

These four crops differ among themselves in an important way: bananas, coffee, and cotton are cash crops, inherently more lucrative than staples like corn.³⁰ According to the discussion

²⁷For instance, beans are among the top ten Ugandan exports, but in my data their price is included in the “other vegetables” category so they cannot be included in the exercise.

²⁸For example, tea is Uganda’s third product in terms of export value and the IFS data include a specific price series for tea, but it is mainly produced by bigger firms and only less than 100 observations report a tea harvest in the LSMS household survey.

²⁹Source: own calculation using data from the United Nations Commodity Trade Statistics Database (UN-ComTrade), HS (Harmonized System) 2002 series and country statistics from the Food and Agriculture Organisation (FAOStat).

³⁰At the end of 2004, before the start of my sample period, the value of Ugandan exports of coffee and cotton was

in Section 1.7 above, they should then differ significantly in how their prices affect demand for titled land. In particular, I expect the price of more valuable crops to have a more pronounced effect on land titles, as they represent a stronger driver of better earnings prospects.

For each commodity j I therefore run the following regression:

$$y_{ist} = \alpha + \beta l_{sj} \times \log p_{jt-1} + x'_{ist} \gamma + \theta_t + \eta_i + \epsilon_{ist}, \quad (1.6)$$

where $l_{sj} \times \log p_{jt-1}$ is the share of land harvested with commodity j in sub-county s interacted with the lagged log-price of j , and all other variables are defined as in Equation (1.3).

Results are reported in Table 1.8. The prices of bananas, coffee and cotton behave in a similar way, inducing an increase in the share of land under occupancy titles. For bananas and cotton, prices also significantly decrease the share of untitled land. This evidence fits the discussion in Section 1.7: the prices of crops characterised by a higher market value are positively and significantly related to an increase in formalisation of land tenure. In Table 1.8D, instead, the situation looks different, as corn prices are associated with a reduction in the share of land with formal certificates of title and an increase in that of unregistered land. This is somehow surprising, as a priori one would have expected to find a weaker or at most insignificant effect of corn prices with respect to other commodities, but not an effect of opposite sign. To better understand the result, it would be informative to check what happens to each specific plot of land cultivated in corn, but as mentioned in Section 1.5 this is not possible given the structure of my data. In principle, one could speculate that the result might be due to the acquisition of more untitled land when prices increase, but the interpretation can only be taken as tentative in this context.

respectively around 20 and 6 times that of corn (UN-ComTrade data). As bananas in Uganda are mostly produced for domestic consumption, exports of corn surpassed those of bananas. However, the international price for 1 kg of bananas was almost 4 times as high as that of corn (FAOStat).

Table 1.8: The effect of specific crop prices

	(1)	(2)	(3)	(4)
	property right	cert. customary	cert. occupancy	no certificate
<i>Panel A</i>				
banana	0.176 (0.114)	-0.019 (0.036)	0.355*** (0.122)	-0.439** (0.208)
<i>Panel B</i>				
coffee	0.031 (0.049)	-0.035 (0.027)	0.137** (0.059)	-0.096 (0.085)
<i>Panel C</i>				
cotton	0.031 (0.046)	0.021 (0.017)	0.152** (0.073)	-0.187* (0.097)
<i>Panel D</i>				
corn	-0.040** (0.016)	-0.001 (0.006)	-0.007 (0.009)	0.046** (0.021)
Observations	6,262	6,262	6,262	6,262
Number of HH	2,208	2,208	2,208	2,208
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES
<i>t-tests:</i>				
H_0 : banana=corn	*		**	**
H_0 : coffee=corn			**	
H_0 : cotton=corn			**	**

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): share of land for which the household has a formal certificate of title; (2): share of land with a certificate of customary ownership; (3): share of land with a certificate of occupancy; (4): share of land without any certificate. Standard errors are clustered at the sub-county level. The outcome is regressed on household and year fixed effects and an interaction of the lagged log-price of a specific crop with the sub-county-level share of land harvested with that crop. The specific crops considered are: Panel A: banana; Panel B: coffee; Panel C: cotton; Panel D: corn. Additional controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The last three lines report the significance level for the test of equality of coefficients on the prices of banana/coffee/cotton vs. corn.

1.8.2.3 Insecurity

In Table 1.9, I first test for the reduced-form correlation of insecurity and land titles. Insecurity here is measured exploiting the subjective assessment of farmers who report being concerned

that someone may dispute their property or use rights on the land.³¹ My main regressor of interest is therefore the share of total landholdings on which farmers feel insecure.

Clearly, the effects measured in Table 1.9 cannot really be regarded as causal, as there might well be reverse causality (higher land titling could for example be expected to bring about lower insecurity). The table, however, is still informative to gauge the correlations between the variables involved, which are indeed non-negligible. Perceived insecurity is correlated with an increase in the share of land under formal certificates of title by 13 percentage points (almost twice the sample mean) and with a reduction in the share of untitled land by 6 percentage points.³²

In Table 1.10, I then check whether farmers facing tenure insecurity are in fact subject to a stronger incentive to register their land when prices rise, interacting the price index with the lag of an indicator for having felt insecure. I find that 10 percent higher prices make land-insecure farmers increase their landholdings under formal certificates of property by almost 2 percentage points, and reduce their share of uncertified land by roughly 1.4 percentage points.

When I test whether land insecurity is in turn affected by agricultural prices (Table 1.11), though, the aggregate price index per se does not affect farmers' perceptions about land insecurity in a statistically significant way. The interpretation of the combined evidence from Tables 1.10 and 1.11 could thus be as follows: overall, prices have no effect on the prevalence of land grabbing, and hence do not make farmers more insecure; however, in a context of existing high insecurity, the negative consequences of losing land are worse when prices increase, which constitutes a further incentive towards the acquisition of titled land.

³¹A land dispute is defined in the LSMS survey as a disagreement, either between specific individuals or against collective interests, over land rights, boundaries or uses.

³²This result runs contrary to recent findings by Bezu & Holden (2014), who note that fear of land expropriation may negatively influence the willingness to pay for a land registration certificate, but is consistent with Collin et al. (2012), who find that demand for property rights responds positively to a higher perceived risk of expropriation.

Table 1.9: The insecurity effect

	(1) property right	(2) cert. customary	(3) cert. occupancy	(4) no certificate
perceived insecurity	0.130*** (0.028)	-0.005 (0.007)	0.006 (0.014)	-0.060** (0.029)
Observations	6,262	6,262	6,262	6,262
Number of HH	2,208	2,208	2,208	2,208
Outcome mean	0.076	0.016	0.054	0.785
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): share of land for which the household has a formal certificate of title; (2): share of land with a certificate of customary ownership; (3): share of land with a certificate of occupancy; (4): share of land without any certificate. Standard errors are clustered at the sub-county level. The outcome is regressed on household and year fixed effects and on the share of land on which the household feels insecure. Land insecurity is defined as the household being concerned that someone may dispute their property or use rights. Additional controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects.

Table 1.10: Insecurity and prices

	(1) property right	(2) cert. customary	(3) cert. occupancy	(4) no certificate
price	-0.018 (0.081)	0.005 (0.036)	0.223** (0.105)	-0.246** (0.109)
price × insecurity	0.190*** (0.056)	0.011 (0.037)	-0.020 (0.049)	-0.138* (0.072)
Observations	3,363	3,363	3,363	3,363
Number of HH	1,512	1,512	1,512	1,512
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): share of land for which the household has a formal certificate of title; (2): share of land with a certificate of customary ownership; (3): share of land with a certificate of occupancy; (4): share of land without any certificate. Standard errors are clustered at the sub-county level. The outcome is regressed on household and year fixed effects, the log of the lag of a price index, a lagged indicator for perceived land insecurity, and an interaction of the latter two. Land insecurity is defined as the household being concerned that someone may dispute their property or use rights on the land. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000. Additional controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects.

Table 1.11: The effect of prices on insecurity

	(1)
	perceived insecurity
price	0.021 (0.018)
Observations	5,275
Number of HH	1,828
Outcome mean	0.126
HH fixed effects	YES
Year fixed effects	YES
Additional Controls	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): share of land on which the household feels insecure. Land insecurity is defined as the household being concerned that someone may dispute their property or use rights. Standard errors are clustered at the sub-county level. The outcome is regressed on household and year fixed effects and on the the log of the lag of a price index. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000.

Moreover, if I run regression (1.6) for individual crop prices on perceived land insecurity (Table 1.12), I find that a 10 percent increase in banana prices causes a significant, sizeable increase by almost 3 percentage points in perceived land insecurity (Column 1). This is equivalent to a 25 percent increase with respect to the overall sample mean. Although none of the other crops analysed produces a significant effect, the signs of the estimated coefficients go in the expected direction: coffee and cotton prices enter the regression equation with a positive sign, corn price with a negative one. It is also interesting to notice that, in Section 1.8.2.2, the size of the coefficients on banana prices in Table 1.8 was at least twice as big as for any of the other crops. If one were to take the joint findings from this subsection and the previous one very seriously, the evidence for banana prices might indicate that, when active, the direct effect of prices on insecurity is at least as strong as the effect of crop profitability in driving overall impacts on land registration.

Table 1.12: Perceived insecurity - major export crops

	(1)	(2)	(3)	(4)
	perceived insecurity	perceived insecurity	perceived insecurity	perceived insecurity
banana	0.290** (0.114)			
coffee		0.045 (0.058)		
cotton			0.047 (0.044)	
corn				-0.011 (0.014)
Observations	6,262	6,262	6,262	6,262
Number of HH	2,208	2,208	2,208	2,208
Outcome mean	0.12	0.12	0.12	0.12
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: The outcome is the share of land on which the household feels insecure. Land insecurity is defined as the household being concerned that someone may dispute their property or use rights. Standard errors are clustered at the sub-county level. The outcome is regressed on household and year fixed effects and the interaction of the lagged log-price of an export crop with the sub-county-level share of land harvested with that crop. The export crops are: Column (1) banana; Column (2) coffee; Column (3) cotton; Column (4) corn. Additional controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects.

1.8.3 Social status

In this subsection, I check whether agricultural prices have a differential effect on certain socio-economic groups of the population, following patterns of discrimination or privilege. I test for the existence of a “social status” effect running the following regression:

$$y_{ist} = \alpha + \beta \log P_{st-1} + x'_{ist}\gamma + \delta D_{ist} \times \log P_{st-1} + \zeta D_{ist} + \theta_t + \eta_i + \epsilon_{ist}, \quad (1.7)$$

where all variables are as defined in Equation (1.3) and D is a dummy variable identifying a certain sub-group of the population. The coefficient of interest is δ , which measures whether

and by how much group D is able to benefit from increasing agricultural prices with respect to the rest of the population.

I start by exploring the possibility that the acquisition of titled land is biased towards affluent, well-connected individuals, who might leverage on their acquaintance with government officials and knowledge of bureaucratic procedures. To this extent, I first focus on wealthy households: I build a wealth index through principal component analysis on asset ownership,³³ and I define a household as wealthy if at baseline they belong to the top wealth quintile in their district of residence.³⁴ Then, I also test for the effect of the household head having higher levels of education, defined as having attended at least upper secondary school (measured at the beginning of my sample period). Finally, I perform the same exercise on the extent of a household's political connections, proxied by whether they have at least one family member serving in a local council.³⁵

As regards disadvantaged groups instead, I consider households headed by women³⁶ and ethnic minorities. I define ethnic minorities as households whose head does not belong to the predominant group in their district of residence, measured as the ethnicity with the highest share in total district population according to a 10 percent sample of the 2002 Ugandan Population and Household Census (Bureau of Statistics, Uganda).³⁷

Results are reported in Table 1.13, but, quite surprisingly, none of the groups considered seems to be differentially impacted by changes in agricultural prices. Social position, per se, does not look like a significant driver of the relationship between prices and the acquisition of registered land.

³³More information on the wealth measure is provided in the Appendix.

³⁴Results are robust to more restrictive definitions.

³⁵The Ugandan local government system has a pyramidal structure formed by the village (LC1), parish (LC2), sub-county (LC3), county (LC4), and district (LC5) in rural areas. The political organ at all levels is the council, whose members are elected every four years in regular elections and represent specific electoral areas or interest groups. Councillors are also assisted by government employees who provide technical support, parish and sub-county chiefs, and Chief Administrative Officers. Other than providing land services, the responsibilities of Local Councils include making local development plans and managing the provision of public services such as health, education, and road maintenance (cf. for details Steiner, 2006; Van Leeuwen, 2017). In my household data, I have information on whether individuals are councillors in an LC1, LC2, or LC3.

³⁶Many recent studies (Bomuhangi et al., 2011; Goldstein et al., 2016; USAid, 2010, among others) document how, in spite of recent legal provisions for equitable ownership of land, women are still handicapped by formal and customary land systems, which make them vulnerable to expropriation, land-grabbing by an ex-husband or by relatives of a deceased husband, and inheritance loss. Although many elite-class women now purchase land and have reasonably secure titles on it, moreover, in the late 2000s women still owned less than 8 percent of the land, despite heading 26 percent of rural households and growing between 70 percent and 80 percent of the harvest from food crops in the country (USAid, 2010).

³⁷More details on the geographical distribution of ethnicities in the country are reported in Appendix 1.I.

Table 1.13: Social status

	(1)	(2)	(3)	(4)
	property right	cert. customary	cert. occupancy	no certificate
<i>Panel A</i>				
price	0.043** (0.019)	0.009 (0.010)	0.043** (0.017)	-0.081*** (0.030)
price×wealthy	-0.014 (0.016)	0.016 (0.011)	0.001 (0.014)	-0.022 (0.026)
Observations	4,900	4,900	4,900	4,900
Number of HH	1,651	1,651	1,651	1,651
<i>Panel B</i>				
price	-0.074 (0.079)	0.020 (0.038)	0.295*** (0.096)	-0.251** (0.101)
price×educated	-0.004 (0.048)	0.003 (0.030)	-0.017 (0.043)	-0.041 (0.053)
Observations	3,443	3,443	3,443	3,443
Number of HH	1,580	1,580	1,580	1,580
<i>Panel C</i>				
price	0.037* (0.021)	0.015 (0.011)	0.039** (0.015)	-0.083** (0.034)
price×politician	0.010 (0.034)	-0.017 (0.011)	0.019 (0.023)	0.011 (0.058)
Observations	5,267	5,267	5,267	5,267
Number of HH	1,827	1,827	1,827	1,827
<i>Panel D</i>				
price	0.042** (0.020)	0.015 (0.010)	0.044*** (0.016)	-0.080*** (0.028)
price×female head	-0.011 (0.020)	-0.008 (0.009)	-0.005 (0.016)	-0.010 (0.026)
Observations	5,275	5,275	5,275	5,275
Number of HH	1,828	1,828	1,828	1,828
<i>Panel E</i>				
price	0.034 (0.029)	0.016 (0.011)	0.040** (0.017)	-0.074** (0.033)
price×minority	0.010 (0.022)	-0.007 (0.011)	0.006 (0.020)	-0.016 (0.034)
Observations	5,275	5,275	5,275	5,275
Number of HH	1,828	1,828	1,828	1,828
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): share of land for which the household has a formal certificate of title; (2): share of land with a certificate of customary ownership; (3): share of land with a certificate of occupancy; (4): share of land without any certificate. Standard errors are clustered at the sub-county level. The outcome is regressed on household and year fixed effects, the log of the lag of a price index, an indicator for belonging to a certain sub-group of the population, and an interaction of the latter two. In Panel A, the sub-group is identified by belonging to the highest wealth quintile in the district; in Panel B, by having a household head with at least some upper secondary education; in Panel C, by being related to a local council member; in Panel D, by having a female household head; in Panel E, by not belonging to the predominant ethnicity in the district. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000.

1.8.4 Social capital

Social capital is likely to affect the discussion of both land insecurity and social status. In particular, I expect to find a positive impact of prices on insecurity in areas with lower levels of social capital. Moreover, I also expect a different effect of prices across social groups in areas with different levels of social capital.

I proxy social capital with a measure of ethnic concentration in each district, in line with existing research showing that ethnic fragmentation is negatively correlated with various measures of government performance, institutional quality, and economic growth (Alesina et al., 2003; Easterly & Levine, 1997; La Porta et al., 1999).

I measure ethnic concentration by the Herfindahl-Hirschman index, using data from a 10 percent sample of the 2002 Ugandan Census. Given a population composed of N ethnic groups indexed by $i = 1 \dots N$, each with population share s_i , the Herfindahl-Hirschman index is the sum of the squared ethnic shares:

$$HHI = \sum_{i=1}^N s_i^2. \quad (1.8)$$

Higher values of the index describe a district with a more concentrated ethnic composition, lower values a more fractionalised one. Here, I consider an ethnic area to be highly concentrated if it belongs to the top quartile of the distribution of the Herfindahl-Hirschman index across the country.³⁸

In light of existing discussion in the literature on the additional harmful effects of ethnic polarisation (cf. Alesina et al., 2003; Esteban & Ray, 1994; Garcia-Montalvo & Reynal-Querol, 2002), in Appendix Section 1.J I also replicate the analysis in this subsection proxying high social capital with ethnic concentration *and* non-polarisation (more details on the construction of the polarisation measure in Appendix Section 1.J). To abstract from ethnicity, in Appendix Section 1.J I also construct social capital as the share of people in a district who perceived others to be trustworthy in their village in the first round of the household survey. Qualitative results are robust to both these alternative definitions of social capital.

Table 1.14 explores the effect of social capital on insecurity. The analysis is the same as in Table 1.11, with the addition of an indicator for high social capital and an interaction between

³⁸Results are robust to more restrictive definitions.

this and the price index. Here, the coefficient on the interaction between prices and social capital is negative and significant: a ten percent increase in prices is associated with 0.5 percentage points lower perceived insecurity in areas with a higher social capital.

Table 1.14: Social capital and insecurity

	(1) perceived insecurity
price	0.034 (0.023)
price $\times$ social capital	-0.050* (0.025)
Observations	5,284
Number of HH	1,830
Outcome mean	0.126
HH fixed effects	YES
Year fixed effects	YES
Additional Controls	YES

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: Column (1): share of land on which the household feels insecure. Land insecurity is defined as the household being concerned that someone may dispute their property or use rights. Standard errors are clustered at the sub-county level. The outcome is regressed on household and year fixed effects, the log of the lag of a price index, an indicator for high social capital, and an interaction of the latter two. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000. High social capital is proxied by ethnically concentrated areas (top quartile of the Herfindahl-Hirschman concentration index on ethnic population shares).

Now turning to the impact of social capital on social status, in Table 1.15 I test whether the impacts analysed in Section 1.8.3 above differ between areas with higher and lower levels of social capital. Each panel of the Table replicates the analysis performed in Section 1.8.3 for the effect of social position, splitting the sample in areas with high and low social capital. The last row of each panel reports the significance level for the test of equality of the coefficients obtained in the two samples.

The main finding emerging from Table 1.15 is that, regardless of the specific outcome variables affected in each case, social capital appears to have an equality-enhancing effect along most dimensions. This means that, among the differences between coefficients in high and low

social capital areas, the ones that are statistically significant are negative for privileged groups and positive for weaker ones: the wealthy, the educated, and those with political connections are at a relative advantage in low-social-capital areas; women benefit more where social capital is higher. The result goes exactly in the direction predicted in Section 1.7.

The only significant exception is represented by Panel E of the table, where ethnic minorities are shown to be strongly penalised where social capital is higher. The most relevant result is the one in Column 1 for formal certificates of title. In low-social-capital settings, ethnic minorities respond to 10 percent higher prices increasing their share of titled land by almost 0.4 percentage points more than ethnic majorities. Where social capital is stronger, instead, their share of titled land is actually 1.5 percentage points *lower* – an effect of opposite size, and almost four times as strong, as in the other sub-sample. Despite being rather counter-intuitive at first sight, the results from Table 1.15E can nevertheless be quite readily explained. Recall that social capital in this section has been proxied by ethnic concentration. In this light, it is not hard to imagine that, in the areas whose ethnic composition is more homogeneous, it may become increasingly difficult for those not belonging to the predominant group to establish themselves and enjoy the same opportunities as the ethnic majorities. On the other hand, fragmented areas will be more likely to constitute a level playing field – at least along ethnic lines. When I proxy social capital by trust levels in Appendix Table J.20 the results for ethnic minorities are indeed more in line with the rest of the Panels in Table 1.15. Although the differences between the effects for ethnic minorities in the high- and low-social-capital sub-samples are not statistically significant, in fact, their direction is now as expected: minorities appear to benefit more where social capital is higher.

Table 1.15: Social status and social capital

(a)	(b)	(1)	(2)	(3)	(4)
SUBSAMPLE		property right	cert. customary	cert. occupancy	no certificate
<i>Panel A</i>					
high	price × wealthy	-0.058**	0.012	-0.003	0.020
social capital		(0.026)	(0.032)	(0.018)	(0.067)
low	price × wealthy	-0.002	0.022**	-0.004	-0.035
social capital		(0.016)	(0.011)	(0.017)	(0.028)
	difference	*			
<i>Panel B</i>					
high	price × educated	0.077	-0.095**	0.031	-0.105
social capital		(0.068)	(0.036)	(0.039)	(0.101)
low	price × educated	-0.014	0.019	-0.038	-0.023
social capital		(0.058)	(0.035)	(0.054)	(0.061)
	difference		**		
<i>Panel C</i>					
high	price × politician	-0.055	-0.048**	-0.039**	0.164**
social capital		(0.036)	(0.023)	(0.016)	(0.064)
low	price × politician	0.038	-0.018	0.044*	-0.041
social capital		(0.033)	(0.012)	(0.024)	(0.046)
	difference	*		***	***
<i>Panel D</i>					
high	price × female head	-0.028	0.042	0.066**	-0.206***
social capital		(0.030)	(0.029)	(0.029)	(0.076)
low	price × female head	-0.004	-0.006	-0.021	0.009
social capital		(0.020)	(0.009)	(0.016)	(0.025)
	difference			***	***
<i>Panel E</i>					
high	price × minority	-0.148*	-0.100***	-0.048	0.205**
social capital		(0.078)	(0.032)	(0.031)	(0.095)
low	price × minority	0.036*	0.008	-0.006	-0.052*
social capital		(0.020)	(0.010)	(0.023)	(0.031)
	difference	**	***		***

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): share of land for which the household has a formal certificate of title; (2): share of land with a certificate of customary ownership; (3): share of land with a certificate of occupancy; (4): share of land without any certificate. Standard errors are clustered at the sub-county level. The regression is performed on the sub-sample identified in Column (a). In each panel, the outcome is regressed on household and year fixed effects, the log of the lag of a price index, an indicator for belonging to the category displayed in Column (b), and an interaction of the latter two. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000. Wealthy is an indicator for belonging to the highest wealth quintile in the district. Educated is an indicator for having a household head with at least some upper secondary education. Politician is an indicator for being related to a local council member. Female head is an indicator for female household head. Minority is an indicator for not belonging to the predominant ethnicity in the district. High and low social capital are proxied by ethnically concentrated and fragmented areas, respectively. Concentrated and fragmented areas are those belonging to the top 25 and bottom 75 percent of the distribution of the Herfindahl-Hirschman concentration index on ethnic population shares.

1.9 Conclusion

This chapter investigates the relationship between crop prices and individual demand for titled land in Uganda. Using information on the tenure of the land harvested by Ugandan farmers over a six-year time span, I show that higher agricultural prices induce households to increase their share of titled land.

With 78 percent of the world's poor living in rural areas and mostly depending on agriculture for their livelihoods, improving farm productivity and strengthening farmers' links to markets are increasingly seen by policy-makers as promising ways to end poverty and boost shared prosperity (The World Bank, 2016). The International Food Policy Research Institute (IFPRI, 2016) also estimates that current levels of population growth will require an increase in food calorie production by 70 percent by 2050, which will need to come mostly from productivity enhancement. The opportunities for any such improvement are highest for Sub-Saharan Africa: here, the IMF (2016) reports that agriculture accounts for 60 percent of total employment, but agricultural yields are currently about 50 percent lower than their potential level. Based on the evidence on property rights, investment, and productivity presented in Section 1.2, a well-established system of clear land titles might be an effective driver of change in this direction. Even abstracting from large scale effects, the fact that subsistence farming systems are still dominant in the developing world (Fan et al., 2013) makes it even more crucial to avoid threats to smallholders' access to their main source of livelihood.

For all the above reasons, land reform has recently been high on the agenda of international organisations and of the governments of many developing countries³⁹ – but policy efforts on the supply side are bound to be meaningless in the absence of an adequate uptake on the part of target beneficiaries. To the extent that the diffusion of formal property rights spurs investment, output, and poverty reduction, understanding the determinants of individual demand for titled land is crucial to guide current and future reform, in order to make public investment cost-effective.

This chapter represents a step in that direction. Despite abstracting from general equilibrium effects,⁴⁰ I show that farmers in Uganda react to higher agricultural prices increasing their

³⁹The World Bank alone for example is, at the time of writing, implementing at least ten different major rural land tenure programmes in various parts of the world, with the aim of improving tenure security and land registration, and to strengthen institutional quality (World Bank Projects and Operations website, accessed July 2017).

⁴⁰For example, nothing has been said on what happens to prices of other goods.

share of titled land. As commented above in Section 1.6, this could be driven by the purchase of more titled plots, the sale of untitled ones, or the registration of existing landholdings, but the data do not allow me to straightforwardly tell these possibilities apart. Nevertheless, my analysis does suggest that small farmers, *ceteris paribus*, are more likely to keep titled rather than untitled land in a world of increasing crop prices.

I explain my findings in a framework combining an income and an incentive effect, which in turn can be split into a “profitability and investment” and an “insecurity” component. As long as increasing agricultural prices relax farmers’ budget constraints by raising their incomes, or incentivise tenure by potentially more productive individuals, the observed increase in titled landholdings represents a favourable development on land markets. To the extent that at least part of the total effect also stems from high land insecurity however, its interpretation becomes more nuanced. The fact that results significantly differ based on farmers’ social status and existing levels of social capital also adds to the complexity of the picture. In fact, I show that positive effects are mostly in favour of the better-off and of “political friends” in a context of low social capital, and of ethnic majorities in ethnically concentrated areas.⁴¹ Whether this depends on unbalanced incentives or unbalanced access to titled land and certificates, it anyway means that higher prices reinforce existing allocative inefficiency and privilege in areas already prone to social fragmentation: where social cohesion is feebleness, local elites benefit from yet another advantage. This in turn (let alone concerns in terms of equity) may generate even new distortions in the economy, watering down whatever positive effects land registration might bring about.

From a policy perspective, it also needs to be stressed that farmers in my sample consider land titles a valid shield against land grabbing, regardless of whether this is actually the case in practice or not. This result is also in line with recent qualitative evidence from Uganda by Van Leeuwen (2014, 2017), who documents a widespread conviction, across participants in various focus groups, that titles are indispensable for securing tenure.⁴² In practice though, even Van Leeuwen (2017) points out how land registration in the country is not particularly

⁴¹This lends empirical evidence to recent theoretical claims by Glaeser et al. (2016), who contend that demand for formality is higher where justice is more fairly administered, and that, when it is not, the strong will have a greater demand for formality or title than the weak.

⁴²Van Leeuwen reports that farmers see titles as an adequate instrument to prevent land disputes, and a valuable piece of evidence when disputes appear in court; moreover, they believe that titles increase freedom of individual ownership, and prevent interference from the extended family in land transactions.

effective in this respect, and how recent reforms have often resulted in institutional multiplicity⁴³ and ambiguity about tenure rules and dispute-resolving practices. Given this implicit mismatch between farmers' expectations and the actual performance of the land management system, it becomes all the more crucial to ensure that the existing land-rights schemes meet farmers' demand for tenure security, and that the authorities in charge of land administration are truly efficient and accessible to all.

⁴³In an instance of institutional multiplicity, claims to land are subject to parallel governing bodies and sets of norms, rules or conventions, with different sources of legitimacy (be it tradition, religion or the state), and often in competition with each other (Van Leeuwen, 2017).

Appendix

1.A Commodity prices

1.A.1 Price series

I use the IMF International Financial Statistics database to retrieve price indices for banana, coffee, corn, cotton, ground nuts, rice, sorghum, soy beans, and sugar. Price indices report the ratio of benchmark prices representative of the global market to prices in a reference year. Here, all price series are indexed with 2010=100.

Some of these price indices are obtained as simple averages of various series:

- Coffee prices are calculated using an average of Brazilian, Brazilian (US), Ugandan (US), and Other coffee prices (US).
- Ground nuts prices are calculated using an average of Nigerian and European prices.
- Rice prices are calculated using an average of two series of Thailand rice prices.
- Soy beans prices are calculated using an average of three US (Rotterdam) prices.
- Sugar prices are calculated by using an average of five Caribbean, US, and EU prices.

I use the US Bureau of Labour Statistics data to have price series for two comprehensive categories: cereals and other vegetable products. In the price index in Equation (1.2), the former price is weighted by GAEZ land harvested in millet, the latter by land harvested in potatoes, pulses, and a residual “other vegetables”. Prices from US BLS are calculated as a simple average of monthly price data.

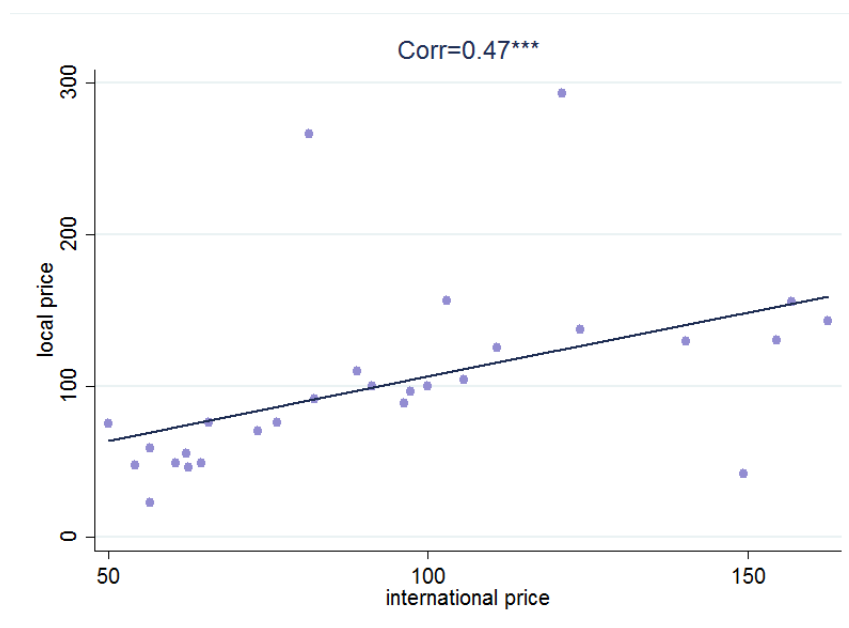
1.A.2 Price pass-through

A proper test of the degree of price transmission would require a number of time series techniques like cointegration or error correction mechanism: however, I do not have enough data points to perform such analyses.

To assess the correlation between international and domestic prices, I infer local prices from the LSMS household survey, using farmers' self-reported sale value for each crop divided by the quantity they report having sold rather than used otherwise. Given the noisiness of the data, I take the median price for each crop in all sub-counties, and then consider the median of these medians. I then index all prices with 2010=100, and compare the data thus obtained with my international prices.

Figure A.1 shows that, although as expected the correlation is not exceedingly high, the two sets of prices are indeed positively, significantly correlated. In Figure A.2, I also consider separately the export cash crops most popular across farmers in my sample (bananas, coffee, cotton) and other crops and staples (corn, ground nuts, rice, sorghum, soy beans, sugar cane). Reassuringly, the correlation is higher in the former case. Similarly, in Figure A.3 I sub-divide my sample in areas that are more and less connected to markets. In particular, for each sub-county in every year, I take the share of communities that have access to a trunk road or an agricultural market (cf. Section 1.6 for details and definitions of these variables), and I define a sub-county as integrated if it belongs to the top 50 percent of the distribution of this share. Again, it is heartening that the correlation between local and international prices is stronger for better connected areas. Even though international prices do not account for most of the variation in the domestic ones, they do therefore look like a good proxy for my analysis.

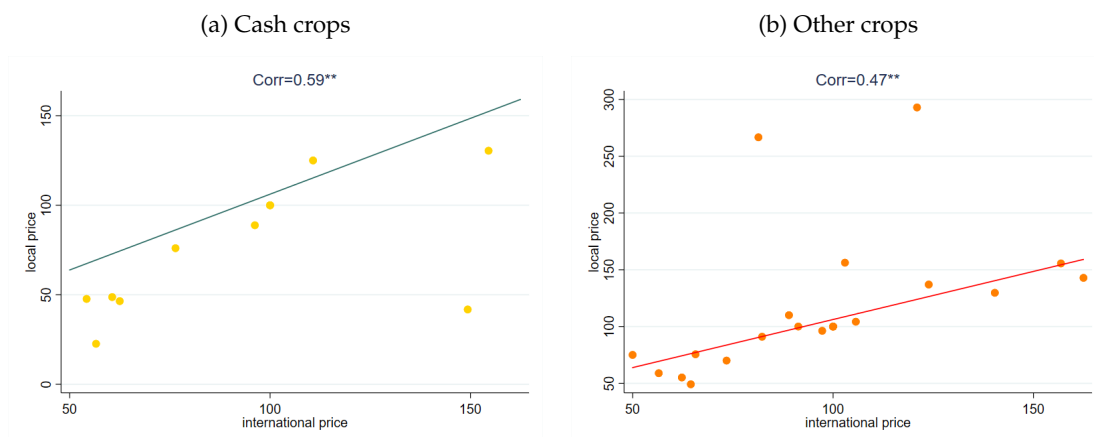
Figure A.1: Price transmission from international to local prices



Notes: Base year: 2010.

Data sources: IMF International Financial Statistics and LSMS, various commodities. Years 2004, 2005, 2009, 2010, 2011.

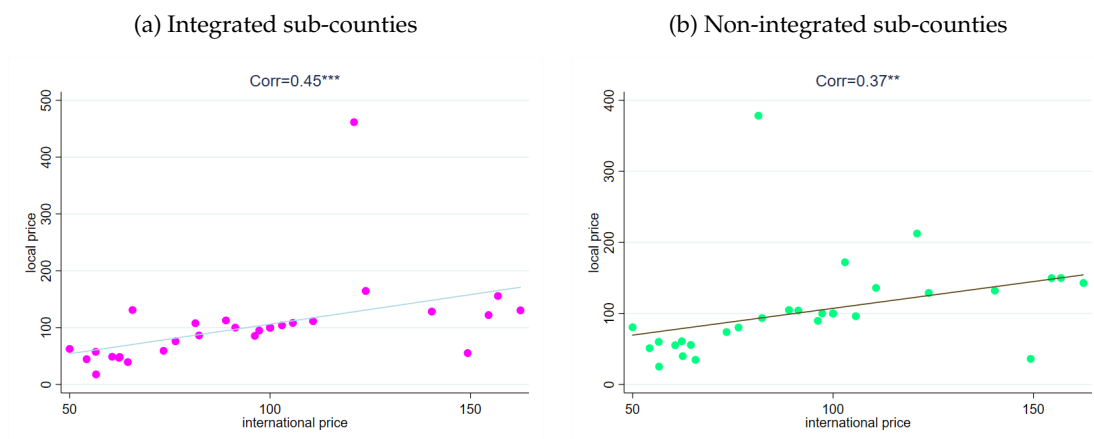
Figure A.2: Price transmission from international to local prices



Notes: Base year: 2010. Cash crops include bananas, coffee, and cotton. Other crops include corn, ground nuts, rice, sorghum, soy beans, sugar cane.

Data sources: IMF International Financial Statistics and LSMS, various commodities. Years 2004, 2005, 2009, 2010, 2011.

Figure A.3: Price transmission from international to local prices

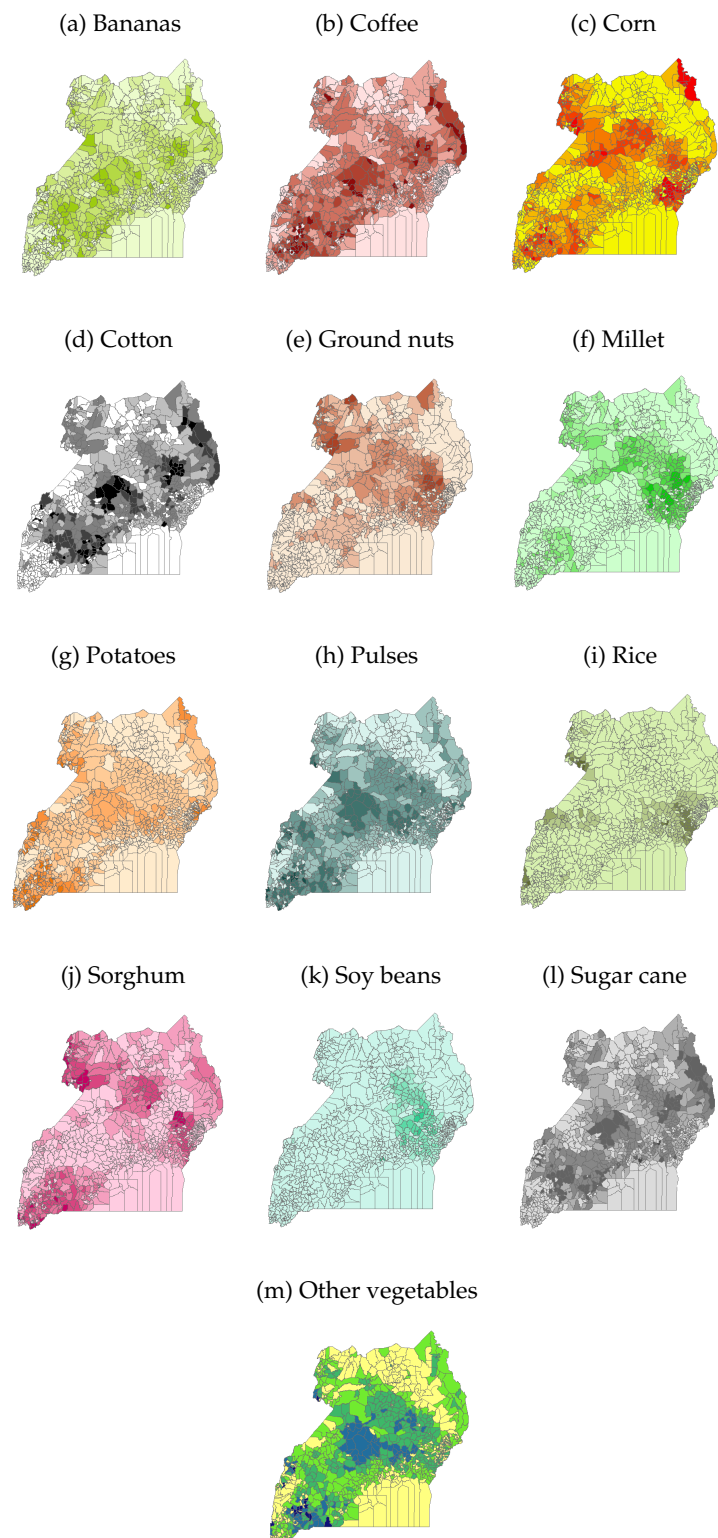


Notes: Base year: 2010. Integrated sub-counties are those belonging to the top 50 percent of the distribution of the share of communities with access to a trunk road or an agricultural market.

Data sources: IMF International Financial Statistics and LSMS, various commodities. Years 2004, 2005, 2009, 2010, 2011.

1.B Land use maps

Figure B.4: Land use, Uganda 2000



Data sources: FAO and IIASA Global Agro-Ecological Zones (GAEZ) project, series actual land use, irrigated and rain-fed land, year 2000.

1.C Missing values

Table C.1: Prices and missing values in reporting on land tenure

VARIABLES	(1)
	has missing values
price	-0.023 (0.020)
Observations	5,275
Number of HH	1,828
Outcome mean	0.196
Year fixed effects	YES
HH fixed effects	YES
Additional Controls	YES
Robust standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

Notes: Column (1): Dummy variable for households whose shares of land under formal certificate of title, certificate of customary ownership, certificate of occupancy, and no certificate do not sum to 1. Standard errors are clustered at the sub-county level. The outcome is regressed on household and year fixed effects and on the the log of the lag of a price index. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000.

1.D Land rights, investment and farm income

Table D.2: Land rights, investment and farm income

	property right	customary ownership	certificate of occupancy	no certificate
pesticides	0.068 [0.041; 0.095]	0.018 [−0.009; 0.045]	0.077 [0.05; 0.103]	−0.106 [−0.133; −0.079]
chemical fertilisers	0.118 [0.091; 0.144]	−0.002 [−0.029; 0.025]	0.02 [−0.007; 0.047]	−0.082 [−0.109; −0.055]
organic fertilisers	0.053 [0.026; 0.08]	0.002 [−0.025; 0.029]	0.066 [0.039; 0.092]	−0.029 [−0.056; −0.002]
farming income	0.019 [−0.016; 0.054]	−0.018 [−0.053; 0.017]	0.071 [0.036; 0.106]	−0.036 [−0.071; −0.001]
agricultural income	0.058 [0.024; 0.092]	−0.009 [−0.044; 0.025]	0.04 [0.006; 0.074]	−0.048 [−0.082; −0.013]

Notes: Each cell reports the correlation of the share of land under the tenure system in each column and the land-improving investment or income measure (per acre) in each row. 95 percent confidence intervals are in brackets. Property right refers to a formal, written and signed official record of an agreement concerning the full ownership of a parcel of land. Customary ownership is a document given to a person who owns a parcel under a customary system in order to recognise and guarantee their interest in the land. Certificate of occupancy is a document issued to a *bona fide* tenant, which details the interests or claims of the occupant. No certificate refers to an informal short term agreement or squatting.

1.E Robustness checks

Table E.3: Excluding year 2005

	(1)	(2)	(3)	(4)
	property right	cert. customary	cert. occupancy	no certificate
price	-0.064 (0.087)	0.031 (0.039)	0.237*** (0.084)	-0.205* (0.114)
Observations	3,772	3,772	3,772	3,772
Number of HH	1,676	1,676	1,676	1,676
Outcome mean	0.082	0.018	0.083	0.722
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: Column (1): share of land for which the household has a formal certificate of title; (2): share of land with a certificate of customary ownership; (3): share of land with a certificate of occupancy; (4): share of land without any certificate. Standard errors are clustered at the sub-county level. The outcome is regressed on household and year fixed effects and the log of the lag of a price index. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000. The analysis is performed only on the years 2009, 2010, 2011.

Table E.4: Price index as arithmetic mean

	(1)	(2)	(3)	(4)
	cert. title	cert. customary	cert. occupancy	no certificate
price	0.038* (0.020)	0.015 (0.010)	0.038** (0.015)	-0.080*** (0.026)
Observations	5,275	5,275	5,275	5,275
Number of HH	1,828	1,828	1,828	1,828
Outcome mean	0.072	0.016	0.06	0.785
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): share of land for which the household has a formal certificate of title; (2): share of land with a certificate of customary ownership; (3): share of land with a certificate of occupancy; (4): share of land without any certificate. Standard errors are clustered at the sub-county level. The outcome is linearly regressed on year fixed effects, the log of the lag of a price index, and household fixed effects. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as an arithmetically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000.

Table E.5: Weights built as sub-county-level crop suitability of land

	(1)	(2)	(3)	(4)
	property right	cert. customary	cert. occupancy	no certificate
price	1.116 (0.848)	-0.305 (0.293)	3.326*** (0.585)	-4.982*** (1.160)
Observations	5,275	5,275	5,275	5,275
Number of HH	1,828	1,828	1,828	1,828
Outcome mean	0.072	0.016	0.06	0.785
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): share of land for which the household has a formal certificate of title; (2): share of land with a certificate of customary ownership; (3): share of land with a certificate of occupancy; (4): share of land without any certificate. Standard errors are clustered at the sub-county level. The outcome is regressed on household and year fixed effects and the log of the lag of a price index. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average crop suitability of land for each crop.

Table E.6: Weights as sub-county-level land use instrumented with crop suitability

	(1)	(2)	(3)	(4)
	property right	cert. customary	cert. occupancy	no certificate
price	0.016 (0.024)	0.015 (0.014)	0.105*** (0.027)	-0.144*** (0.042)
Observations	5,275	5,275	5,275	5,275
Number of HH	1,828	1,828	1,828	1,828
Outcome mean	0.072	0.016	0.06	0.785
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: Column (1): share of land for which the household has a formal certificate of title; (2): share of land with a certificate of customary ownership; (3): share of land with a certificate of occupancy; (4): share of land without any certificate. Standard errors are clustered at the sub-county level. The outcome is regressed on household and year fixed effects and the log of the lag of a price index. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000, instrumented by crop suitability data.

Table E.7: Five-year price trend

	(1)	(2)	(3)	(4)
	property right	cert. customary	cert. occupancy	no certificate
price	-0.048** (0.020)	0.010 (0.015)	0.077** (0.039)	-0.042 (0.037)
Observations	3,789	3,789	3,789	3,789
Number of HH	1,671	1,671	1,671	1,671
Outcome mean	0.082	0.018	0.083	0.723
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): share of land for which the household has a formal certificate of title; (2): share of land with a certificate of customary ownership; (3): share of land with a certificate of occupancy; (4): share of land without any certificate. Standard errors are clustered at the sub-county level. The outcome is regressed on household and year fixed effects and the log of a price index. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of the change in agricultural commodity prices over the past five years, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000.

Table E.8: Weights as household-level land use

	(1)	(2)	(3)	(4)
	property right	cert. customary	cert. occupancy	no certificate
price	0.020 (0.018)	0.002 (0.007)	0.021 (0.014)	-0.024 (0.026)
Observations	5,153	5,153	5,153	5,153
Number of HH 1,807	1,807	1,807	1,807	
Outcome mean	0.071	0.015	0.06	0.786
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): share of land for which the household has a formal certificate of title; (2): share of land with a certificate of customary ownership; (3): share of land with a certificate of occupancy; (4): share of land without any certificate. Standard errors are clustered at the sub-county level. The outcome is regressed on household and year fixed effects and the log of the lag of a price index. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the average acreage of land harvested by the household with each crop in each period.

Table E.9: Weights as household-level land use (fixed land share, beginning of period)

	(1)	(2)	(3)	(4)
	property right	cert. customary	cert. occupancy	no certificate
price	0.022 (0.017)	-0.002 (0.008)	0.033** (0.016)	-0.028 (0.028)
Observations	4,849	4,849	4,849	4,849
Number of HH	1,590	1,590	1,590	1,590
Outcome mean	0.071	0.016	0.058	0.795
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): share of land for which the household has a formal certificate of title; (2): share of land with a certificate of customary ownership; (3): share of land with a certificate of occupancy; (4): share of land without any certificate. Standard errors are clustered at the sub-county level. The outcome is regressed on household and year fixed effects and the log of the lag of a price index. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the beginning-of-period average acreage of land harvested by the household with each crop.

Table E.10: Weights as household-level land use (fixed land share, average over sample period)

	(1)	(2)	(3)	(4)
	property right	cert. customary	cert. occupancy	no certificate
price	0.016 (0.021)	0.004 (0.009)	0.080*** (0.020)	-0.033 (0.035)
Observations	5,187	5,187	5,187	5,187
Number of HH	1,789	1,789	1,789	1,789
Outcome mean	0.071	0.015	0.059	0.787
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: Column (1): share of land for which the household has a formal certificate of title; (2): share of land with a certificate of customary ownership; (3): share of land with a certificate of occupancy; (4): share of land without any certificate. Standard errors are clustered at the sub-county level. The outcome is regressed on household and year fixed effects and the log of the lag of a price index. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the acreage of land harvested by the household with each crop, averaged over the entire sample period.

Table E.11: Tobit model

	(1)	(2)	(3)	(4)
	property right	cert. customary	cert. occupancy	no certificate
price	0.954*** (0.003)	2.840*** (0.006)	2.882*** (0.002)	-0.571*** (0.001)
Observations	5,449	5,449	5,449	5,449
Outcome mean	0.071	0.015	0.06	0.787
Sub-county fixed effects	YES	YES	YES	YES
HH fixed effects	NO	NO	NO	NO
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): share of land for which the household has a formal certificate of title; (2): share of land with a certificate of customary ownership; (3): share of land with a certificate of occupancy; (4): share of land without any certificate. Standard errors are clustered at the sub-county level. The analysis is performed via Tobit regression. The outcome is constrained to be between 0 and 1, and is regressed on year fixed effects, the log of the lag of a price index, and sub-county fixed effects. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000.

Table E.12: Asymmetric responses to prices

	Latent outcomes			
	(1) property right	(2) cert. customary	(3) cert. occupancy	(4) no certificate
Panel A				
	Increased share			
price	0.012 (0.086)	0.005 (0.039)	0.211** (0.094)	-0.428*** (0.103)
Observations	3,370	3,370	3,370	3,370
Number of HH	1,517	1,517	1,517	1,517
Outcome mean	0.074	0.021	0.077	0.16
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES
Panel B				
	Decreased share			
price	-0.148** (0.060)	0.007 (0.010)	-0.070 (0.051)	0.159 (0.108)
Observations	3,370	3,370	3,370	3,370
Number of HH	1,517	1,517	1,517	1,517
Outcome mean	0.053	0.018	0.033	0.26
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES
Panel C				
	Unchanged share			
price	0.136 (0.115)	-0.012 (0.039)	-0.141 (0.091)	0.269** (0.136)
Observations	3,370	3,370	3,370	3,370
Number of HH	1,517	1,517	1,517	1,517
Outcome mean	0.873	0.961	0.89	0.58
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): share of land for which the household has a formal certificate of title; (2): share of land with a certificate of customary ownership; (3): share of land with a certificate of occupancy; (4): share of land without any certificate. Standard errors are clustered at the sub-county level. The dependent variable is a dummy for whether the household increased (Panel A), decreased (Panel B), or left unchanged (Panel C) the share of land under each latent outcome variable from one period to the next. The dependent variable is linearly regressed on year fixed effects, the log of the lag of a price index, and household fixed effects. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects, lagged latent outcome variable. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000.

Table E.13: Regression with lead

	(1)	(2)	(3)	(4)
	property right	cert. customary	cert. occupancy	no certificate
price	0.042** (0.018)	0.014 (0.010)	0.037** (0.015)	-0.084*** (0.027)
price lead	0.079 (0.070)	0.030 (0.033)	-0.141*** (0.052)	-0.048 (0.088)
Observations	5,275	5,275	5,275	5,275
Number of HH	1,828	1,828	1,828	1,828
Outcome mean	0.072	0.016	0.06	0.785
HH fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): share of land for which the household has a formal certificate of title; (2): share of land with a certificate of customary ownership; (3): share of land with a certificate of occupancy; (4): share of land without any certificate. Standard errors are clustered at the sub-county level. The outcome is regressed on household and year fixed effects, the log of the lag of a price index, and the log of the lead of a price index. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000.

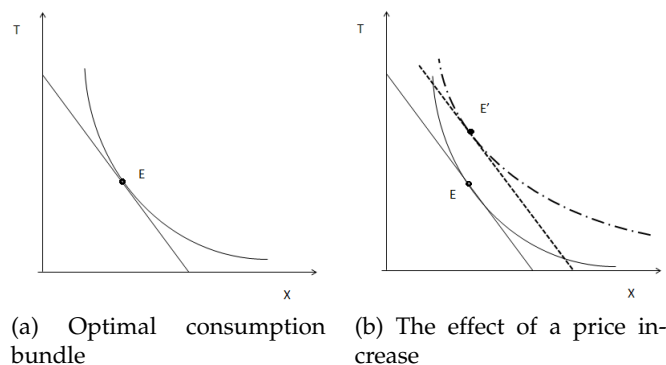


Figure F.5: The demand for land titles: individual consumption choice

1.F Formalising the mechanisms

1.F.1 The individual maximisation problem: assumptions

Let us first assume that a representative farmer is faced with the choice whether to allocate their income I to the acquisition of land titles T at a cost c_T or to the purchase of a composite consumption good X costing c_X . In the absence of any constraint on the supply side (the Government is able to issue all the land certificates the farmer demands), the maximisation problem solved by the individual is

$$\begin{aligned} \max_{T, X} U(T, X) \\ \text{s.t. } c_T T + c_X X = I. \end{aligned} \quad (1.9)$$

The problem leads to the standard system of equations determining the individual optimal choice, which must satisfy equality of the marginal rate of substitution to the relative price and the budget constraint:

$$\begin{cases} \frac{MU_T}{MU_X} = \frac{c_T}{c_X} \\ c_T T + c_X X = I. \end{cases} \quad (1.10)$$

The solution of the problem is represented by point E in Figure F.5a, at the tangency between the individual's indifference curve and their budget constraint. The location of point E might in turn be affected by agricultural prices, in ways that depend on the set of assumptions that follow.

First, I assume that the marginal utility of substitution between land titles and other goods

is a positive function of land value, land insecurity, and the capability (in an Amartya Sen's way) to reap the benefits stemming from the valuable resource in practice:

Assumption 1.

$$\frac{MU_T}{MU_X} = u(\underset{+}{\text{land value}}, \underset{+}{\text{insecurity}}, \underset{+}{\text{capability}}). \quad (1.11)$$

Intuitively, one might expect the marginal utility from titling to be increasing in how much the land is worth. This in turn could be modelled to be a positive function of the expected future revenues that agricultural production on the plot will yield, as well as of any sunk investment the farmer has already undertaken on the land in terms of either past land improving practices or product choice:

Assumption 2.

$$\underset{+}{\text{land value}} = v(\underset{+}{E[\text{revenues}_{t+n}]}, \underset{+}{\text{investment}_{t-m}}). \quad (1.12)$$

Abstracting from general equilibrium effects, future revenues will in turn positively depend on the profitability of the crop mix harvested on the plot and, mechanically, on expected agricultural prices $E[P_{t+n}]$:

Assumption 3.

$$\underset{+}{E[\text{revenues}_{t+n}]} = r(\underset{+}{\text{profitability}}, \underset{+}{E[P_{t+n}]}). \quad (1.13)$$

Turning to the second argument of function u in Assumption 1, the appeal of registering a parcel of land should also be higher the higher the likelihood that a third party tries to unduly take possession of the land, which will very likely be a positive function of land value and a negative function of social capital:

Assumption 4.

$$\underset{+}{\text{insecurity}} = i(\underset{+}{\text{land value}}, \underset{-}{\text{social capital}}). \quad (1.14)$$

Social capital will also positively affect the capability to benefit from the land, together with one's relative position in the social context of reference:

Assumption 5.

$$\underset{+}{\text{capability}} = c(\underset{+}{\text{social position}}, \underset{+}{\text{social capital}}). \quad (1.15)$$

Finally, I am also going to assume that functions u , v , and r are imperfectly separable in their arguments, so that the effect of any change in one argument is magnified by its interaction with the other ones:

Assumption 6.

$$\frac{\partial^2 u}{\partial \text{land value} \partial \text{capability}} \geq 0 \quad (1.16)$$

$$\frac{\partial^2 v}{\partial E[\text{revenues}_{t+n}] \partial \text{investment}_{t-m}} \geq 0 \quad (1.17)$$

$$\frac{\partial^2 r}{\partial E[P_{t+n}] \partial \text{profitability}} \geq 0. \quad (1.18)$$

1.F.2 Predictions

If Assumptions 1-5 hold, we can expect the following set of predictions regarding the effect of agricultural prices.

Prediction 1. If farmers predict price shocks to be persistent, an increase in current prices will increase the future revenues obtainable from the land:

$$\frac{\partial E[\text{revenues}_{t+n}]}{\partial P} \geq 0. \quad (1.19)$$

Prediction 2. By Prediction 1, an increase in prices will increase the value of land:

$$\frac{\partial \text{land value}}{\partial P} = \frac{\partial v}{\partial E[\text{revenues}_{t+n}]} \frac{\partial E[\text{revenues}_{t+n}]}{\partial P} \geq 0. \quad (1.20)$$

Prediction 3. By Prediction 2, an increase in prices will also increase land insecurity:

$$\frac{\partial \text{insecurity}_t}{\partial P} = \frac{\partial i}{\partial \text{land value}} \frac{\partial \text{land value}}{\partial P} \geq 0. \quad (1.21)$$

Prediction 4. By Predictions 2-3, an increase in prices will increase the marginal rate of substitution between land titles and other goods:

$$\frac{\partial \frac{MU_T}{MU_X}}{\partial P} = \frac{\partial u}{\partial \text{land value}} \frac{\partial \text{land value}}{\partial P} + \frac{\partial u}{\partial \text{insecurity}} \frac{\partial \text{insecurity}}{\partial P} \geq 0. \quad (1.22)$$

By Assumption 6, the effect is also stronger the higher past investment on the land, profitability

of the harvested crop mix, and capability to benefit from favourable conditions on the market.

Prediction 4 results in a flattening of the individual's indifference curve represented by the dashed line in Figure F.5b: the individual now needs to be compensated by a higher quantity of the composite good X in order to give up any amount of land titles.

If we now assume away any general equilibrium effects, if the farmer is a net producer of agricultural goods we also have the following:

Prediction 5. Individual income will be an increasing function of prices:

$$\frac{\partial I}{\partial P} \geq 0. \quad (1.23)$$

This is reflected in Figure F.5b by a shift of the budget constraint away from the origin, as shown by the dotted straight line. Taken together, the two effects from Predictions 4 and 5 give us our final:

Prediction 6. By Propositions 4 and 5, an increase in crop prices will increase demand for land titles:

$$\frac{\partial T}{\partial P} \geq 0. \quad (1.24)$$

In Figure F.5b, the combined effects of prices on both the budget constraint and the indifference curve shift the individual's optimal consumption bundle from point E to point E' , which is characterised by both a higher level of land titles and a higher proportion of income spent on titles with respect to other goods.

1.G Household wealth

The wealth indicator used in Section 1.6.1 is built based on the first principal component from principal component analysis on a set of the assets owned by households at baseline.⁴⁴ After building the wealth index, I consider a household wealthy if they belong to the last quintile of the wealth distribution in their district of residence.

The specific items composing the wealth index are the following:

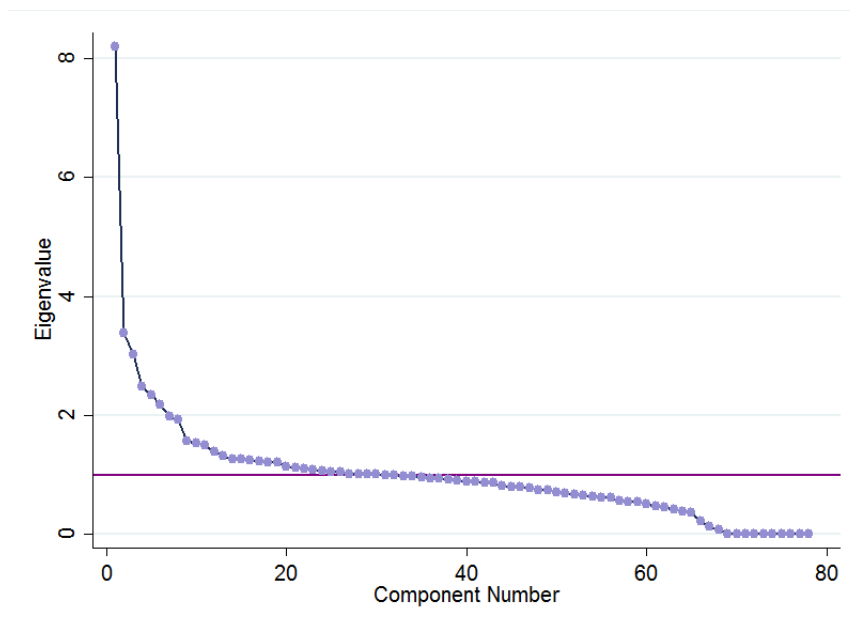
- a Durable goods, appliances, buildings, and vehicles: furniture and furnishings, bed net, appliances, mobile phone, jewellery, electronic equipment, generator, solar panel or electric inverters, other goods, bicycle, motorcycle, other vehicles, own house, other buildings.
- b Housing characteristics: floor made of earth, floor made of earth and cow dung, floor made of cement, floor made of tile, floor made of bricks, floor made of stones, floor made of other material; walls made of straw, walls made of mud and poles, walls made of timber, walls made of unburnt bricks, walls made of burnt bricks and mud, walls made of burnt bricks and cement, walls made of cement, walls made of stones, other walls; roof made of straw, roof made of mud, roof made of wood, roof made of iron, roof made of asbestos, roof made of tile, roof made of tin, roof made of cement, other roof.
- c Sanitation: covered pit latrine private, covered pit latrine shared, vip latrine private, vip latrine shared, uncovered pit latrine, flush toilet private, flush toilet shared, bush, other toilet.
- d Main source of drinking water: private connection to pipeline, public tap, borehole, protected well or spring, unprotected well or spring, river, vendor, gravity flow scheme, rain, other source.
- e Type of stove and cooking fuel: traditional metal stove, traditional 3-stone stove, improved charcoal stove, improved firewood stove, gas, paraffine stove, electric plate, other stove; firewood, charcoal, paraffine or kerosene, electricity, gas, other cooking fuel.
- f Source of light: electricity, paraffine, paraffine lamp, firewood, solar light, other source.

⁴⁴See e.g. Bollen et al. (2001); Filmer & Pritchett (2001); Montgomery et al. (2000); O'Donnell et al. (2008) on the construction of asset-based household wealth indicators.

Figure G.6 shows the scree plot. The eigenvalue for the first component is more than twice as large as the eigenvalue for the second.

The factor loadings on all variables for the first principal component used to build the wealth index are reported in Table G.14.

Figure G.6: Principal component analysis on wealth - Scree plot



Notes: The figure graphs each eigenvalue against the component number after principal component analysis.

Data source: LSMS, year 2005.

Table G.14: Principal component analysis on wealth - Factor loadings

	Loadings		Loadings
roof made of straw	.1971007	toilet: flush toilet private	-.0918565
roof made of mud	-.0219248	toilet: flush toilet shared	-.0627815
roof made of wood	-.0071297	toilet: bush	.1217267
roof made of iron	-.1854594	other toilet	-.0060681
roof made of asbestos	-.0322543	light: electricity	-.2262219
roof made of tile	-.0412972	light: paraffine	-.1254648
roof made of cement	-.0127315	light: paraffine lamp	.2207244
other roof material	.0129457	light: firewood	.0758705
walls made of straw	.0125629	light: solar	-.0170949
walls made of mud and poles	.1421961	other light	-.0408864
walls made of timber	-.0079697	cooking fuel: firewood	.2866383
walls made of unburnt bricks	.0884093	cooking fuel: charcoal	-.2712517
walls made of burnt bricks and mud	-.0074152	cooking fuel: paraffine/kerosene	-.0368456
walls made of burnt bricks and cement	-.2365121	cooking fuel: electricity	-.0378569
walls made of cement blocks	-.0488478	cooking fuel: gas	-.038862
walls made of stone	-.0028293	other cooking fuel	-.0438657
other wall material	.0093934	stove: traditional metal	-.2588895
floor made of earth	.1138798	stove: traditional 3-stone	.2605103
floor made of earth and cow dung	.1453288	stove: improved charcoal	-.0479941
floor made of cement	-.2745159	stove: improved firewood	.0094725
floor made of tile	-.046062	stove: gas	-.038862
floor made of bricks	.0020933	stove: paraffine	-.0475177
floor made of stone	-.0193694	stove: electric plate	-.0378569
other floor material	-.0133219	other stove	-.0428259
drink. water: private connection to pipeline	-.1312421	own house	-.1505768
drink. water: public tap	-.1626505	own other buildings	.0151872
drink. water: bore hole	.0830105	own furniture	.0729379
drink. water: protected well/spring	.0148889	own furnishings	.0489412
drink. water: unprotected well/spring	.082033	own bednets	.1339058
drink. water: river	.0514385	own appliances	.1532471
drink. water: vendor	-.0829882	own electronic equipment	.136694
drink. water: gravity flow scheme	.0108353	own generator	.0512669
drink. water: rain	-.0175871	own solar panel/electric inverters	.0279357
drink. water: other	.008065	own bicycle	-.0220965
toilet: covered pit latrine private	.0068214	own motorcycle	.0469672
toilet: covered pit latrine shared	-.0995826	own other transport	.0841136
toilet: vip latrine private	-.0511283	own jewellery	.1459691
toilet: vip latrine shared	-.0543006	own mobile phone	.2265159
toilet: uncovered pit latrine	.0740196	own other	.0484945

Data source: LSMS, year 2005.

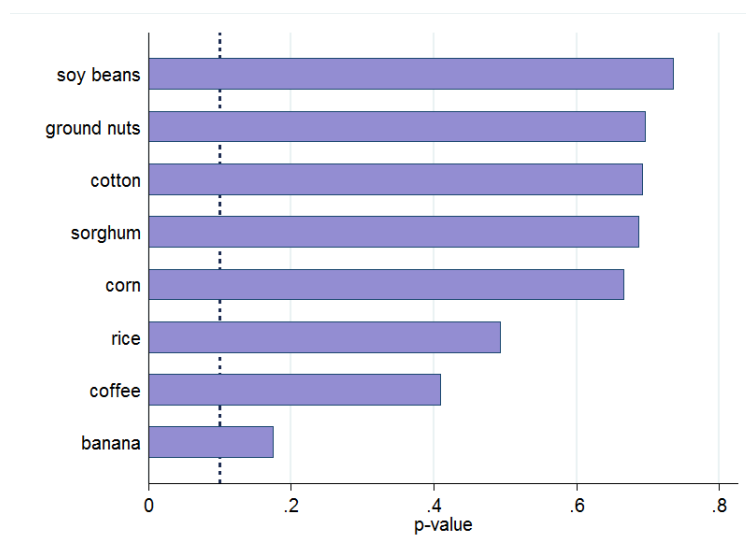
1.H Testing for unit roots in price series

In time series analysis, a situation where the effect of a shock is permanent without fading away over time is described by a series with stochastic trends, containing a unit root. A series where the effect of a shock will only be transitory before the series reverts back to its long-term mean or trend is instead referred to as (trend) stationary, and has no unit roots.⁴⁵

Here, I consider international commodity price data for the period 1957-2013,⁴⁶ and I test for the presence of a unit root in the price series. For each price series, I conduct an augmented Dickey-Fuller unit root test, where the null hypothesis is the presence of a unit root (cf. Fuller, 1996 for details), and report the p-values of the test in Figure H.7.

As all bars in the Figure are well above 0.5, the test is far from rejecting the presence of a unit root for any of the commodities considered even at very low significance levels.

Figure H.7: P-values from augmented Dickey-Fuller unit root test



Notes: H_0 : time series has a unit root. The model allows for four lags and a time trend. The null hypothesis is rejected at standard significance levels for values of the p-value to the left of the blue vertical line.

Data sources: Commodity prices from Bazzi & Blattman (2014) and IMF International Financial Statistics. The price series cover the period 1957-2013.

⁴⁵Evidence by Ghoshray (2011) for the period 1900-2003 shows that, although results tend to depend on both sample size and the specific unit root test chosen, there are roughly as many primary commodities exhibiting a unit root as there are stationary ones. The picture is also confirmed by Bazzi & Blattman (2014).

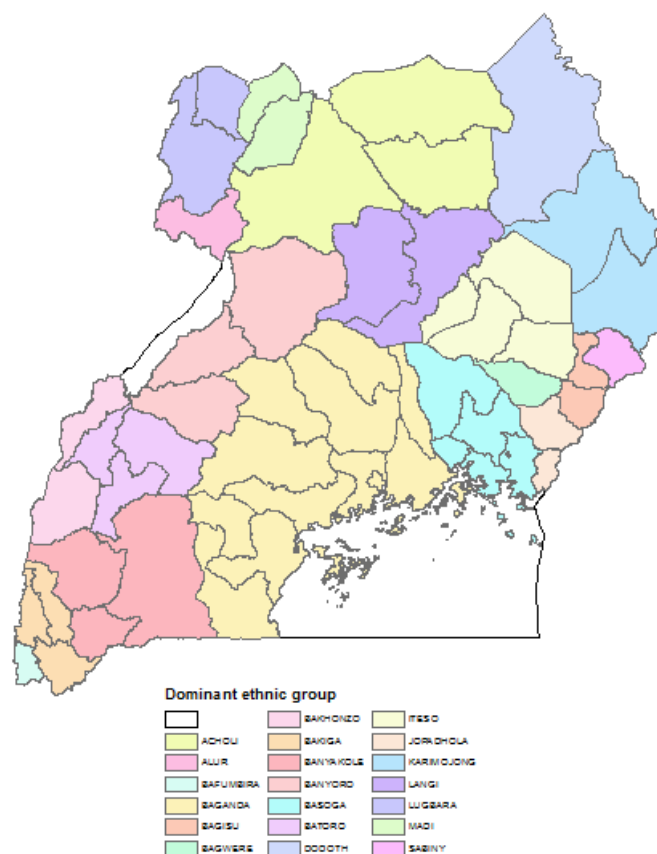
⁴⁶International commodity prices for the years until 2004 come from the series built by Bazzi & Blattman (2014), available to the public in the online appendix to their paper.

1.I Ethnic groups in Uganda

The population of the main ethnic groups in Uganda as of year 2002 is reported in Table I.15, while Figure I.8 reports the predominant ethnicities in each district in the same year. Data come from a 10 percent sample of the 2002 Ugandan Population and Household Census (Bureau of Statistics, Uganda) and were retrieved from IPUMS.⁴⁷

Figures I.9-I.14 visualise the ethnic distribution in the 37 main ethnic areas identified in the 2002 Ugandan Census, alongside the point estimates of both ethnic concentration (see Section 1.8.4) and ethnic polarisation (cf. *infra*).

Figure I.8: Predominant ethnicities by district, Uganda 2002



Data source: 10 percent sample of the Ugandan Population and Household Census (Bureau of Statistics, Uganda), year 2002.

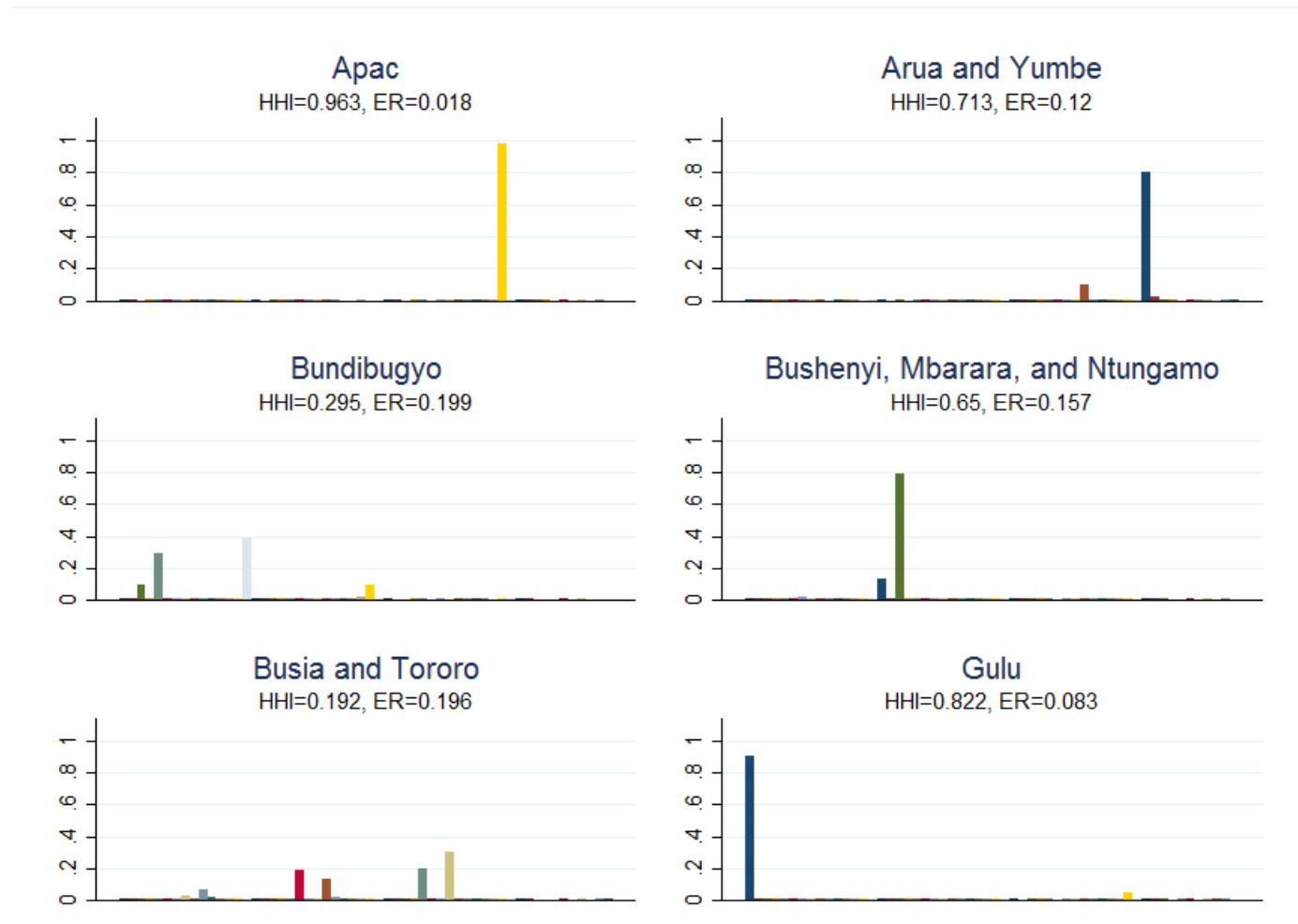
⁴⁷Minnesota Population Center. Integrated Public Use Microdata Series, International: Version 6.4 [Machine-readable database]. Minneapolis: University of Minnesota, 2015.

Table I.15: Population by ethnic group

Ethnic Group	Population	Ethnic Group	Population
Acholi	116960	Batwa	672
Alur	54062	Chope	2052
Baamba	3711	Dodoth	33657
Babukusu	1599	Ethur	5539
Babwisi	7045	Ik (Teuso)	1573
Bafumbira	46301	Iteso	160089
Baganda	421284	Jie	15079
Bagisu	113898	Jonam	9203
Bagungu	4904	Jopadhola	37238
Bagwe	7568	Kakwa	13241
Bagwere	41599	Karimojong	26915
Bahehe	408	Kebu (Okebu)	3326
Bahororo	18111	Kuku	3500
Bakenyi	6465	Kumam	17538
Bakhonzo	61603	Langi	151614
Bakiga	172780	Lendu	1140
Banyabindi	1467	Lugbara	103406
Banyakole	238219	Madi	30024
Banyara	2224	Mening	201
Banyarwanda	31995	Mvuba	106
Banyole	34588	Napore	3092
Banyoro	68646	Nubi	2641
Baruli	14594	Nyangia	1543
Basamia	28602	Pokot	7326
Basoga	211516	Sabiny	18390
Basongora	1089	So (Tepeth)	2186
Batagwenda	4731	Other Ugandans	9573
Batoro	61812	Missing/non-Ugandan	56582
Batuku	2222	Total	2497449

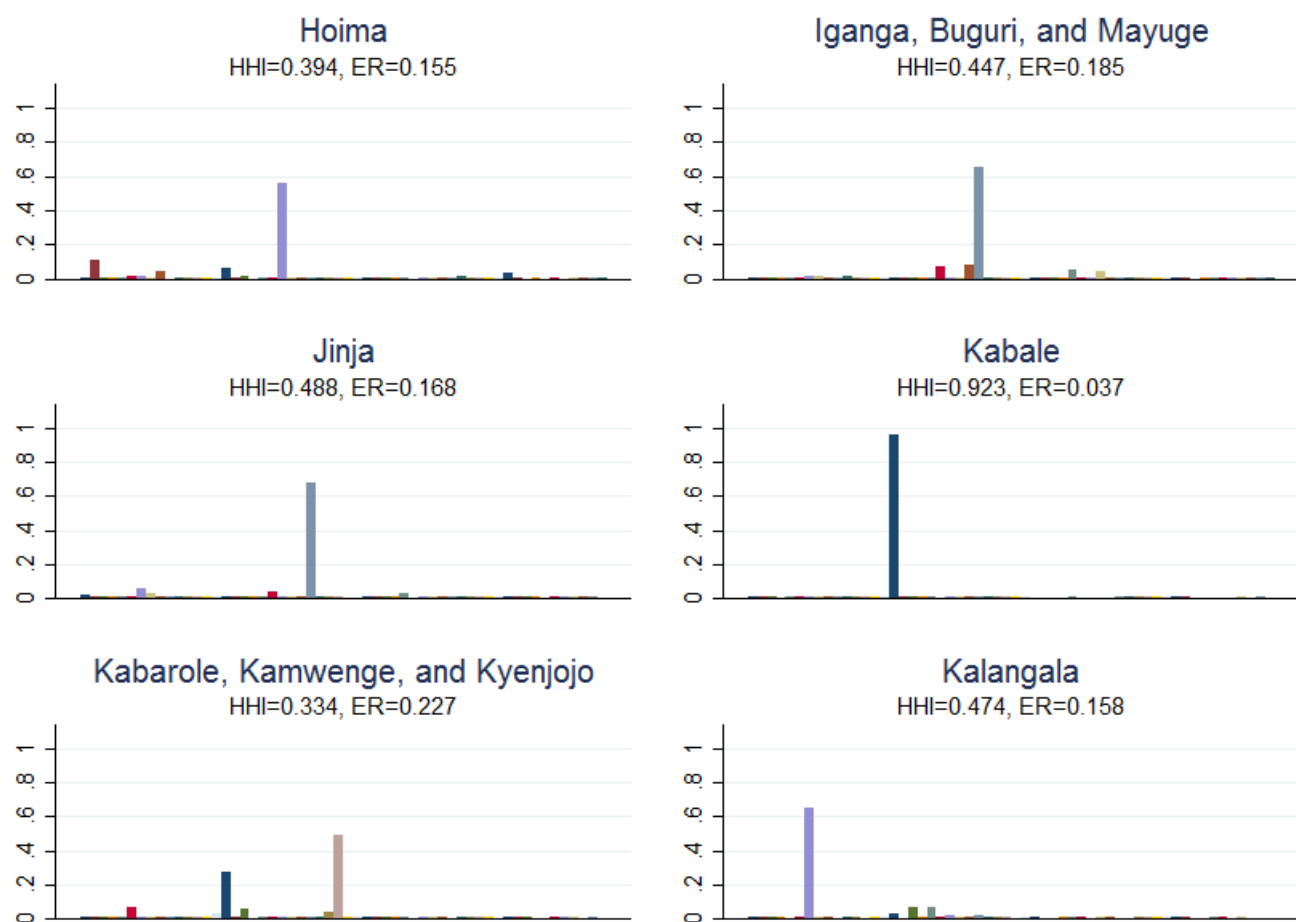
Data source: 10 percent sample of the Ugandan Population and Household Census (Bureau of Statistics, Uganda), year 2002.

Figure I.9: Ethnic distribution by district, Uganda 2002



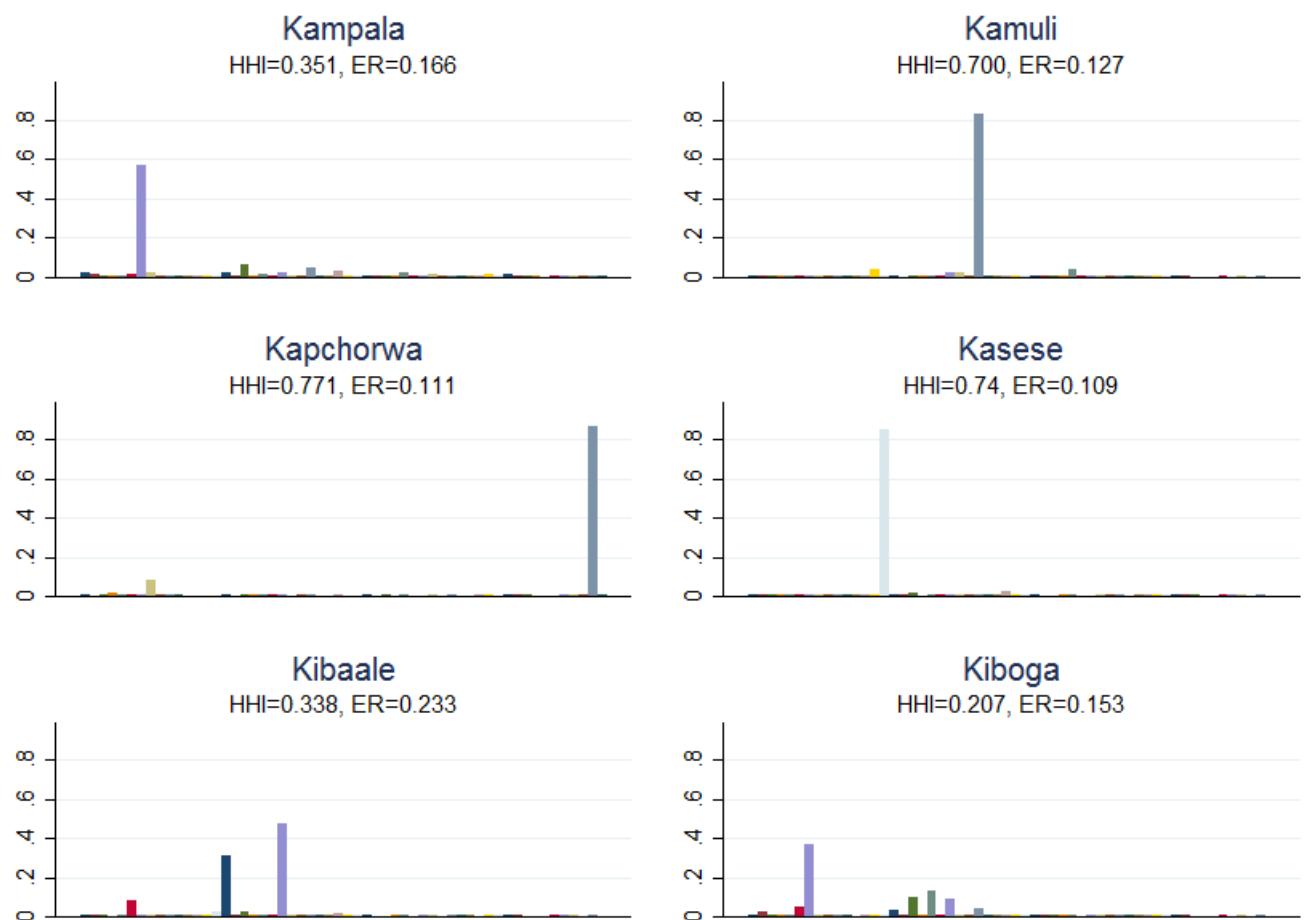
Data source: 10 percent sample of the Ugandan Population and Household Census (Bureau of Statistics, Uganda), year 2002. HHI is the Herfindahl-Hirschman index of ethnic concentration. ER is the Esteban-Ray index of ethnic polarisation.

Figure I.10: Ethnic distribution by district, Uganda 2002 (cont'd)



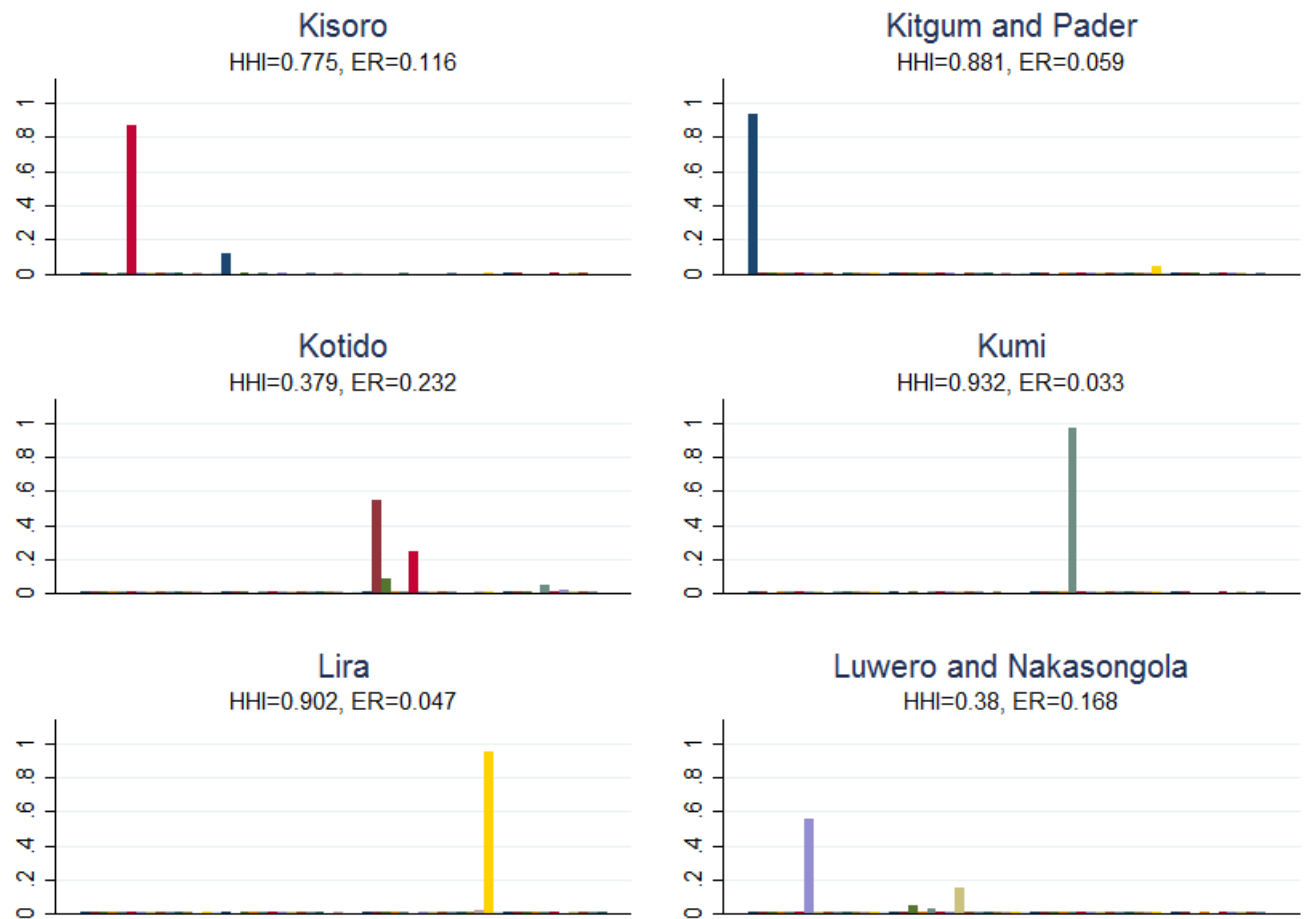
Data source: 10 percent sample of the Ugandan Population and Household Census (Bureau of Statistics, Uganda), year 2002. HHI is the Herfindahl-Hirschman index of ethnic concentration. ER is the Esteban-Ray index of ethnic polarisation.

Figure I.11: Ethnic distribution by district, Uganda 2002 (cont'd)



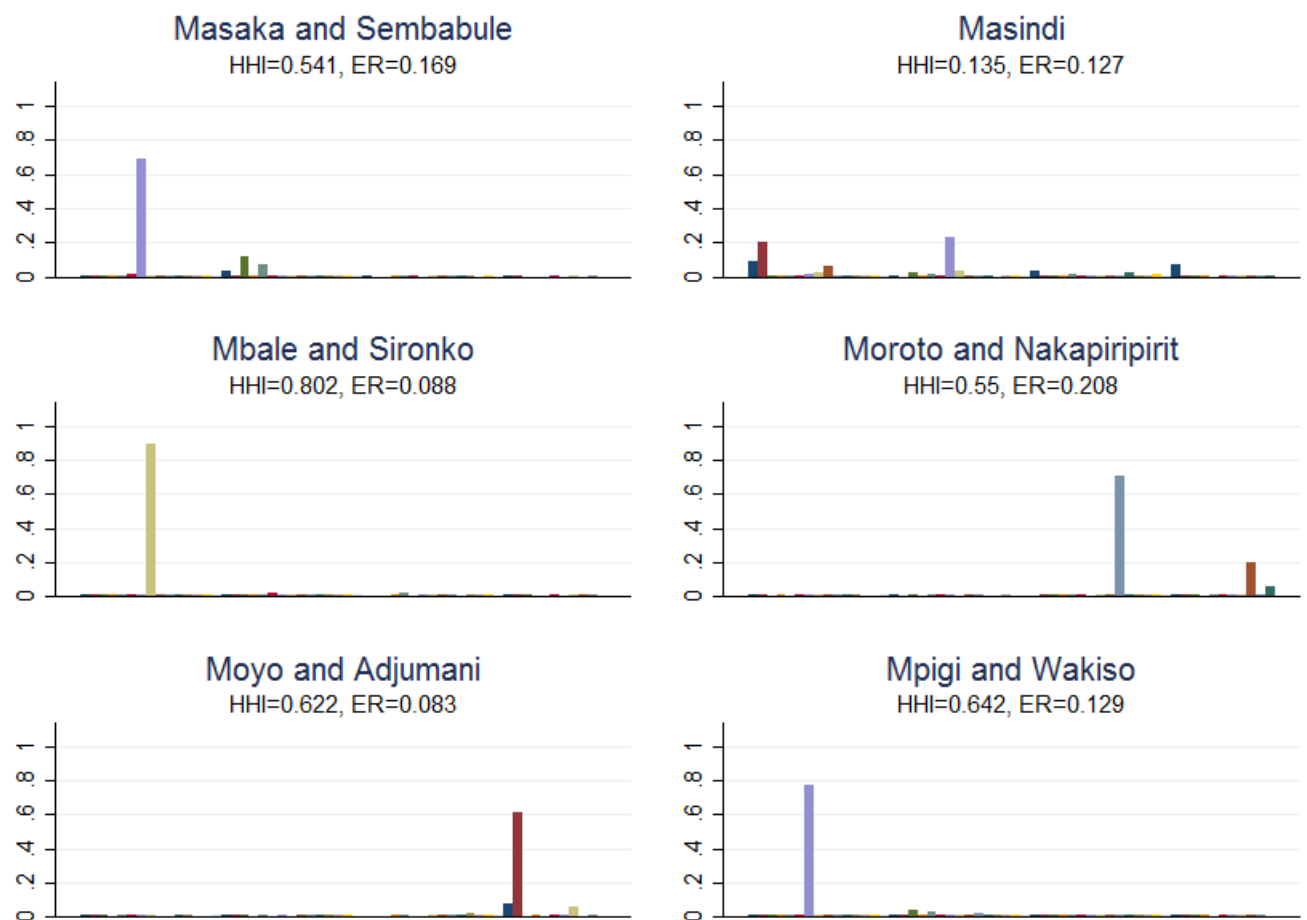
Data source: 10 percent sample of the Ugandan Population and Household Census (Bureau of Statistics, Uganda), year 2002. HHI is the Herfindahl-Hirschman index of ethnic concentration. ER is the Esteban-Ray index of ethnic polarisation.

Figure I.12: Ethnic distribution by district, Uganda 2002 (cont'd)



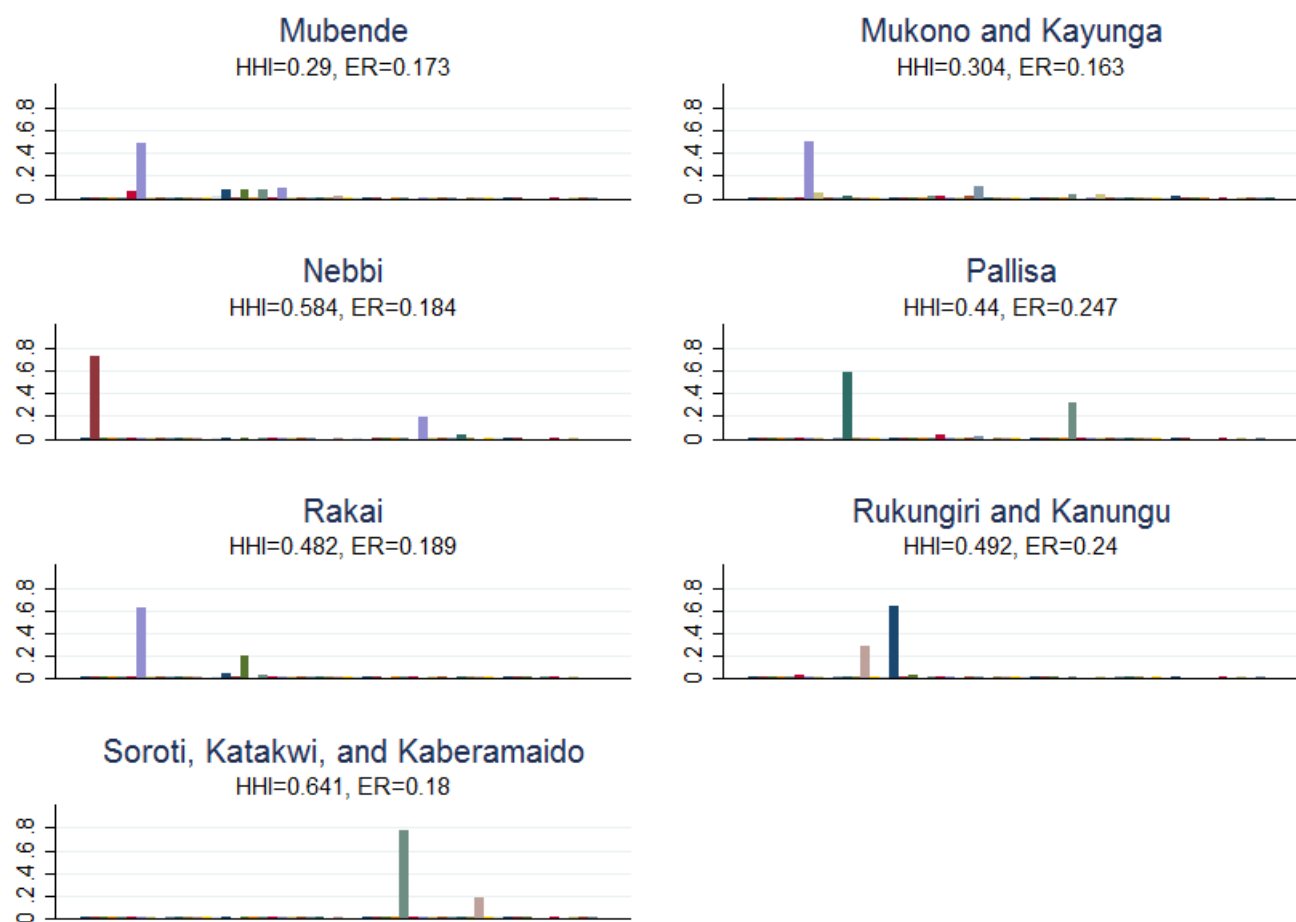
Data source: 10 percent sample of the Ugandan Population and Household Census (Bureau of Statistics, Uganda), year 2002. HHI is the Herfindahl-Hirschman index of ethnic concentration. ER is the Esteban-Ray index of ethnic polarisation.

Figure I.13: Ethnic distribution by district, Uganda 2002 (cont'd)



Data source: 10 percent sample of the Ugandan Population and Household Census (Bureau of Statistics, Uganda), year 2002. HHI is the Herfindahl-Hirschman index of ethnic concentration. ER is the Esteban-Ray index of ethnic polarisation.

Figure I.14: Ethnic distribution by district, Uganda 2002 (cont'd)



Data source: 10 percent sample of the Ugandan Population and Household Census (Bureau of Statistics, Uganda), year 2002. HHI is the Herfindahl-Hirschman index of ethnic concentration. ER is the Esteban-Ray index of ethnic polarisation.

1.J Alternative measures of social capital

I replicate the results of Section 1.8.4 using two alternative measures of social capital: (i) I define low social capital as ethnic polarisation rather than just ethnic fragmentation; and (ii) I exploit information on self-reported trust levels in the communities where farmers live.

I measure ethnic polarisation building on the Esteban-Ray index (Esteban & Ray, 1994). Given a population composed of N ethnic groups indexed by $i = 1 \dots N$, each one with population share s_i and income y_i , the Esteban-Ray index is computed as

$$ER = K \sum_{i=1}^N \sum_{j=1}^N s_i^{1+\alpha} s_j |y_i - y_j|, \quad (1.25)$$

where K is a scaling factor and $\alpha \in [0; 1.6]$ is a parameter measuring the degree of polarisation sensitivity. Alesina et al. (2003) point out that, to compute this measure for ethnically defined groups, one lacks a measure of the distance between groups $|y_i - y_j|$, and that the response in the literature has been to set it constant across all pairwise comparisons where $i \neq j$. I therefore set the term to 1 for every $i \neq j$. Following Alesina et al., I set K and α equal to 1 and 0.8, respectively. I then define an ethnic area to be highly polarised if it belongs to the top quartile of the distribution of the Esteban-Ray index across the country.

For trust levels, I exploit a set of questions, in the 2005 household survey, asking farmers how much they trust people in their community on a scale from 1 to 5 (with 5 being highest). The information is available for co-villagers belonging to both the same and a different ethnic group as the respondent, so by summing these two I obtain a general trust score ranging from 2 (low trust) to 10 (high trust). I then aggregate the individual information to build district averages, and define high-social-capital districts as those belonging to the top 25 percent of the distribution of the mean trust score thus obtained.

In Table J.16, I check how the Esteban-Ray polarisation index and the average trust score correlate with the concentration index that I use as my proxy for social capital in Section 1.8.4. As expected, ethnic concentration and trust are positively correlated, whereas ethnic polarisation correlates negatively with both other indices.

The replication of the analysis from Section 1.8.4 is reported in Tables J.17-J.20. Although results are somewhat less precisely estimated, their overall qualitative interpretation is in line

with what is presented in the main body of the chapter. In particular, when prices increase and social capital is higher: (i) perceived land insecurity does not increase; and (ii) privileged groups benefit less, and disadvantaged ones more. Interestingly, the differences by ethnicity outlined in Table 1.15 disappear as soon as I consider the non-ethnic-based measure of social capital, in Panel E of Table J.20.

Table J.16: Social capital - various definitions

INDICATOR	HHI	ER	Trust score
HHI	1		
ER	-0.834***	1	
Trust score	0.345***	-0.421***	1

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: HHI is the Herfindahl-Hirschman concentration index on ethnic population shares. ER is the Esteban-Ray polarisation index on ethnic population shares, built with the normalisations proposed in Alesina et al. (2003). Trust score is the average at the district level of an index of how much individuals trust other people living in their community, spanning the range [2-10].

Table J.17: Social capital and insecurity

Polarisation	
	(1)
	perceived insecurity
price	0.050**
	(0.020)
price×social capital	-0.028
	(0.026)
Observations	2,565
Number of HH	860
Outcome mean	0.081
HH fixed effects	YES
Year fixed effects	YES
Additional Controls	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): share of land on which the household feels insecure. Land insecurity is defined as the household being concerned that someone may dispute their property or use rights. Standard errors are clustered at the sub-county level. The outcome is regressed on household and year fixed effects, the log of the lag of a price index, an indicator for high social capital, and an interaction of the latter two. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000. High social capital is proxied by ethnically concentrated areas (top quartile of the Herfindahl-Hirschman concentration index on ethnic population shares) that are also non-polarised. Low social capital is proxied by ethnically polarised areas (top 25 percent of the distribution of the Esteban-Ray index on ethnic population shares).

Table J.18: Social capital and insecurity

Trust levels	
	(1)
	perceived insecurity
price	0.023
	(0.020)
price×social capital	-0.008
	(0.021)
Observations	5,271
Number of HH	1,826
Outcome mean	0.126
HH fixed effects	YES
Year fixed effects	YES
Additional Controls	YES

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): share of land on which the household feels insecure. Land insecurity is defined as the household being concerned that someone may dispute their property or use rights. Standard errors are clustered at the sub-county level. The outcome is regressed on household and year fixed effects, the log of the lag of a price index, an indicator for high social capital, and an interaction of the latter two. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000. High social capital is proxied by the districts with the highest percentage of individuals reporting high levels of trust in people living in their community in 2005. High-social-capital districts are those belonging to the top 25 percent of the distribution at the district level of an average trust score taking values in the range [2-10].

Table J.19: Social position and social capital - Polarisation

(a)	(b)	(1)	(2)	(3)	(4)
SUBSAMPLE		property right	cert. customary	cert. occupancy	no certificate
<i>Panel A</i>					
high	price × wealthy	-0.058**	0.012	-0.003	0.020
social capital		(0.026)	(0.032)	(0.018)	(0.067)
low	price × wealthy	0.006	0.012	0.008	-0.053
social capital		(0.021)	(0.009)	(0.013)	(0.037)
	difference	*			
<i>Panel B</i>					
high	price × educated	0.077	-0.095**	0.031	-0.105
social capital		(0.068)	(0.036)	(0.039)	(0.101)
low	price × educated	0.011	0.076*	0.007	-0.193**
social capital		(0.080)	(0.045)	(0.054)	(0.089)
	difference		***		
<i>Panel C</i>					
high	price × politician	-0.055	-0.048**	-0.039**	0.164**
social capital		(0.036)	(0.023)	(0.016)	(0.064)
low	price × politician	0.029	-0.008	0.058**	-0.057
social capital		(0.055)	(0.006)	(0.027)	(0.061)
	difference		*	***	**
<i>Panel D</i>					
high	price × female head	-0.028	0.042	0.066**	-0.206***
social capital		(0.030)	(0.029)	(0.029)	(0.076)
low	price × female head	0.011	-0.003	-0.016	0.004
social capital		(0.022)	(0.006)	(0.011)	(0.030)
	difference			***	**
<i>Panel E</i>					
high	price × minority	-0.148*	-0.100***	-0.048	0.205**
social capital		(0.078)	(0.032)	(0.031)	(0.095)
low	price × minority	0.071***	0.000	0.014	-0.082**
social capital		(0.023)	(0.014)	(0.016)	(0.035)
	difference	***	***	*	***

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): share of land for which the household has a formal certificate of title; (2): share of land with a certificate of customary ownership; (3): share of land with a certificate of occupancy; (4): share of land without any certificate. Standard errors are clustered at the sub-county level. The regression is performed on the sub-sample identified in Column (a). In each panel, the outcome is regressed on household and year fixed effects, the log of the lag of a price index, an indicator for belonging to the category displayed in Column (b), and an interaction of the latter two. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000. Wealthy is an indicator for belonging to the highest wealth quintile in the district. Educated is an indicator for having a household head with at least some upper secondary education. Politician is an indicator for being related to a local council member. Female head is an indicator for female household head. Minority is an indicator for not belonging to the predominant ethnicity in the district. High and low social capital are proxied by ethnically concentrated, non-polarised, and polarised areas, respectively. Concentrated and fragmented areas are those belonging to the top 25 and bottom 75 percent of the distribution of the Herfindahl-Hirschman concentration index on ethnic population shares. Polarised and non-polarised areas are those belonging to the top 25 and bottom 75 percent of the distribution of the Esteban-Ray index on ethnic population shares.

Table J.20: Social position and social capital - Trust levels

(a)	(b)	(1)	(2)	(3)	(4)
SUBSAMPLE		property right	cert. customary	cert. occupancy	no certificate
<i>Panel A</i>					
high	price × wealthy	0.018	0.030	-0.046**	-0.027
social capital		(0.048)	(0.030)	(0.021)	(0.071)
low	price × wealthy	-0.013	0.017*	0.011	-0.032
social capital		(0.014)	(0.009)	(0.015)	(0.027)
difference				**	
<i>Panel B</i>					
high	price × educated	-0.055	0.098	-0.024	-0.027
social capital		(0.073)	(0.065)	(0.043)	(0.074)
low	price × educated	0.011	-0.025	-0.012	-0.056
social capital		(0.059)	(0.034)	(0.055)	(0.068)
difference			*		
<i>Panel C</i>					
high	price × politician	-0.106***	-0.029	-0.021	0.162**
social capital		(0.021)	(0.026)	(0.024)	(0.061)
low	price × politician	0.073**	-0.021**	0.048*	-0.066
social capital		(0.033)	(0.010)	(0.025)	(0.048)
difference		***		**	***
<i>Panel D</i>					
high	price × female head	0.056	0.029	0.046	-0.152**
social capital		(0.045)	(0.027)	(0.038)	(0.062)
low	price × female head	-0.016	-0.011	-0.024	0.012
social capital		(0.020)	(0.009)	(0.015)	(0.026)
difference				*	**
<i>Panel E</i>					
high	price × minority	0.043	0.022	0.040	-0.108*
social capital		(0.054)	(0.025)	(0.044)	(0.058)
low	price × minority	0.031	0.005	-0.010	-0.035
social capital		(0.021)	(0.012)	(0.025)	(0.033)
difference					

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): share of land for which the household has a formal certificate of title; (2): share of land with a certificate of customary ownership; (3): share of land with a certificate of occupancy; (4): share of land without any certificate. Standard errors are clustered at the sub-county level. The regression is performed on the sub-sample identified in Column (a). In each panel, the outcome is regressed on household and year fixed effects, the log of the lag of a price index, an indicator for belonging to the category displayed in Column (b), and an interaction of the latter two. Controls include gender, age (linear and square), education and ethnicity of the household head, region fixed effects. The price index is built as a geometrically-weighted index of agricultural commodity prices, with weights equal to the sub-county-level average acreage of land harvested with each crop as of year 2000. Wealthy is an indicator for belonging to the highest wealth quintile in the district. Educated is an indicator for having a household head with at least some upper secondary education. Politician is an indicator for being related to a local council member. Female head is an indicator for female household head. Minority is an indicator for not belonging to the predominant ethnicity in the district. High social capital is proxied by the districts with the highest percentage of individuals reporting high levels of trust in people living in their community in 2005. High- and low-social-capital districts are those belonging to the top 25 and bottom 75 percent of the distribution at the district level of an average trust score taking values in the range [2-10].

CHAPTER 2

TO TRADE OR NOT TO TRADE? LOCAL LABOUR MARKET EFFECTS OF A FREE TRADE AGREEMENT IN HONDURAS

2.1 Introduction

The widespread resurgence of protectionist sentiments, which has recently received extensive media coverage following various developments on the global political scene,¹ has spurred concerns among economists and international organisations alike. Past trade barriers are being removed only slowly, and efforts to further reduce trade costs are facing increasing opposition. Both the International Monetary Fund (2016) and the World Bank (2016), in turn, stress how these developments are holding back trade growth, which overall weakness in economic activity in the aftermath of the global financial crisis has been already hampering since 2012. In particular, the World Bank (2016) warns that this might significantly jeopardise growth in emerging and developing countries.

Nonetheless, as mounting evidence documents substantial and long-lasting adjustment costs associated with trade-induced structural changes (cf. e.g. Dix-Carneiro & Kovak, 2015), it is to an extent no wonder that popular support for trade integration is currently low – and that politicians with a short-run horizon may be keen on riding that wave. To counter the recent uptick of protectionism, it is therefore imperative for economists and policy-makers to achieve a more thorough understanding of the costs embedded in the path to free trade.

This chapter provides evidence on the short-run effect of trade liberalisation on incomes and labour market outcomes in a lower middle income country. While both existing evidence

I acknowledge helpful suggestions and comments by David Atkin, Abhijit Banerjee, François Bourguignon, Luciano Ciravegna, Carlo Devillanova, David Dorn, Marcel Fafchamps, James Fenske, Simone Ghislandi, Douglas Gollin, Andrés Ham, Elhanan Helpman, Beata Javorcik, Nathan Nunn, Natalie Quinn, Simon Quinn, Ferdinand Rauch, Arthur Silve, and participants in the Firms and Development Group meetings at the University of Oxford and in the Informal Workshop on Quantitative Development Studies at the University of Oxford.

¹Examples range from the “Brexit” decision of the United Kingdom to leave the European Union to the ambivalence of the United States towards regional trade agreements, like the North-America Free Trade Agreement (NAFTA) with Canada and Mexico, the Trans-Pacific Partnership (TPP) with twelve Pacific Rim countries, and the Transatlantic Trade and Investment Partnership (TTIP) with the European Union.

and current public discourse mainly tend to focus on economically big actors, in this study I document these effects for a small, lower middle-income economy engaging in a free trade agreement with a much richer partner. Specifically, the chapter focusses on the impact of the Dominican Republic - Central America Free Trade Agreement (DR-CAFTA) across regions in Honduras.

DR-CAFTA is a free trade agreement between the United States, five Central American countries, and the Dominican Republic, which was signed in 2004. The agreement consisted in significant reductions in the tariffs imposed by Central American countries on imports from the United States, with immediate tariff elimination for a wide range of product categories. At the same time, the US consolidated and extended the existing preferential treatment granted to imports from Central America under the Caribbean Basin Initiative (CBI) and the United States - Caribbean Basin Trade Partnership Act (CBTPA). Moreover, the agreement featured a number of special provisions on non-tariff trade barriers, from public sector investment to labour and environmental standards.

Honduras, one of the poorest countries in Latin America,² constitutes an excellent natural experiment to study the development effects of a trade agreement when the economic sizes of the two parties are strongly unbalanced. In principle, trade theory often predicts that the more the partners differ, the higher the gains from trade liberalisation, but there are various arguments running in the opposite direction. The degree of subsidisation still provided by richer countries to their export products may for instance generate an uneven playing field for domestic producers in poorer parts of the world. Moreover, the imbalance in terms of value added of the exports of high- vs. middle- and low-income countries might make the latter worse-off. For example, Hausmann et al. (2007) make a convincing case that the type of goods in which a country specialises has important implications for subsequent economic performance: *ceteris paribus*, an economy is better-off producing the goods that richer countries export. Finally, despite claims that so-called “North-South” trade agreements represent a driver of technology spillovers from developed to developing economies, Acemoglu & Zilibotti (2001) warn that this can be beneficial to the receiving “South” economy only insofar as the technology transferred is “appropriate” for its stage of development.

²The per-capita GDP of the US was more than twenty times that of Honduras at the time DR-CAFTA was signed (World Bank National Accounts data).

For my analysis, I exploit regional variation in trade exposure per worker, building an index that weights national trade flows by the structure of regional labour force composition prior to negotiation of the agreement. I find that DR-CAFTA depressed household income and wealth in the regions most exposed to trade. After providing evidence that workers in trade-intensive areas cannot relocate either to other regions or to different sectors of employment, I interpret my main findings in a framework of segmented local labour markets. I show that areas more intensely affected by the trade agreement experienced a substantial wage shock, which spread to various sectors of the economy rather than being confined to the tradable sector. Moreover, a seeming reduction in unemployment, observed in highly trading areas, actually masked a movement of workers either out of the labour force or to low-earning self-employment activities.

These findings are in line with a growing strand of research that documents strong heterogeneity in local labour-market responses to national-level trade shocks, which reinforce existing patterns of within-country inequality (see e.g. Autor et al., 2016; Dix-Carneiro & Kovak, 2015; Topalova, 2010). In particular, these recent studies are concerned with the adjustment process to trade liberalisation, in the absence of factor mobility across productive sectors or geographical locations. As Dix-Carneiro & Kovak (2015) point out, these adjustment costs are not necessarily just a short-run phenomenon, and may fade out only several years after a trade shock. Consequently, traditional social safety nets providing temporary relief might not be sufficient to counter intra-national inequalities – which could then prove more persistent in time than is commonly assumed.

In this sense, my paper provides an example of a concrete rationale for the recent distrust in trade integration, which public discourse increasingly sees as producing benefits only for a lucky few (International Monetary Fund, 2016). This logic becomes in fact more understandable if trade does indeed create unbalanced opportunities within countries, and if the resulting costs and benefits are not adequately redistributed over winners and losers.

The rest of the chapter is organised as follows: Section 2.2 summarises existing literature on the topic and highlights the original contribution of my research; Section 2.3 describes DR-CAFTA and provides some background evidence on recent patterns of Honduran trade; Section 2.4 describes the data sources and outlines my empirical strategy; Section 2.5 reports

the results of the estimation, along with some robustness checks; Section 2.6 explores the mechanisms driving my main findings; and Section 2.7 concludes.

2.2 Related literature

My work contributes to the vast literature trying to weight the growth opportunities of trade liberalisation³ against its welfare and distributional challenges.

First, the chapter speaks to the literature on trade and poverty. McCulloch et al. (2001) identify three main channels that could drive the positive or negative effect of trade policies on poverty. First, trade liberalisation will change the government's fiscal position through a fall in tariff revenues, but also higher tax revenues on the profits of growing firms: which of these effects prevails will determine the extent of resources available for anti-poverty policies. Second, price changes factor both into the consumption decisions of households and in the value of their production, and therefore have an a priori ambiguous net effect on their living standards. Third, firm profits will be affected by trade and so will returns to factors of production, with repercussions on employment and wages. I provide evidence on the third channel, studying how free trade affects labour market outcomes in the regions whose productive structure more closely matches the patterns of trade.

As regards inequality, the fact that trade has differential effects across sectors of an economy dates back to the Stolper-Samuelson result, which posits that a rise in the price of a good will increase the return to the factor used intensively in the production of that good, thereby unequally spreading the benefits of trade among the owners of different factors of production.⁴ More recently, Melitz (2003) theorised that, in the adjustment to the opening of trade, market shares are reallocated towards bigger and more efficient firms, squeezing out of the market the least productive ones. The result has found empirical support in various studies (see e.g. Iacovone et al., 2013 or Bloom et al., 2015), and again underscores the fact that the process of trade liberalisation has its winners and losers.

I complement this literature providing evidence that the short-run effect of trade liberal-

³See Sachs & Warner 1995, Frankel & Romer 1999, or Dollar & Kraay 2004, for formal tests of the link between openness and growth.

⁴The evidence on this result is rather mixed: Acemoglu (2003), and Feenstra & Hanson (1996, 2003), for example, find empirical support for the hypothesis, whereas Anderson (2005) and Goldberg & Pavcnik (2007) obtain opposite results.

isation is indeed an unequal distribution of costs and benefits within the economy, and that regions where the existing composition of production and employment predicts a higher intensity of trade are relatively penalised with respect to the rest of the country. My paper, however, departs from the traditional approach to the study of trade-induced domestic inequality, and joins the increasingly popular strand of research that addresses the inequality threats resulting from variation in local labour-market responses to national trade shocks.

These studies share a focus on the adjustment cost of trade liberalisation, caused by the inability of workers (and factors of production in general) to move to a different firm, industry or location in response to a trade-related shock. Both empirical and theoretical research show that local labour market frictions result in reduced employment, wage losses, reduced consumption and increased poverty where the trade shock is more intense (Autor et al., 2014, 2016; Dauth et al., 2014; Faber, 2014; Galle et al., 2015; Topalova, 2010). Menezes-Filho & Muendler (2011) also document how labour market frictions can trap workers in lower productivity firms and industries, or push them to the informal sector or even to idleness. Furthermore, against conventional wisdom,⁵ Dix-Carneiro & Kovak (2015) provide evidence that the spatial differences in local labour market outcomes induced by low labour mobility do not fade away over time. Similarly, Hollweg et al. (2014) also report that the simulated adjustment period of sectoral wages and employment following a trade shock ranges from 2 to 15 years, with a new steady state typically reached within 10 years. Davidson & Matusz (2010), on the other hand, go as far as to claim that if labour reallocations are costly, there may even be no gains from trade at all.

I contribute to this literature adding supporting evidence on the spatial inequalities induced by trade liberalisation, and identifying the set of mechanisms that may be driving the result. In particular, I show that the wage channel is particularly strong, and that adjustments on the extensive margin are primarily due to a transition of workers away from formal activities and into the informal sector. Moreover, while most existing research tends to focus on relatively big economies,⁶ I am among the first to document these effects for a very poor and

⁵See e.g. Blanchard & Katz (1992), Bound & Holzer (2000).

⁶For instance, Autor et al. (2014), Autor et al. (2016), Dauth et al. (2014), Galle et al. (2015), and Hakobyan & McLaren (2016) focus on workers in Germany and the United States. As regards poorer yet economically big countries, Faber (2014) studies consumption across Mexican households, Dix-Carneiro & Kovak (2015) and Menezes-Filho & Muendler (2011) analyse Brazilian labour markets, and Hasan et al. (2012) and Topalova (2010) investigate poverty patterns across Indian districts.

very small country. Other than from a purely developmental perspective, this is quite relevant for research in trade too, as most theories in the discipline rely on the presumption that gains from trade are highest for so-called “small open economies”. A small country, it is argued, has the most to benefit from opening up to trade, as it is relatively easier to specialise in the production of fewer commodities, export the surplus production to large, high-demand countries, and benefit from cheaper imports from the rest of the world. When an economy is not big enough to influence international prices, it should also gain the most in terms of aggregate welfare from the elimination of tariffs and other trade barriers. Here however, I show that this is not necessarily the case if labour adjustments do not minimise mobility costs across industries and locations.

Finally, the paper is also relevant from a policy evaluation point of view, as it significantly complements the study of the effects of DR-CAFTA. Existing evaluations feature both cross-country analyses (Francois et al., 2008; Taylor et al., 2010) and individual case-studies (Bussolo & Niimi, 2009; Filipinski et al., 2011; Morley et al., 2007; Pörtner, 2003). In particular, Cuesta (2005) and Morley et al. (2008) focus specifically on Honduras. All these contributions, however, consist in ex-ante studies performed via simulation, whereas, to the best of my knowledge, no one has yet conducted an ex-post assessment of the actual effect of the agreement. Despite attracting a relatively modest interest on the part of economists and international observers because of the small size of the Central American countries involved, the agreement in fact constituted a major economic and political step for its signatories, a number of which also happen to be among the region’s poorest.⁷ Assessing its impact therefore represents a useful exercise in itself, of interest to both policy-makers and practitioners in international development.

2.3 DR-CAFTA and Trade in Honduras

DR-CAFTA is a free trade agreement signed by Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, the Dominican Republic, and the United States, between May and August 2004. The treaty, which Honduras ratified in April 2006, is a collection of bilateral free trade agreements between the United States and the other signatories, and does not change the existing

⁷Evidence from the World Bank’s World Development Indicators.

trade arrangements between the Central American countries themselves.

The treaty was aimed at consolidating and formalising the existing benefits provided by the Caribbean Basin Initiative (CBI) and the United States - Caribbean Basin Trade Partnership Act (CBTPA).⁸ Under DR-CAFTA, Honduran products mentioned in the CBI/CBTPA were granted preferential access to the US market on a permanent basis, and with fewer access restrictions. *Maquila* textile products from DR-CAFTA or NAFTA⁹ signatory countries were also granted immediate duty-free access to the United States. On the other hand, the Central American countries and Dominican Republic agreed to move towards a trading system with the United States that would be free of tariffs and other trade barriers (Cuesta, 2005; Jansen et al., 2007).

Upon signature of DR-CAFTA, the partner countries agreed on a gradual tariff removal scheme that set a differential pattern of liberalisation across various groups of commodities (cf. Appendix Table A.1).¹⁰ Tables A.2 and A.3 in the Appendix report the average percent reduction in tariffs for 2-digit commodity categories in Honduras (Column 3) and the US (Column 4) between 2005 and 2007. Overall, 21 over 87 categories experienced a complete elimination of tariffs, and more than a third underwent a reduction of 75 percent or more. Not surprisingly, the commodities subject to the mildest tariff variation (less than 25 percent) are mainly comprised of primary agricultural products. Given their high socio-economic salience in the two countries, white corn and sugar constitute important exceptions to the overall move towards trade opening, and were respectively not liberalised in Honduras and the US (Cuesta, 2005).

Other than tariff cuts, the DR-CAFTA stipulation also included major agreements on public sector investment, customs, financial services, telecommunications, e-commerce, intellectual property, transparency, and labour and environmental standards.

In terms of trade volumes, Figure 2.1 offers evidence that the accession of Honduras to CAFTA coincides with the start of an intensification of Honduran bilateral trade flows with

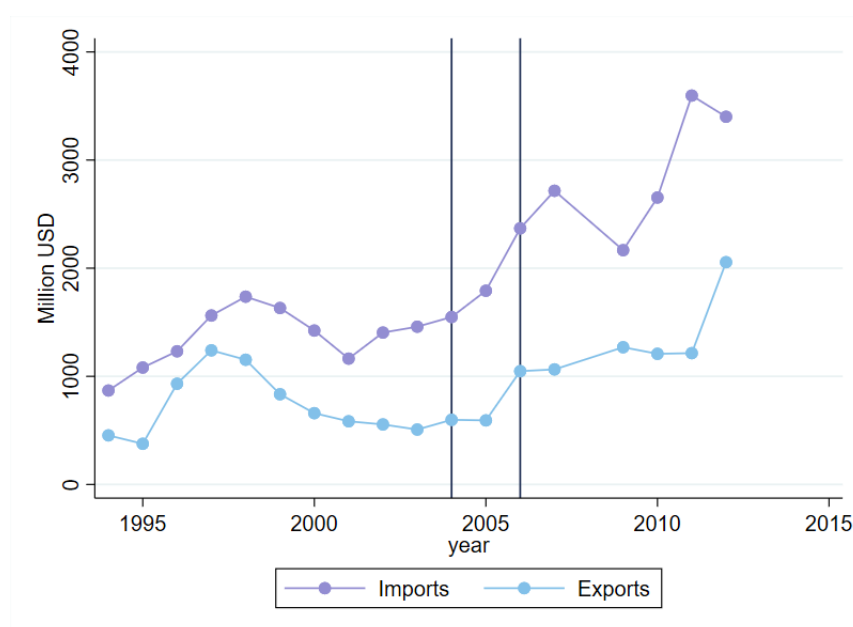
⁸The Caribbean Basin Initiative (CBI), enforced in January 1984 and renewed in September 1995, was a unilateral act whereby the US granted preferential treatment (duty-free or lower than applicable preferential tariffs) to many products imported from 24 Caribbean and Central American countries. The United States - Caribbean Basin Trade Partnership Act (CBTPA) later extended the CBI treatment to additional products (most notably apparel products), and granted a similar benefits scheme as the one applied to Mexican products under the North-America Free Trade Agreement (NAFTA). The application of CBI and CBTPA lowered the average tariff applied to Central-American imports into the United States to around 2.7 and 2.6 percent, respectively (Cuesta, 2005).

⁹The North America Free Trade Agreement, signed by Canada, Mexico, and the United States, came into force in January 1994.

¹⁰Although the tariff-reduction categories are roughly the same for all participants in the agreement, the specific commodities entering each group vary across countries.

the United States. The figure visualises the trade flows of Honduras with the US over the last 20 years. Trade with the US was relatively stagnant until 2003, but gained momentum in the years marking the signing and enactment of DR-CAFTA, enclosed between the two vertical lines in the figure. Both imports and exports almost doubled in the time span from 2004 to 2006. After that, growth of both trade flows experienced a slowdown during the core years of the recent financial crisis (imports dropped by nearly 20 percent between 2007 and 2009, while exports almost flattened), followed by a sustained recovery.

Figure 2.1: Honduras-US trade volumes



Notes: Trade flows are in constant 2010 USD. The first vertical line marks the ratification of DR-CAFTA in 2004, the second its enforcement by Honduras in 2006.

Data sources: Trade flows from UN-ComTrade, HS1992; Price deflator from World Bank National Accounts.

2.4 Data and Empirical Strategy

2.4.1 Data Sources

The data used in this paper are retrieved from four different sources.

Pre-CAFTA regional employment data at the industry level come from the 2001 Honduran Census collected by the Honduran Statistical Institute (INE). The census features information on regional employment for approximately 130 categories of economic activity.

Trade data at the 2 digit commodity level are retrieved from the United Nations Commodity Trade Statistics Database (UN-ComTrade) for the years 2003, 2005, and 2007.¹¹ Since the early 1960s, ComTrade has stored standardised official annual trade statistics reported by countries, which reflect international merchandise flows detailed by commodity and partner country. The coverage of the dataset reaches up to 99 percent of world merchandise trade. As Marcouiller & Robertson (2009) point out, a further advantage of ComTrade with respect to other trade datasets (like data from the World Trade Organisation, or trade statistics collected by the Honduran Statistical Institute) is that it does not systematically exclude *maquila* trade, which is crucial considering the high relevance of (mainly apparel) *maquila* exports in Honduras.¹²

Evidence on the base level of tariffs and their reduction schedules for both Honduras and the United States is publicly available from the the DR-CAFTA website, which provides information at the 8-digit commodity level.

Finally, household-level data come from the September rounds of the Honduran household survey EPHPM (*Encuesta Permanente de Hogares de Propósitos Múltiples*), rounds 2003, 2005, and 2007. The EPHPM is a biannual cross-sectional survey collected by the INE, which reports information on labour market outcomes and various socio-demographic characteristics of a representative sample of households throughout the country. Descriptive statistics for the sample used in the analysis are shown in Appendix Table B.4.

2.4.2 Empirical Strategy

The empirical strategy relies on a “quasi-differences” (Wagstaff, 2010) set-up with a continuous treatment measured at the regional level. The approach differs from standard difference-in-differences in that the analysis is performed on one post- and two pre-treatment periods, rather than just one and one. The identifying assumption of the “quasi-differences” approach is that, absent the treatment, each group would have retained its pre-treatment trend: in this way, the analysis relaxes the “parallel trends” assumption of standard difference-in-differences, allowing for group-specific pre-treatment trends instead (cf. Appendix section 2.C for technical

¹¹Specifically, I use data from the Harmonised System categorisation, series *HS-2002*.

¹²Morley (2006) shows that the ratio of *maquila* exports to total exports was the highest in Central America in 2002.

details on the quasi-differences approach).

Given a household-level outcome y and a continuous, regional-level trade index V (to be detailed below), the regression equation for household i living in region r at time t is

$$y_{irt} = \alpha + \beta V_{rt} + \gamma_r + \delta_t + \epsilon_{irt} \quad (2.1)$$

where γ_r and δ_t are respectively a regional and a time fixed effect, and ϵ is an error term.

Coefficient β in Equation (2.1) measures the effect of being relatively more intensely exposed to trade with respect to other regions. In this sense, the exercise does not assess the level effect of trade liberalisation per se, but it rather addresses the question of whether the areas that are more exposed to trade capture more of the gains, or suffer more of the losses, resulting from liberalisation (cf. Topalova, 2010 for a similar approach).

Given that the treatment is defined at the regional level, the standard errors in Equation (2.1) are clustered at the regional level as well. Considering that Honduras has only 17 regions, I perform wild cluster bootstrapping of the t-statistic to obtain cluster-robust inference.¹³

2.4.2.1 Trade indices

My trade index V is a regional measure of trade exposure per worker built following a Bartik-inspired approach,¹⁴ whereby trade of a certain industry is apportioned to each region according to its share of national industry-level employment (see also Autor et al., 2013; Topalova, 2010). In this way, the index focusses on differences in exposure to trade that stem from different pre-liberalisation regional industry composition: variation of the index across regions, therefore, depends entirely on variation in the local industry employment structure. In order to mitigate both anticipation effects and simultaneity bias, which would respectively arise if regional employment were affected by prospective or actual changes in trade (Autor et al.,

¹³With standard clustering, standard errors would be underestimated due to the low number of clusters, and standard asymptotic tests would tend to over-reject the null hypothesis of insignificant coefficients. Wild cluster bootstrapping is an extension of wild bootstrap to the clustered setting (cf. Cameron et al., 2008 for technical details) and has been shown to perform particularly well with respect to other procedures, as it does not require resampling of the regressors (Cameron et al., 2008; MacKinnon & Webb, 2014; Webb, 2014).

¹⁴Cf. Bartik (1991). Originally, the method consisted in isolating local labour demand changes to produce a measure of local labour demand that would be unrelated to changes in local labour supply. This was achieved by averaging national employment growth across industries using local industry employment shares as weights.

2013), I focus on employment composition prior to DR-CAFTA negotiations.¹⁵

Denoting trade volumes with the US (imports or exports) as V and employment as L , and indexing traded industries by $j \in J$, the trade exposure index for region r in year t is

$$V_{rt}^f = \frac{1}{L_{rt0}} \sum_{j \in J} \frac{L_{rt0j}}{L_{t0j}} V_{jt}^f, \quad f = I, E. \quad (2.2)$$

The first element in Equation (2.2) represents inverse total employment in region r in reference year t_0 , and is introduced to produce a measure per worker; the product inside the summation symbol is the volume of national trade flows (imports I or exports E) in industry j in year t , weighted by the share of region r in national employment in industry j in the reference year.

2.4.2.2 Trade openness

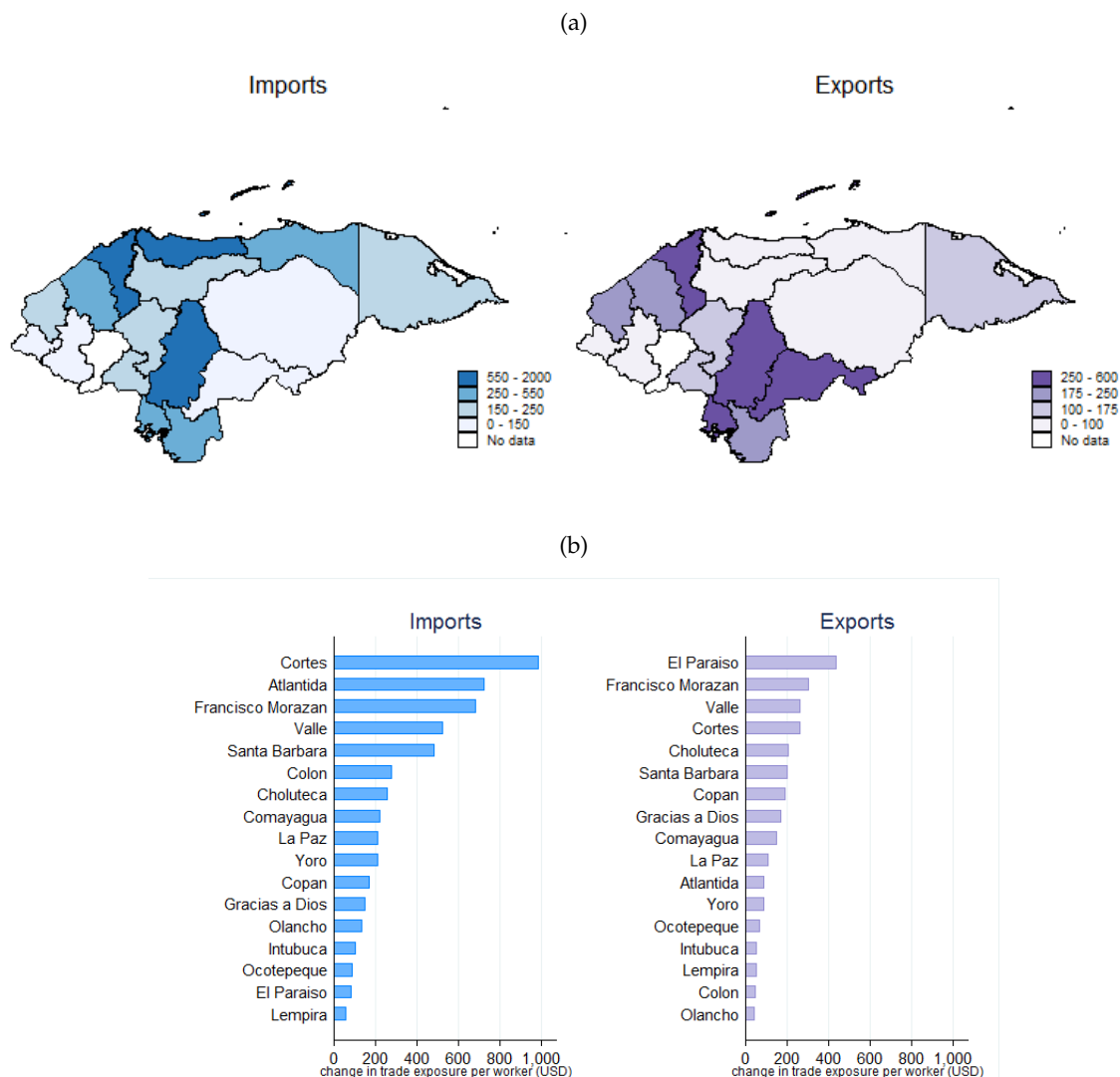
As regards within-country heterogeneity, Figure 2.2 shows the change in import and export exposure per worker over Honduran regions between 2005 and 2007. Although exports look relatively more uniformly spread across regions than imports, the degree of change in both trade volumes pre- and post-CAFTA is quite diverse, which supports the approach adopted in this paper of looking at the effect of differential intensity of trade exposure at the regional level.

The lower values observed in the right panel of the figure reflect the fact that access of Honduran exports to the US market had been already initiated by the CBI/CBTPA agreements, so that DR-CAFTA did not boost exports in the same way as it did for imports. At the same time, however, a striking feature of the figure is the fact that the ranking of regions in terms of trade exposure looks remarkably similar in the two panels. Apart from a couple of exceptions, most regions fare similarly whether we look at them through an import or export exposure lens. The import and export exposure indices are in fact quite strongly correlated: the correlation coefficient between the two trade measures is 0.66, and is significant at the 1 percent level. For this reason, throughout the paper the trade index in Equation 2.1 will be a measure of trade openness V^O , obtained as the sum of the import and export estimators V^I and V^E computed as of Equation (2.2):

¹⁵Negotiations started in September 2001. Given the availability of household census data for 2001, I use that year as my reference period.

$$V_{rt}^O = V_{rt}^I + V_{rt}^E. \quad (2.3)$$

Figure 2.2: Change in US-trade exposure per worker, Honduran regions, 2007-2005



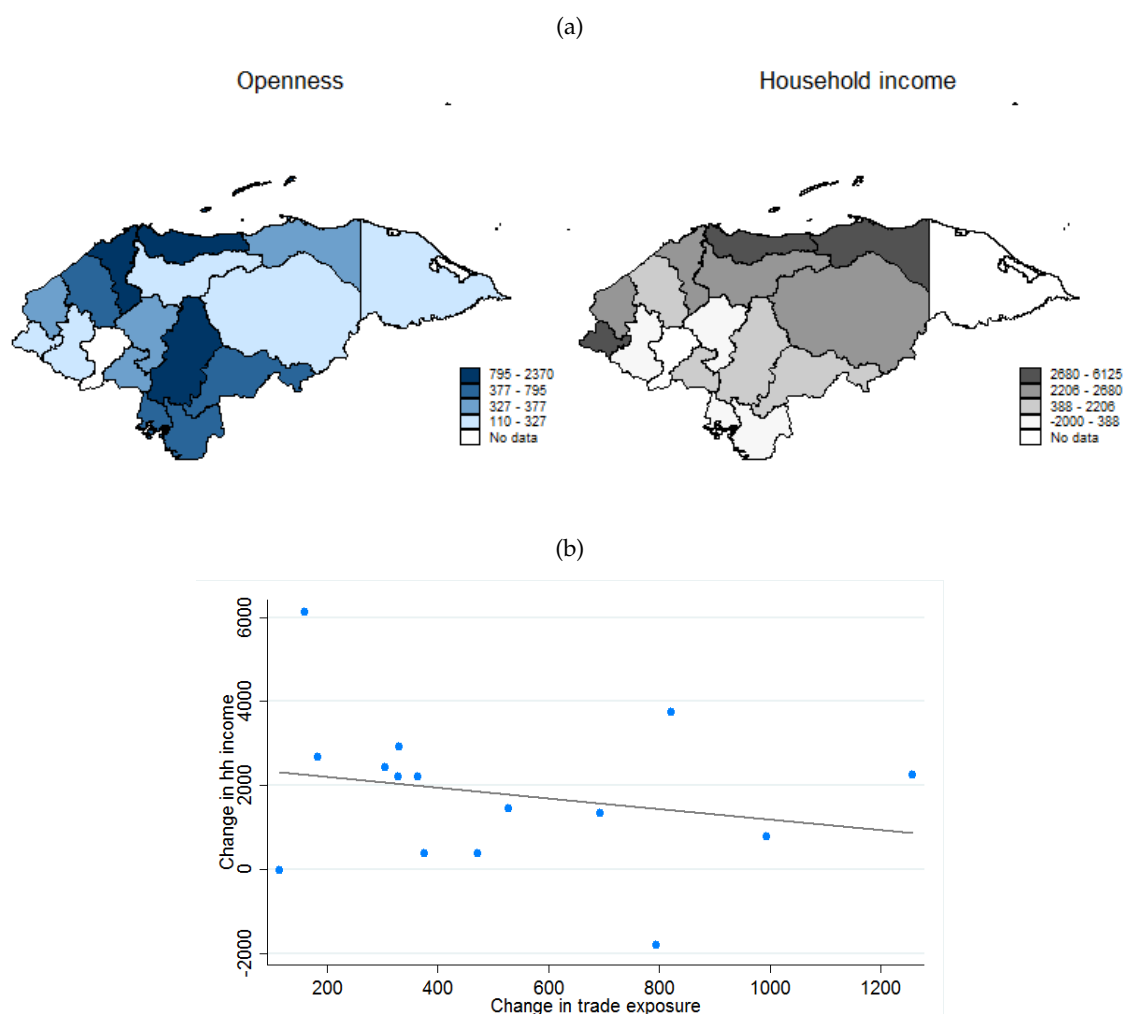
Notes: Change in trade openness is a regional weighted sum of industry-level change in trade flows per worker, where imports/exports of a certain industry are apportioned to each region according to its share of national industry employment. Trade flows are in nominal value and are computed in 1,000 USD.

Data sources: UN-ComTrade, HS2002, years 2005 and 2007; INE, 2001 Household Census.

Figure 2.3 reports the change in trade openness and in average household income across Honduran regions between 2005 and 2007. In Panel (a), the locations that experienced a higher increase in trade exposure are largely the ones where household income increased more mod-

erately over time on average. Panel (b) of the figure shows the negative correlation between changes in the two variables more clearly. Explaining the extent to which this correlation can be attributed to the enactment of DR-CAFTA is the aim of the rest of the chapter.

Figure 2.3: Change in trade openness and household income, Honduran regions, 2007-2005



Notes: Change in trade openness is a regional weighted sum of industry-level change in trade flows per worker, where imports and exports of a certain industry are apportioned to each region according to its share of national industry employment. Trade flows are in nominal value and are computed in 1,000 USD. Household income is winsorised and is computed in Honduran Lempiras.

Data sources: UN-ComTrade, HS2002, years 2005 and 2007; INE, 2001 Household Census; EPHPM, years 2005 and 2007.

2.5 Results

2.5.1 Main Findings

Results are reported in Table 2.1. Here, the effect of trade openness one year after implementation of DR-CAFTA is negative. Higher trade flows make household income shrink by 13.2 percent. In terms of standardised coefficients, a one standard deviation increase in trade volumes produces an 11 percent reduction in household income.

Table 2.1: The effect of trade openness on living standards

	(1)	(2)	(3)
	HH income (log)	Deprivation	Wealth
Trade flows	-0.132*	0.103	-0.143**
	[0.072]	[0.140]	[0.036]
Outcome mean	8.335	0.770	0.276
Observations	35,116	35,203	30,158
Regional Fixed Effects	YES	YES	YES
Year Fixed Effects	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: Column (1): log of household income (winsorised); (2): unmet basic needs, where needs are type of dwelling, members per room, drinking water, waste disposal, education and subsistence capacity (possible values are 0,1,2,... depending on the number of needs that are unmet); (3): asset ownership index obtained from pca on durable goods, household goods, vehicles, housing characteristics. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. Regional trade exposure is a weighted average of the sum of regional imports from and exports to the US of all industries, where trade flows of a certain industry are apportioned to each region according to its share of national industry employment.

To account for the fact that reliable income measures are rare when using survey data, especially in the context of a poor country (Rutstein & Johnson, 2004),¹⁶ in Columns 2 and 3 of Table 2.1 I replicate the analysis on two alternative measures of living standards, which rely on easily collected data on household assets and access to utility services.¹⁷ First, I use a

¹⁶This is mainly due to imperfect knowledge by the individuals surveyed and to the extent of informal self-employment and home production, usually not properly taken into account in self-reported data.

¹⁷This approach has been used for example by Sahn & Stifel (2003), who consider an asset-based alternative to the standard use of expenditures in defining well-being and poverty. They show that use of the asset index as a proxy for long-term wealth results in lower measurement error than expenditures, and in valid predictions of child

simple deprivation measure available in the Honduran household survey. The index considers a set of six basic household needs (type of dwelling, household members per room, drinking water, waste disposal, education, and subsistence capacity), and increases in the number of needs that are unmet.¹⁸ To improve the accuracy of the measure, I also build a wealth index through principal component analysis over a similar set of items and services available to households (cf. O'Donnel et al., 2008). My index features detailed information on (i) ownership of durable consumption goods, appliances and vehicles; (ii) housing characteristics; (iii) type of toilet facility; (iv) source of drinking water; (v) waste disposal; and (vi) energy supply. Details about the specific variables entering the index and about performance of principal component analysis are reported in Appendix Section 2.D.

Regression on these two additional measures of living standards portrays a very similar picture to the one for income. Trade flows are associated with a significant reduction in household wealth by 14.3 percent, and a (marginally insignificant) increase in deprivation by around 10 percent.

2.5.2 Robustness Checks

One potential concern with my empirical strategy is that I may be picking up the effect of trade in general more than of trade liberalisation in particular. As a first robustness check, I therefore build an index of tariff variation, to focus more specifically on the effect induced by DR-CAFTA. For region r in year t , my tariff reduction index is defined as

$$T_{rt} = I_t \times \frac{1}{L_{rt0}} \sum_{j \in J} \left[\frac{L_{rt0j}}{L_{t0j}} \left(\frac{\tau_{jt1} - \tau_{jt2}}{\tau_{jt1}} \times 100 \right) \right], \quad (2.4)$$

where τ_{jt1} and τ_{jt2} are respectively the baseline average tariff rate (in Honduras or the US) in industry j before the enforcement of CAFTA and the average tariff rate one year after it,¹⁹ I is a dummy for post-CAFTA period, and all other variables are defined as in Equation (2.2). The openness index is then obtained as the sum of the reduction in Honduras and US tariffs.

health and nutrition. The use of asset-based indicators of living standards has also been analysed in Bollen et al. (2001), Filmer & Pritchett (2001), and Montgomery et al. (2000).

¹⁸Cf. Feres & Mancero (2001) for details on the construction of the index. The “naive” approach of building welfare indices as a sum of dummy variables for whether households possess or lack certain assets has been widely explored in the literature (Case et al., 2004; Montgomery et al., 2000; Morris et al., 2000).

¹⁹Qualitative results do not change if I consider simple differences rather than percent tariff change.

Results are reported in Appendix Table E.7: given that I am here considering a percent tariff variation (multiplied by 100), whereas in my main specification trade flows are measured in 1000 USD, results differ by roughly an order of magnitude between Table E.7 and Table 2.1, but are otherwise very similar to those in Section 2.5.1 above. More pronounced tariff reductions reduce household income by 3.9 percent, which means that a one standard deviation fall in tariffs reduces household income by 7 percent. Results for wealth and deprivation are not statistically significant here, but they still go in the same direction as those for trade flows. Given that DR-CAFTA complemented the elimination of import duties with a number of measures on non-tariff barriers, I still consider my main index in (2.2) as a better estimator of the impact of the agreement. All findings of the paper however hold whether I use trade volumes or tariff reduction, and I report the latter set of results in Appendix Section 2.E.

Another straightforward robustness check is to replicate the analysis focussing on the import and export channels separately, to address the fact that the two trade flows were not perfectly correlated in all regions as of Figure 2.2 above. Table E.8 in Appendix Section 2.E hence reports the outcome of the analysis on imports from the US and Honduran tariff reduction in Panel A, and on exports to the United States and US tariff reduction in Panel B. Looking at the table, however, the results for imports and exports go in fact in the same direction, although they are marginally insignificant for imports. Interestingly, results are stronger for exports than for imports when trade flows alone are considered, whereas the reverse is true when the analysis focusses on tariff reduction. This pattern is very much in line with the underlying scheme of DR-CAFTA implementation: as mentioned in Section 2.3 above, the bulk of tariff reduction under the agreement happened on the part of Central-American countries, whereas US tariffs had been already lowered to a significant degree under CBI/CBTPA existing agreements. It is thus not surprising that additional reductions in US tariffs have a weaker (almost half in size) impact than any corresponding decrease in Honduran duties.

Turning to the validity of my identification strategy, one might be worried about selective migration, arising from the fact that my outcome variables and my trade indices are respectively measured at the household and at the regional level. My results might in fact be influenced by individuals re-sorting between locations if the treatment were valuable to them (Baum-Snow & Ferreira, 2014). For example, workers may move across districts in response to

the jobs created or destroyed by changes in trade patterns: locations suffering negative shocks to wages are likely to experience significant outflows of migrants, while the opposite may hold for locations with positive shocks. Such a scenario would however violate the difference-in-differences identifying condition that there are no time-varying unobservables, differing across treatment and control groups, that predict the outcome of interest (Baum-Snow & Ferreira, 2014). To deal with this issue, I first restrict my analysis to non-migrant families, defined as those still living in the same region where they resided five years before the interview. Results, reported in Appendix Table E.9, do not differ substantially from my main specification.

An additional issue is however that of selective *non*-migration: the decision of non-migrating itself could well be endogenous to the treatment, and non-migrant households could be inherently different from the rest of the population. I then re-run regression (2.1) assigning every household to their region five years before the interview, to identify the effect of trade on people who were living in a certain area, regardless of their subsequent decision to migrate or not.²⁰ In this sense, the estimated coefficients are most safely interpreted as intention-to-treat (ITT) parameters. Results in Appendix Table E.10 are still in line with those presented in Table 2.1 above.

Finally, I address the concern that the construction of my openness indices as of Equations (2.2) and (2.4) might be sensitive to the share of workers involved in non-traded production sectors (like services, commerce, transport, or production of goods consumed locally) in each region, which are implicitly treated as zeroes in my main specification that weights trade and tariffs by total regional employment. As Topalova (2010) points out, this means that the openness indices might correlate with initial regional welfare levels, and could therefore confound the empirical strategy if there were convergence or divergence in regional living standards for reasons unrelated to trade exposure. As an additional robustness check, I therefore build two alternative openness measures, which ignore workers in the non-traded production sectors when weighting each region's trade exposure. Specifically, I construct my new trade-volumes

²⁰The validity of the definition rests on the assumption that there was only one migration episode for each individual in the five-year recall window, and that it occurred towards the end of the period.

and tariff-variation exposure indices as:

$$\tilde{V}_{rt} = \frac{1}{\sum_{j \in J} L_{rt0j}} \sum_{j \in J} \frac{L_{rt0j}}{L_{t0j}} V_{jt} \quad (2.5)$$

$$\tilde{T}_{rt} = I_t \times \frac{1}{\sum_{j \in J} L_{rt0j}} \sum_{j \in J} \left[\frac{L_{rt0j}}{L_{t0j}} \left(\frac{\tau_{jt1} - \tau_{jt2}}{\tau_{jt1}} \times 100 \right) \right], \quad (2.6)$$

where all variables are defined as in Equations (2.2) and (2.4). The difference between the two sets of estimators is that, while Equations (2.2) and (2.4) are normalised by the size of the *total* labour force in each region, L_{rt0} , in Equations (2.5) and (2.6) the normalisation accounts only for the labour force *in the traded sector*, $\sum_{j \in J} L_{rt0j}$. Results are reported in Appendix Table E.11, and are again in line with the evidence presented in Section 2.5.1 above. The downside of $\tilde{V}$ and $\tilde{T}$ is that they treat in the same way regions where the overwhelming majority of the working population is engaged in the tradable sector and regions where only a tiny fraction is, if they have an analogous sectoral composition within the traded production sector (Topalova, 2010). Variation in $\tilde{V}$ and $\tilde{T}$ does not therefore represent an accurate measure of the real magnitude of the effect of DR-CAFTA. For this reason, I choose to rely on my main indices as of Equations (2.2) and (2.4) for the remainder of the analysis.

2.6 Mechanisms

2.6.1 A national labour market?

The fact that my findings do not depend on households' migration decisions suggests that trade might not have an impact on their geographical relocation patterns, which I confirm in Table 2.2, where trade exposure does not affect households' internal migration status.²¹

The result in Section 2.5 is therefore best interpreted in the framework of a local labour market effect taking place at the regional level. When mobility costs are significant, workers tend in fact to exhibit “sticky feet” (Hollweg et al., 2014), remaining in their current sector or location. This in turn delays the pace of efficient reallocation of economic activity, and creates

²¹Here again a household is defined as migrant if five years ago the household head lived in a different region than they live now, so I regress the migrant status on the trade measures that refer to the household head's region of origin (i.e. their region five years ago).

regional disparities in the adjustment path of factor prices to a trade shock.

In line with research on local labour markets (Attanasio et al., 2004; Hanson & Harrison, 1999; Wacziarg & Wallack, 2004), in Table 2.3 I also document a low degree of labour mobility across productive sectors.²² With integrated labour markets, the areas more exposed to trade would witness an increase in the likelihood of employment in certain sectors rather than others, but I instead do not find any differential labour reallocation pattern across sectors (apart from a tiny increase in finance).

The labour market segmentation emerging from Tables 2.2 and 2.3 may cause significant adjustment costs. In the next two sections, I therefore analyse the labour market margins along which I expect the trade shock to affect household income in local labour markets.

Table 2.2: The effect of trade on migration

	(1) Migrant
Trade flows (region of origin)	0.035 [0.352]
Observations	35,203
Outcome mean	0.047
Regional Fixed Effects	YES
Year Fixed Effects	YES

P-values from wild cluster bootstrapping in brackets

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: The outcome is a dummy variable for being a migrant household. A household is defined as migrant if five years ago the household head lived in a different region than they live now. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. Regional trade exposure is a weighted average of the sum of regional imports from and exports to the US of all industries, where trade flows of a certain industry are apportioned to each region according to its share of national industry employment. Every household is assigned to the region where the head lived five years ago.

²² Although more fine-grained information would be needed for a more insightful understanding of the dynamics in place, my data do not allow me to go beyond a 1-digit categorisation of sectors.

Table 2.3: Sector reallocation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Agriculture	Commerce	Construction	Finance	Manufacturing	Services	Transport
Trade flows	0.015 [0.154]	-0.003 [0.866]	-0.001 [0.756]	0.006*** [0.006]	0.002 [0.702]	-0.005 [0.138]	0.003 [0.138]
Observations	86,608	86,608	86,608	86,608	86,608	86,608	86,608
Outcome mean	0.203	0.151	0.044	0.027	0.11	0.108	0.028
Regional Fixed Effects	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** p<0.01, ** p<0.05, * p<0.1

Notes: The outcome is a dummy variable for whether an individual is employed in the sector reported in each column. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. The analysis is performed on individuals aged 15 or older. Regional trade exposure is a weighted average of the sum of regional imports from and exports to the US of all industries, where trade flows of a certain industry are apportioned to each region according to its share of national industry employment.

In Section 2.6.2, I first look at wages. In a context of local labour markets, I expect to find lower wages in the regions most exposed to trade: as workers are not able to respond to changes in earnings prospects elsewhere in the country, in fact, wage arbitrage and labour mobility should not dissipate a trade shock at the national level (Autor et al., 2016; Topalova, 2010).

In Section 2.6.3, I then address employment patterns. With integrated labour markets, workers employed in regions specialising in trade-intensive sectors could readily relocate to other locations if displaced by trade, and there would be no measurable impact on employment rates in trade-impacted regions relative to the national market (Hasan et al., 2012; Porto, 2008). In segmented labour markets, instead, existing research has shown that labour demand shocks result in either increased unemployment, shrinking labour force participation, or transitions into lower-quality and informal jobs (Autor et al., 2016; Hakobyan & McLaren, 2016; Kovak, 2013; Menezes-Filho & Muendler, 2011).

2.6.2 Local labour markets: wages

In Table 2.4, workers earn significantly lower wages in areas more exposed to trade. The presence of differential wage impacts of trade across regions is consistent with evidence presented elsewhere in the literature (Autor et al., 2016; Hakobyan & McLaren, 2016; Kovak, 2013).

A number of empirical contributions (Autor et al., 2016; Hakobyan & McLaren, 2016; Kovak, 2013) have also shown that wage effects in local labour markets are not confined to workers employed in the tradable sector. Acemoglu et al. (2012, 2016) call this a “cascade effect”: economic interconnections between sectors propagate any shock from one sector to the rest of the economy, through input-output linkages and other general equilibrium channels. For instance, demand for non-traded services could be subdued when the wages received by those in the traded sector fall; alternatively, workers originally employed in contracting tradable industries may compete for employment in non-traded industries, driving wages down in those sectors too (Hakobyan & McLaren, 2016).

Table 2.4: The effect of trade openness on wages

	(1)
	Daily wage (log)
Trade flows	-0.075** [0.016]
Observations	29,304
Outcome mean	4.612
Regional Fixed Effects	YES
Year Fixed Effects	YES
P-values from wild cluster bootstrapping in brackets	

*** p<0.01, ** p<0.05, * p<0.1

Notes: The outcome is the log of daily wage (winsorised) received by public, private, or domestic employees. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. The analysis is performed on individuals aged 15 or older. Regional trade exposure is a weighted average of the sum of regional imports from and exports to the US of all industries, where trade flows of a certain industry are apportioned to each region according to its share of national industry employment.

Table 2.5: Evidence on sectoral wage changes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Agriculture	Commerce	Construction	Finance	Manufacturing	Services	Transport
Trade flows	-0.044 [0.406]	-0.024 [0.650]	-0.056 [0.416]	0.056 [0.474]	-0.081** [0.032]	-0.059* [0.086]	-0.014 [0.802]
Observations	5,853	4,487	2,416	1,747	5,786	7,418	1,207
Outcome mean	4.054	4.653	4.674	4.93	4.785	4.723	4.934
Regional Fixed Effects	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** p<0.01, ** p<0.05, * p<0.1

Notes: The outcome is log-(winsorised) wage received by workers employed in the sector reported in each column. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. The analysis is performed on individuals aged 15 or older. Regional trade exposure is a weighted average of the sum of regional imports from and exports to the US of all industries, where trade flows of a certain industry are apportioned to each region according to its share of national industry employment.

In Table 2.5, I equally find some evidence that the wage shock reverberates throughout the economy. Wages in regions more exposed to trade drop in most productive sectors, although significantly so only in manufacturing and services. The fact that wages fall both in a traded and a non-traded sector is consistent with local labour markets theory.

2.6.3 Local labour markets: employment

In this section, I provide evidence on two employment effects highlighted by existing research on local labour markets. Specifically, I address the claim that (i) adverse trade shocks result in adjustments on the extensive margin, with increased unemployment and shrinking labour force participation (Autor et al., 2016; Hakobyan & McLaren, 2016; Kovak, 2013; Menezes-Filho & Muendler, 2011); and (ii) workers move to informal jobs and self-employment where trade leads to falling aggregate wages (Hollweg et al., 2014; McCaig & Pavcnik, 2017; Menezes-Filho & Muendler, 2011).

2.6.3.1 Labour force participation

In Table 2.6, the impact of CAFTA on unemployment depends on the exact definition of unemployment I adopt. In Column 1, the unemployed are defined as those working-age individuals who report not having a job but being actively looking for one, and being willing and able to work if offered employment. In this case, the likelihood of unemployment decreases with trade openness. In Column 2, I expand the definition to include individuals who do not participate in the labour force, like homemakers and the inactive (those who are not employed, not engaged in housework, not enrolled in school or work-related training, and not seeking work). Here, the coefficient on trade openness shrinks in magnitude, and becomes (marginally) statistically insignificant. In Column 3 instead, when I include those who report being “unpaid family workers”, the coefficient on trade drops by almost an order of magnitude and becomes statistically insignificant.

Table 2.6: The effect of trade openness on unemployment

	(1)	(2)	(3)
	Unemployed	Unemployed #2	Unemployed #3
Trade flows	-0.021*** [0.002]	-0.018 [0.112]	-0.004 [0.762]
Observations	86,626	86,626	86,626
Outcome mean	0.028	0.323	0.377
Regional Fixed Effects	YES	YES	YES
Year Fixed Effects	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: Column (1): individuals are considered unemployed if they report not having a job but being actively looking for one, and being willing and able to work if offered employment; (2): individuals are considered unemployed if they report not having a job, whether or not they are actively looking for one, and not being in education or training; (3): individuals are considered unemployed as in Column 2, or if they define themselves as unpaid family workers. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. The analysis is performed on individuals aged 15 or older. Regional trade exposure is a weighted average of the sum of regional imports from and exports to the US of all industries, where trade flows of a certain industry are apportioned to each region according to its share of national industry employment.

In Table 2.7, I also study the likelihood of falling into each of the three additional categories (homemaker, inactive, or unpaid worker) used to complement my original definition of unemployment, and I confirm the results from Table 2.6: a higher trade exposure induces a moderate increase in the probability of being engaged in unpaid family work.

Table 2.7: Labour force participation

	(1)	(2)	(3)
	Inactive	Homemaker	Unpaid worker
Trade flows	0.010 [0.226]	-0.007 [0.414]	0.014** [0.050]
Observations	86,626	86,626	86,624
Outcome mean	0.019	0.277	0.054
Regional Fixed Effects	YES	YES	YES
Year Fixed Effects	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): dummy variable for whether the individual is not engaged in employment, education, training, nor housework, and is not looking for a job; (2): dummy variable for whether the individual is not looking for a job because of being engaged in housework; (3): dummy variable for whether the individual is engaged in unpaid family work. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. The analysis is performed on individuals aged 15 or older. Regional trade exposure is a weighted average of the sum of regional imports from and exports to the US of all industries, where trade flows of a certain industry are apportioned to each region according to its share of national industry employment.

2.6.3.2 Self-employment

In Table 2.8, I find that in areas more exposed to trade workers are more likely to be self-employed, with no effect on either public or private employment.

To show that this is indicative of worse earning prospects for workers in my sample, in Figure 2.4 I look at sectors of employment by category of occupation. While public employees are concentrated in services, and private employees are quite evenly spread across sectors, own-account workers are overwhelmingly employed in agriculture and commerce,²³ which are typically characterised by a higher level of informality. Moreover, although household

²³Exact numbers are reported in Appendix Table F.26.

income represents a rather crude proxy for individual earnings, in Appendix Table F.26 I also show that the average household income of the self-employed is consistently lower than that of both public- and private-sector workers.

Table 2.8: Category of occupation

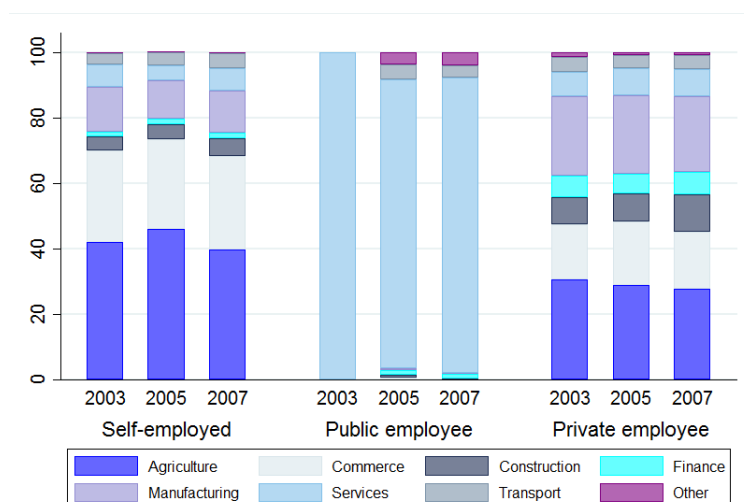
	(1)	(2)	(3)
	Self-employed	Public employee	Private employee
Trade flows	0.020*	0.000	-0.016
	[0.068]	[0.768]	[0.178]
Observations	86,624	86,624	86,624
Outcome mean	0.278	0.048	0.276
Regional Fixed Effects	YES	YES	YES
Year Fixed Effects	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): dummy variable for whether the individual is self-employed; (2): dummy variable for whether the individual is a public employee; (3): dummy variable for whether the individual is a private employee. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. The analysis is performed on individuals aged 15 or older. Regional trade exposure is a weighted average of the sum of regional imports from and exports to the US of all industries, where trade flows of a certain industry are apportioned to each region according to its share of national industry employment.

Figure 2.4: Sector of occupation by category of employment



Data source: EPHPM, years 2003, 2005, 2007.

2.6.4 A consistency check: low-skilled workers

According to existing research on local labour markets in high-income countries, low-skilled workers tend to be relatively more penalised in areas more exposed to trade with poorer partner countries, as they bear the highest burden of competition from cheaper labour abroad. Autor et al. (2014, 2016) and Hakobyan & McLaren (2016), for example, document how blue-collar workers in the US disproportionately suffer in trade-intense locations as a result of, respectively, rising trade with China and competition from Mexican import under NAFTA. Following an inverse logic, one would expect to see low-skilled individuals becoming relatively better-off with respect to their high-skilled counterparts in the Honduran regions facing more trade with the United States.

In Table 2.9, I report the results of running Equation (2.1) on daily wage and the three definitions of unemployment introduced in Section 2.6.3 above, with the addition of an indicator for low skill (defined as having completed at most primary education) and an interaction term between this and my trade exposure index. In practice, the regression I run is of the form

$$y_{irt} = \alpha + \beta V_{rt} + \zeta l_{it} + \xi V_{rt} \times l_{it} + \gamma_r + \delta_t + \epsilon_{irt}, \quad (2.7)$$

where l is the low-skills indicator and all other variables are defined as in Equation (2.1). The parameter of interest is now the coefficient ξ on the interaction term.

As it appears in Column 1 of Table 2.9, unskilled workers do in fact enjoy relatively more favourable wage dynamics in trade-intensive areas: the effect of living in a high-trade region is as much as almost 14 percent less harmful to an unskilled than a skilled individual.

As regards employment adjustments, Equation (2.7) produces results that are exactly the opposite of those observed in Table 2.6. When I define unemployment in the most restrictive way, the trade agreement results in higher unemployment for low-skilled workers in Column 2. In Columns 3-4, instead, which consider the more conservative definitions including those out of the labour force, the effect is reversed and loses significance.

Using a mirror logic to Section 2.6.3, the evidence from Table 2.6 can be jointly interpreted as follows: given that they experience more modest wage reductions, fewer low-skilled workers are pushed out of the active workforce with respect to the high-skilled ones. What the table suggests, then, is that the low-skilled suffer less from the wage cuts that on average af-

fect workers in high-trading regions. This result is, again, fully consistent with local labour markets theory.

Table 2.9: The effect of trade openness on low-skilled workers

	(1)	(2)	(3)	(4)
	Daily wage (log)	Unemployed	Unemployed #2	Unemployed #3
Trade flows×Low-skill	0.138*** [0.004]	0.008** [0.022]	-0.000 [0.904]	-0.003 [0.546]
Trade flows	-0.158*** [0.002]	-0.023*** [0.002]	-0.016 [0.112]	-0.003 [0.728]
Low-skill	-0.794*** [0.002]	-0.031*** [0.002]	0.075*** [0.000]	0.088*** [0.000]
Observations	26,185	80,919	80,919	80,919
Outcome mean	4.597	0.026	0.33	0.382
Regional Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: Column (1): log of daily wage (winsorised) received by public, private, or domestic employees; (2): individuals are considered unemployed if they report not having a job but being actively looking for one, and being willing and able to work if offered employment; (3): individuals are considered unemployed if they report not having a job, whether or not they are actively looking for one, and not being in education or training; (4): individuals are considered unemployed as in Column 3, or if they define themselves as unpaid family workers. The outcome is regressed on a measure of regional trade exposure per worker, an indicator for low skills, year and regional fixed effects, and an interaction between regional trade exposure and low skills. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. The analysis is performed on individuals aged 15 or older. Low skills are defined as education level not higher than complete primary education. Regional trade openness is a weighted average of the sum of regional imports from and exports to the US of all industries, where trade flows of a certain industry are apportioned to each region according to its share of national industry employment.

2.7 Conclusion

This chapter studies the adjustment cost of the DR-CAFTA free trade agreement in Honduras. The analysis exploits regional variation in intensity of regional trade exposure per worker, and focusses on measures of household living standards. The main findings highlight a negative effect of the agreement in locations more exposed to trade, as regions that saw more sustained

trade flows experienced a drop in household income and wealth.

The chapter presents segmented local labour markets as one explanation for these patterns: confronted with the new incentive framework caused by the trade shock, workers could not move without cost. As a result, the trade agreement did not induce any significant reallocation of workers across regions and production sectors. This, in turn, depressed local wages, even outside of the traded sector. Eventually, the wage shock made workers either turn to informal, less lucrative jobs, or drop out of the labour force altogether.

As Topalova (2010) notes, this kind of dynamic also implies that the wage adjustment to the trade agreement absorbed the potentially beneficial effects of DR-CAFTA through the price channel. In principle, in fact, households should have benefited as consumers from DR-CAFTA, as trade liberalisation should have resulted in a reduction in the price of their consumption basket. Given how my trade index is built, however, the regions more exposed to trade are the ones most likely to be net producers of precisely the same goods whose price would be expected to fall. A price slump, then, negatively affects households on the earnings side. Although my chapter largely abstracts from the price effect of DR-CAFTA, then, my finding that the agreement reduced household income and wealth suggests an imbalance between labour-market and price effects. Even if the trade agreement had brought about any reduction in prices, that same reduction seems to have hit households, through the labour market channel, much more than it favoured them on the consumption side.

To be precise, all these effects should be considered as the result of being *relatively* more intensely exposed to trade with respect to less-treated locations, as stressed in Section 2.4.2. The comparative nature of my analysis is suited to measuring relative rather than absolute effects, and therefore the paper is silent on the net impact of DR-CAFTA at the national level. As is typical with this kind of “intensity-of-treatment” evaluation strategy (cf. Autor et al. 2016; Topalova, 2010), my results could be read as trade-impacted locations either experiencing a decline in living standards in absolute terms, or simply benefiting less from the trade agreement, relative to other areas. The latter would be the case if for example the effect of prices on household consumption were *overall* strong enough as to overcome that on depressed wages. Obviously, the policy implications would vary substantially depending on which of the two hypotheses were correct: the former scenario would entail envisaging some form of redistribu-

tion from the winners to the losers from trade, whereas the latter would involve the probably less concerning question on the magnitude of the net gains from trade. As it is, my analysis nonetheless does not tell these two alternative cases apart.

What my paper does document however is that the DR-CAFTA agreement produced quite strong within-country disparities in living standards. In general, the literature is divided between advocates of trade as an engine for development and growth²⁴ and those who call for more caution, especially in light of the threats faced by the poor.²⁵ More recently, public debate has been swamped with concerns about the desirability of free trade, with a significant portion of the public opinion worrying in particular about the distributional consequences of trade agreements.

If the concern is generally about inequalities arising between factors of production, my paper lends evidence to the existence of spatial inequalities as well. According to the World Bank (2006), for some countries the spatial dimension of inequality has already considerable effects on living standards.²⁶ While trade openness is largely regarded as an engine of development and a driver of sustained growth,²⁷ it is crucial to make sure that any free-trade policy actually achieves these goals, rather than reinforcing existing distortions.

To be sure, the effects documented in this paper are measured in the very short run, and as such the immediate adjustment cost to the policy may have been overturned in the medium term. Nonetheless, especially if public opinion is present-biased²⁸ and myopic, free-trade policies can be hard to push forward if they result in short-run strain in the regions more exposed to trade growth, where they would be a priori supposed to have the highest developmental impact.

Devising effective tools for mitigating these costs should hence be particularly high on policy-makers' agenda. Whether these include programmes for re-training, skill building, or

²⁴Cf. for discussion Grossman & Helpman (1991) and Lucas (1988); for cross-country studies, see e.g. Dollar (1992), Edwards (1998), and Sachs & Warner (1995).

²⁵Cf. Winters et al. (2004) for a detailed review.

²⁶For example, Jalan & Ravallion (1997) identify "spatial poverty traps" in rural China, where poorer areas have lower provisions of essential public goods and, as a result, households in the area experience lower productivity on their investments. Ravallion & Wodon (1999), on the other hand, demonstrate that place of residence is an important determinant of poverty in Bangladesh. Hollweg et al. (2014) also document that mobility costs are already particularly high in developing countries: according to their estimates, the average mobility cost in low- and middle-income countries is 4.93 times the annual wage, and more than twice as high as in developed economies.

²⁷Well-known evidence from Dollar & Kraay (2004) for example shows that, in the second half of the Twentieth century, 20-years growth rates increased for "globalisers" but not for other countries.

²⁸See e.g. O'Donoghue & Rabin (1999).

effective support for occupational and geographic mobility, of utmost importance is the identification of an appropriate policy mix to mitigate the downsides of trade liberalisation.²⁹ Further trade reforms cannot dispense with measures to support those who bear the burden of adjustment.

²⁹See also International Monetary Fund (2016).

Appendix

2.A Tariff Reduction under DR-CAFTA

Table A.1: DR-CAFTA Tariff Removal Schedules

Commodity Category	Removal Schedule
A	Immediately duty-free
B	Removed in 5 equal annual stages beginning on the date Agreement enters into force, and duty-free on 1 Jan year 5
C	Removed in 10 equal annual stages beginning on the date Agreement enters into force, and duty-free on 1 Jan year 10
D	Removed in 15 equal annual stages beginning on the date Agreement enters into force, and duty-free on 1 Jan year 15
E	Remain at base rates until year 6. Reduced by 8.25% of the base rate in year 7 and by an additional 8.25% of the base rate each year through year 10. Beginning year 11, reduced by additional 13.4% of the base rate annually through year 15, and duty-free on 1 Jan year 15
F	Remain at base rates until year 10. Beginning year 11, reduced in 10 equal annual stages, and duty-free on 1 Jan year 20
G	Continue duty-free
H	Continue at MFN rates
I [†]	Reduced by 2% on the date Agreement enters into force, and by an additional 2% on 1 Jan year 2. Beginning year 3, reduced by additional 8% of the base rate annually through year 6. Beginning year 7, reduced by an additional 16% of the base rate annually through year 10, and duty-free on 1 Jan year 10
J [†]	Removed immediately in accordance with existing WTO duty-elimination commitments
K [†]	Immediately duty-free
L [†]	Duty-free on 1 Jan year 10
M*	Removed in 10 stages. On the date Agreement enters into force, reduced by 2%, and by an additional 2% in year 2. In year 3 duties reduced by additional 8% of the base rate, and additional 8% of the base rate each year through year 6. In year 7, reduced by additional 16% of the base rate, and by additional 16% of the base rate each year through year 9, and duty-free on 1 Jan year 10
N*	Removed in 12 equal annual stages beginning on the date Agreement enters into force, and duty-free on 1 Jan year 12
O*	Remain at base rates until year 6. Beginning year 7, reduced by 8% of the base rate, and by additional 8% of the base rate each year through year 11. In year 12, reduced by additional 15% of the base rate, and by additional 15% of the base rate each year through year 14, and duty-free on 1 Jan year 15
P*	Remain at base rates until year 10. In year 11, reduced by 8.25% of the base rate, and by additional 8.25% of the base rate each year through year 14. In year 15, reduced by additional 16.75% of the base rate, and by additional 16.75% of the base rate each year through year 17, duty-free on 1 Jan year 18

Source: US Trade Representative (2004)

Note: Items marked with [†] are specific to the US, with * to Honduras.

Table A.2: Average percent tariff reduction, 2005-2007

Commodity (HS8 code)	Description	% ΔT (Honduras)	% ΔT (US)
01	Live animals	51.36	50
02	Meat and edible meat offal	56.15	78.49
03	Fish and crustaceans	66.28	18.1
04	Dairy, eggs, honey and edible products	8	98.77
05	Products of animal origin	76.19	28.57
06	Live trees and other plants	75.76	76.92
07	Edible vegetables	37.38	89.68
08	Edible fruits and nuts, peel of citrus/melons	84.79	79.31
09	Coffee, tea, mate and spices	24.67	29.79
10	Cereals	12.46	80.95
11	Milling industry products	27.95	86.84
12	Oil seeds/miscellaneous grains/medical plants/straw	31.43	46.55
13	Lac, gums, resins	0	33.33
14	Vegetable plaiting materials	25.45	41.67
15	Animal or vegetable fats, oils and waxes	19.81	72.13
16	Edible preparations of meat, fish, crustaceans	58.42	63.42
17	Sugars and sugar confectionery	13	94.59
18	Cocoa and cocoa preparations	22.78	88.64
19	Preparations of cereals, flour, starch or milk	32.05	81.82
20	Preparations of vegetables, fruits, nuts	40.3	90.97
21	Miscellaneous edible preparations	38	86.89
22	Beverages, spirits and vinegar	32	50
23	Residues from food industries, animal feed	76.48	65.71
24	Tobacco and manufactured tobacco substitutes	51.58	52
25	Salt, sulphur, earth and stone, lime and cement	27.89	8.64
26	Ores slag and ash	7.89	2.56
27	Mineral fuels, oils, waxes and bituminous sub	70	40.58
28	Inorganic chemicals, organic/inorganic compounds of precious metals, isotopes	1.4	71.71
29	Organic chemicals	2.34	71.72
30	Pharmaceutical products	7.41	2.38
31	Fertilisers	0	0
32	Tanning or dyeing extracts, dyes, pigments, paints and varnishes, putty, inks	9.6	82.35
33	Oils and resinoids, perfumery, cosmetic or toilet preparations	24.1	31.91
34	Soaps, waxes, scouring products, candles, modeling pastes, dental waxes	26.47	58.54
35	Albuminoidal sub, starches, glues, enzymes	31.58	66.67
36	Explosives, matches, pyrotechnic products	58	69.23
37	Photographic or cinematographic goods	69.19	74.42
38	Miscellaneous chemical products	21.98	69.63
39	Plastics and articles thereof	19.08	87.44
40	Rubbers and articles thereof	46.48	60.27
41	Raw hides, skins and leather	37.35	76.86
42	Articles of leather, saddlery and harness, travel goods, handbags, articles of gut	35.2	88.16
43	Furskins and artificial fur, manufactures	20	68.18
44	Wood and articles of wood, wood charcoal	25.9	31.45
45	Cork and articles of cork	0	5.26
46	Manufactures of straw, esparto, other plaiting materials, basketware and wickerwork	20	71.43
47	Pulp of wood, waste and scrap of paper	0	0
48	Paper and paperboard, articles of paper pulp	31.92	0
49	Printed books, newspapers, pictures, manuscripts, typescripts, plans	28.17	0
50	Silk, including yarns and woven fabrics thereof	60	38.46

Data source: US Trade Representative (2004).

Table A.3: Average percent tariff reduction, 2005-2007 (cont'd)

Commodity (HS8 code)	Description	% ΔT (Honduras)	% ΔT (US)
51	Wool and fine or coarse animal hair, including yarns and woven fabrics thereof	52.63	65.29
52	Cotton, including yarns and woven fabrics thereof	95.59	77.81
53	Vegetable textile fibres nesoi, yarns and woven	48.48	21.62
54	Man-made filaments, yarns and woven	86.67	88.29
55	Man-made staple fibers, yarns	84.55	92.73
56	Wadding, felt and nonwoven, special yarns, twine, cordage, ropes, cables, articles	65.12	65.38
57	Carpets and other textile floor coverings	100	55.81
58	Special woven fabrics, tufted textiles, lace	96.08	75.76
59	Impregnated, coated, covered or laminated textile products, textile products for industrial use	66.67	62.07
60	Knitted or crocheted fabrics	97.96	97.37
61	Articles of apparel and clothing accessories, knitted or crocheted	98.31	93.69
62	Articles of apparel and clothing accessories, not knitted or crocheted	100	95.04
63	Made-up textile articles nesoi, needlecraft sets, worn clothing, rags	93.85	84.69
64	Footwear, gaiters and the like	29.37	72.75
65	Headgear and other parts	40	58.1
66	Umbrellas, sun umbrellas, walking sticks, whips, riding crops and parts	65.71	60
67	Prepared feathers, human hair and articles thereof, artificial flowers	42.22	53.85
68	Articles of stone, plastic, cement, asbestos, mica or similar materials	21.13	43.33
69	Ceramic products	14	65.08
70	Glass and glassware	22.08	74.52
71	Pearls, stones, precious metals, imitation jewelry, coins	44.81	53.85
72	Iron and steel	8.04	8.68
73	Articles of iron and steel	23.08	26.85
74	Copper and articles thereof	5.08	88.54
75	Nickel and articles thereof	0	80
76	Aluminium and articles thereof	19.4	90.77
78	Lead and articles thereof	30	71.43
79	Zinc and articles thereof	0	92.31
80	Tin and articles thereof	0	70
81	Base metals nesoi, cermets, articles	0	63.49
82	Tools, spoons and forks of base metal	14.3	59.18
83	Miscellaneous articles of base metal	26.67	73.68
84	Nuclear reactors, boilers, machinery and mechanical appliances, computers	4.5	36.2
85	Electrical machinery, equipment, parts, telecommunication equipment, sound and tv recorders	15.83	54.29
86	Railway or tramway locomotives, rolling stock, track fixtures and fittings, signals	0	75
87	Vehicles other than railway or tramway rolling stock	48.37	52.12
88	Aircraft, spacecraft and parts thereof	43.75	5.56
89	Ships, boats and floating structures	31.43	27.27
90	Optical, photographic, cinematographic, measuring, checking, precision, medical, surgical instruments and accessories	5.24	50.33
91	Clocks and watches and parts thereof	37.74	63.79
92	Medical instruments, parts and accessories	94.17	62.5
93	Arms and ammunition, parts and accessories	39.05	30.56
94	Furniture, bedding, cushions, lamps and lighting fittings nesoi, illuminated signs, nameplates, prefabricated buildings	36.09	37.91
95	Toys, games and sports equipment, parts and accessories	60.83	38.04
96	Miscellaneous manufactured articles	26.45	70.89
97	Works of art, collectors' pieces, antiques	100	0
98	Agriculture, construction, transport, electric, gas, sanitary, engineering, management, environmental quality		0

Data source: US Trade Representative (2004).

2.B Descriptive statistics

Table B.4: Descriptive statistics

	(1)	(2)	(3)		(1)	(2)	(3)
	2003	2005	2007		2003	2005	2007
HH income	6300.549 (9141.653)	7235.598 (13988.134)	10201.121 (15006.057)	Transport	0.025 (0.157)	0.026 (0.158)	0.029 (0.168)
Deprivation	0.928 (1.020)	0.939 (1.002)	0.723 (0.934)	Finance	0.025 (0.155)	0.025 (0.157)	0.028 (0.165)
Wealth	-0.122 (3.019)	-0.211 (2.983)	0.317 (2.959)	Services	0.109 (0.312)	0.096 (0.294)	0.112 (0.315)
Daily wage	95.118 (61.234)	113.688 (70.464)	135.779 (82.320)	Other sector	0.335 (0.472)	0.350 (0.477)	0.320 (0.466)
Unemployed	0.041 (0.198)	0.032 (0.175)	0.022 (0.145)	Rural	0.453 (0.498)	0.469 (0.499)	0.470 (0.499)
Inactive	0.037 (0.188)	0.009 (0.097)	0.016 (0.124)	Migrant	0.053 (0.223)	0.082 (0.274)	0.026 (0.160)
Unpaid worker	0.056 (0.230)	0.052 (0.222)	0.054 (0.226)	Age	35.901 (15.739)	35.326 (15.239)	36.561 (16.974)
Homemaker	0.252 (0.434)	0.303 (0.460)	0.277 (0.447)	Female	0.523 (0.499)	0.529 (0.499)	0.534 (0.499)
Self-employed	0.283 (0.450)	0.255 (0.436)	0.285 (0.451)	HH members	5.773 (2.630)	5.957 (2.882)	5.555 (2.603)
Public employee	0.044 (0.204)	0.045 (0.208)	0.051 (0.219)	No education	0.169 (0.375)	0.154 (0.361)	0.144 (0.351)
Private employee	0.266 (0.442)	0.285 (0.451)	0.276 (0.447)	Primary education	0.599 (0.490)	0.594 (0.491)	0.587 (0.492)
Agriculture	0.208 (0.406)	0.213 (0.410)	0.198 (0.399)	Secondary education	0.190 (0.393)	0.210 (0.407)	0.218 (0.413)
Manufacturing	0.114 (0.317)	0.108 (0.311)	0.110 (0.313)	High vocational education	0.002 (0.046)	0.003 (0.056)	0.001 (0.038)
Construction	0.036 (0.187)	0.038 (0.191)	0.049 (0.215)	Tertiary education	0.039 (0.195)	0.038 (0.192)	0.049 (0.216)
Commerce	0.149 (0.356)	0.144 (0.351)	0.155 (0.362)	Observations	18167	17670	51373

Notes: The table reports the average of each variable in years 2003, 2005, 2007. Standard deviations are in parentheses. Household income and daily wage are measured in Honduran Lempiras. Deprivation is a measure of unmet basic needs, where needs are type of dwelling, members per room, drinking water, waste disposal, education and subsistence capacity (possible values are 0,1,2,... depending on the number of needs that are unmet); wealth is an asset ownership index obtained from principal component analysis on durable goods, household goods, vehicles, housing characteristics.

2.C Difference-in-differences vs. quasi-differences estimation

2.C.1 Estimating the ATT

Given a certain treatment, the average treatment effect on the treated (*ATT*) is the change in an outcome of interest Y that those who receive the treatment experience as a result of having received the treatment itself. Assuming that receiving the treatment is described by a dummy variable T , and that the treated can be identified by means of a binary variable G taking value a in the treated group and b in the control group, the *ATT* is defined as

$$ATT = E[Y_{t=2}^{T=1} - Y_{t=2}^{T=0} | G = a], \quad (2.8)$$

where $t = 2$ identifies the period after the treatment has been put in place.

Clearly, estimation of Equation (2.8) suffers from the problem of a missing counterfactual, as it is not possible to know what would have happened in period 2 to group a had the treatment not been in place. In other words, the quantity $E[Y_{t=2}^{T=0} | G = a]$ is a priori unknown.

Adding and subtracting from Equation (2.8) the outcome for group a *before* the treatment $Y_{t=1}^{T=0}$ and rearranging, one obtains the equivalent expression

$$ATT = E[Y_{t=2}^{T=1} - Y_{t=1}^{T=0} | G = a] - E[Y_{t=2}^{T=0} - Y_{t=1}^{T=0} | G = a]. \quad (2.9)$$

If one is willing to assume that, in the absence of treatment, the evolution of the outcome for the treated group would have been the same as in the control group,

$$E[Y_{t=2}^{T=0} - Y_{t=1}^{T=0} | G = a] = E[Y_{t=2}^{T=0} - Y_{t=1}^{T=0} | G = b], \quad (2.10)$$

then the *ATT* can be estimated by the “difference-in-differences” estimator:

$$DD = \hat{E}[Y_{t=2}^{T=1} - Y_{t=1}^{T=0} | G = a] - \hat{E}[Y_{t=2}^{T=0} - Y_{t=1}^{T=0} | G = b]. \quad (2.11)$$

The assumption of common trends between the two groups is nonetheless not an innocuous one, especially when the treatment and control groups are not randomly assigned – as is the case in this chapter. Wagstaff (2010), therefore, proposes an alternative technique, labelled

“quasi-differences” estimation, which relies on the availability of more than one pre-treatment time periods (periods 0 and 1, respectively).

Specifically, the technique adds and subtracts from Equation (2.9) above the quantities $Y_{t=1}^{T=0}$ and $Y_{t=0}^{T=0}$, which produces

$$ATT = E[(Y_{t=2}^{T=1} - Y_{t=1}^{T=0}) - (Y_{t=1}^{T=0} - Y_{t=0}^{T=0})|G = a] - E[(Y_{t=2}^{T=0} - Y_{t=1}^{T=0}) - (Y_{t=1}^{T=0} - Y_{t=0}^{T=0})|G = b]. \quad (2.12)$$

Here, in order to be able to estimate Equation (2.12), one only needs to assume that, both for the treatment and control group, the evolution of outcomes without the treatment over time would have followed the same pre-treatment group-specific trend:

$$E[Y_{t=2}^{T=0} - Y_{t=1}^{T=0}|G = a] = E[Y_{t=1}^{T=0} - Y_{t=0}^{T=0}|G = a] \quad (2.13)$$

$$E[Y_{t=2}^{T=0} - Y_{t=1}^{T=0}|G = b] = E[Y_{t=1}^{T=0} - Y_{t=0}^{T=0}|G = b]. \quad (2.14)$$

Imposing such a weaker assumption, one can thus estimate the *ATT* as a so-called “quasi-differences” estimator,

$$QD = \left[\hat{E}[Y_{t=2}^{T=1}|G = a] - \hat{E}[Y_{t=1}^{T=0}|G = a] - \hat{E}[Y_{t=2}^{T=0}|G = b] - \hat{E}[Y_{t=1}^{T=0}|G = b] \right] \\ - \left[\hat{E}[Y_{t=1}^{T=0}|G = a] - \hat{E}[Y_{t=0}^{T=0}|G = a] - \hat{E}[Y_{t=1}^{T=0}|G = b] - \hat{E}[Y_{t=0}^{T=0}|G = b] \right]. \quad (2.15)$$

2.C.2 Regression analysis with continuous treatment

Now turning to the case of a linear regression with continuous treatment, as considered in this chapter, let us assume for the sake of simplicity that we only have two regions r_1 and r_2 , which differ in their exposure to a continuous treatment V_{rt} . The resulting diff-in-diff regression equation for region r at time t would therefore be

$$Y_{rt} = \beta V_{rt} + \gamma_r + \delta_t + \epsilon_{rt}, \quad (2.16)$$

where γ_r and δ_t are respectively a region and a time fixed effect, and ϵ is a random error term.

With just two time periods t_1 and t_2 , the diff-in-diff estimator DD would be estimated as

$$DD = \left[\hat{E}[Y|r = r_2, t = t_2] - \hat{E}[Y|r = r_1, t = t_2] \right] - \left[\hat{E}[Y|r = r_2, t = t_1] - \hat{E}[Y|r = r_1, t = t_1] \right], \quad (2.17)$$

which, substituting in Equation (2.16), becomes equal to

$$DD = \beta[(V_{r_2 t_2} - V_{r_1 t_2}) - (V_{r_2 t_1} - V_{r_1 t_1})] + [E(\epsilon_{r_2 t_2} - \epsilon_{r_2 t_1}) - E(\epsilon_{r_1 t_2} - \epsilon_{r_1 t_1})]. \quad (2.18)$$

If we then impose the common trends assumption

$$E(\epsilon_{r_2 t_2} - \epsilon_{r_2 t_1}) = E(\epsilon_{r_1 t_2} - \epsilon_{r_1 t_1}), \quad (2.19)$$

we can see that the diff-in-diff estimator is equal to β times the difference in exposure to the treatment between groups over time:

$$DD = \beta[(V_{r_2 t_2} - V_{r_1 t_2}) - (V_{r_2 t_1} - V_{r_1 t_1})]. \quad (2.20)$$

If instead we had a third time period t_0 , we would be able to compute the quasi-difference estimator

$$QD = \left\{ \left[\hat{E}[Y|r = r_2, t = t_2] - \hat{E}[Y|r = r_1, t = t_2] \right] - \left[\hat{E}[Y|r = r_2, t = t_1] - \hat{E}[Y|r = r_1, t = t_1] \right] \right\} \\ + \left\{ \left[\hat{E}[Y|r = r_2, t = t_1] - \hat{E}[Y|r = r_1, t = t_1] \right] - \left[\hat{E}[Y|r = r_2, t = t_0] - \hat{E}[Y|r = r_1, t = t_0] \right] \right\}. \quad (2.21)$$

Substituting as above in Equation (2.16), we obtain

$$QD = \beta \left\{ [(V_{r_2 t_2} - V_{r_1 t_2}) - (V_{r_2 t_1} - V_{r_1 t_1})] - [(V_{r_2 t_1} - V_{r_1 t_1}) - (V_{r_2 t_0} - V_{r_1 t_0})] \right\} \\ + \left\{ [E(\epsilon_{r_2 t_2} - \epsilon_{r_2 t_1}) - E(\epsilon_{r_2 t_1} - \epsilon_{r_2 t_0})] - [E(\epsilon_{r_1 t_2} - \epsilon_{r_1 t_1}) - E(\epsilon_{r_1 t_1} - \epsilon_{r_1 t_0})] \right\}. \quad (2.22)$$

Imposing the group-specific pre-treatment trends,

$$E(\epsilon_{r_2 t_2} - \epsilon_{r_2 t_1}) - E(\epsilon_{r_2 t_1} - \epsilon_{r_2 t_0}) = E(\epsilon_{r_1 t_2} - \epsilon_{r_1 t_1}) - E(\epsilon_{r_1 t_1} - \epsilon_{r_1 t_0}), \quad (2.23)$$

we finally obtain our quasi-diff estimator as β times the difference in exposure to the treatment between groups over the three periods of time:

$$QD = \beta \left\{ [(V_{r_2t_2} - V_{r_1t_2}) - (V_{r_2t_1} - V_{r_1t_1})] - [(V_{r_2t_1} - V_{r_1t_1}) - (V_{r_2t_0} - V_{r_1t_0})] \right\}. \quad (2.24)$$

2.C.3 Honduran regions and the common trends assumption

To show that the parallel trends assumption would not have worked in the case of Honduran regions and exposure to DR-CAFTA, I perform a falsification exercise. Specifically, I test for differences in pre-treatment trends, whereby Equation (2.1) is estimated only on the sample of pre-treatment observations, and where a placebo treatment variable measures the effect of trade before the treatment actually started. If the parallel trend assumption held, I would expect the coefficient on the placebo variable to be statistically insignificant.

Results reported in Table C.5, however, show that this is not actually the case. The placebo variable is in fact significant both for deprivation and household wealth, and is only marginally insignificant for household income. This was to an extent to be expected, considering that Honduran regions were not entirely closed to trade before DR-CAFTA, and that they already widely differed in terms of socio-economic standards. Controlling for both pre-treatment periods therefore happens to result crucial, as it allows to account for such inter-regional differences, which existed even before the trade agreement was enacted.

Table C.5: The effect of trade openness on living standards

Pre-treatment trends			
	(1)	(2)	(3)
	HH income (log)	Deprivation	Wealth
Trade (placebo)	0.414 [0.106]	1.010** [0.016]	-0.886** [0.030]
Outcome mean	8.156	0.885	0.002
Observations	14,035	14,122	11,835
Regional Fixed Effects	YES	YES	YES
Year Fixed Effects	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): log of household income (winsorised); (2): unmet basic needs, where needs are type of dwelling, members per room, drinking water, waste disposal, education and subsistence capacity (possible values are 0,1,2,... depending on the number of needs that are unmet); (3): asset ownership index obtained from pca on durable goods, household goods, vehicles, housing characteristics. The analysis is performed only on years 2003 and 2005. The outcome is regressed on a measure of regional trade exposure per worker before the enactment of DR-CAFTA, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. Regional trade exposure is a weighted average of the sum of regional imports from and exports to the US of all industries, where trade flows of a certain industry are apportioned to each region according to its share of national industry employment.

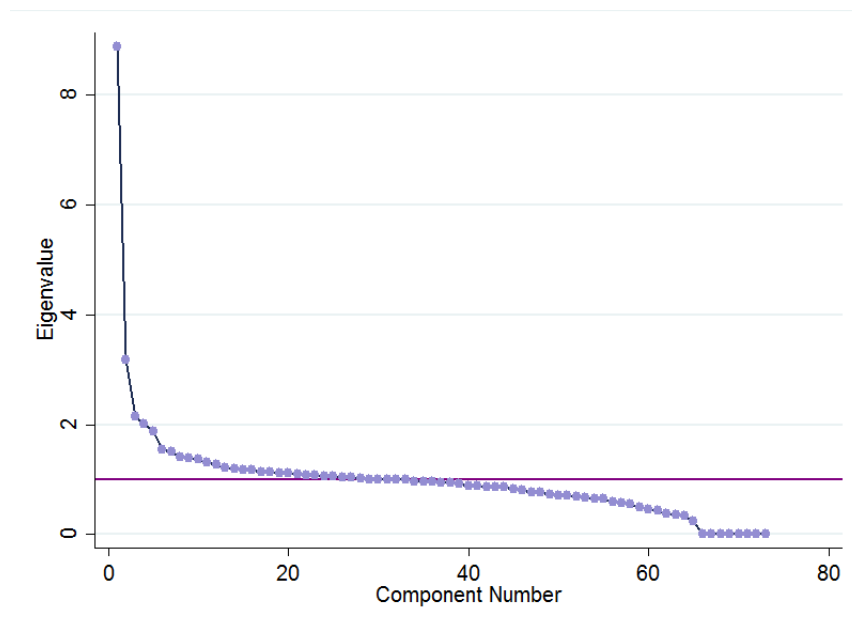
2.D The wealth index

The wealth index used in Section 2.5 is built as the first principal component from principal component analysis over a set of 73 items. These items can be split in the following categories:

- a Durable consumption goods, appliances and vehicles: radio, tv, phone, mobile phone, computer, refrigerator, stove, air conditioning, car.
- b Housing characteristics: number of sleeping members per room, floor made of earth, floor made of wood, floor made of cement, floor made of cement tile, floor made of granite, floor made of ceramic tile, floor made of clay tile, floor made of other material, walls made of natural materials, walls made of adobe, walls made of wood, walls made of waste materials, walls made of stones/bricks/blocks, walls made of prefab material, other walls, roof made of clay tiles, roof made of asbestos, roof made of metal, roof made of concrete, roof made of wood, roof made of natural materials, roof made of waste materials, other roof.
- c Type of toilet facility: private flush toilet to sewer system, shared flush toilet to sewer system, private flush toilet to septic system, shared flush toilet to septic system, private flush toilet to other, shared flush toilet to other, other private latrine, other shared latrine, private latrine with siphon, shared latrine with siphon, private composting latrine, shared composting latrine, private pit latrine, shared pit latrine.
- d Main source of water: public water piped into home, private water piped into home, water from dug well, water from tube well, water from surface source, water from tanker truck, other source; water received inside house, water received outside house but inside property, water collected outside property (less than 100m), water collected outside property (more than 100m).
- e Waste disposal: public or private collection of trash at home, trash disposed in containers, trash is buried, trash is used for composting, trash is burnt, trash is disposed anywhere, other disposal.
- f Source of light: public provider, collective private provider, own electrical engine, solar energy, candle, lantern/gas lamp, ocote, other source.

Figure D.1 shows the scree plot, which graphs each eigenvalue against the component number: the eigenvalue for the first component is almost three times as large as the eigenvalue for the second. The factor loadings on all variables for the first principal component used to build the wealth index are reported in Table D.6.

Figure D.1: Principal component analysis on wealth - Scree plot



Data source: EPHPM, year 2003.

Table D.6: Principal component analysis on wealth - Factor loadings

	Loadings		Loadings
Radio	.0556428	If light comes from solar energy	-.0188673
TV	.232297	If light comes from candle	-.0685074
Refrigerator	.2407024	If light comes from lantern/gas lamp	-.183011
Car	.1603368	If light comes from ocote	-.0990947
Phone	.205332	If light comes from other source	-.0202459
Mobile phone	.165688	Public or private collection of trash at home	.2375439
Computer	.144576	Trash disposed in containers	.0421593
Air conditioning	.0970792	Trash is buried	-.0564059
Stove	.2219192	Trash is used for composting	-.0548932
If gets public water piped into home	.158468	Trash is burnt	-.1643361
If gets private water piped into home	-.0763656	Trash is disposed anywhere	-.1102559
If gets water from dug well	-.0428646	Other disposal of trash	.0087932
If gets water from a tube well	-.041256	If walls are made of stones, bricks or blocks	.2318359
If gets water from a surface source	-.1008391	If walls are made of adobe	-.175912
If gets water from a tanker truck	-.0057677	If walls are made of prefab material	.0075846
If gets water from other source	-.0563678	If walls are made of wood	-.0422586
If gets water inside house	.2343005	If walls are made of natural materials	-.1060198
If gets water outside house but inside property	-.1768944	If walls are made of waste materials	-.0203178
If gets water outside property, less than 100m far	-.0723846	If walls are made of other materials	-.0084942
If gets water outside property, more than 100m far	-.0760204	If floors are made of ceramic tile	.0675443
If uses pvt flush toilet to sewer system	.2445548	If floors are made of cement tile	.1527006
If uses shared flush toilet to sewer system	.0090015	If floors are made of granite	.0977455
If uses pvt flush toilet to septic system	.0140735	If floors are made of clay tile	-.0177807
If uses shared flush toilet to septic system	-.0055401	If floors are made of cement	-.0626646
If uses pvt flush toilet to other	.0065695	If floors are made of wood	-.0068924
If uses shared flush toilet to other	-.0017576	If floors are made of earth	-.195316
If uses other private latrine	-.0034428	If floors are made of other materials	.0057881
If uses other shared latrine	-.0003376	If roof is made of clay tiles	-.1543167
If uses pvt latrine with siphon	-.1406339	If roof is made of asbestos	.1434728
If uses shared latrine with siphon	-.0213388	If roof is made of metal	.0246884
If uses pvt composting latrine	-.0601786	If roof is made of concrete	.0611174
If uses shared composting latrine	-.0139546	If roof is made of wood	.0044132
If uses pvt pit latrine	-.1395198	If roof is made of natural materials	-.031902
If uses shared pit latrine	-.0317065	If roof is made of waste materials	-.020695
If light comes from public provider	.2324251	If roof is made of other materials	-.0234869
If light comes from collective private provider	-.0067301	Sleeping members per room	-.1576841
If light comes from own electrical engine	-.0085424		

Data source: EPHPM, year 2003.

2.E Robustness checks

Table E.7: The effect of trade openness on living standards

	(1)	(2)	(3)
	HH income (log)	Deprivation	Wealth
Tariff reduction	-0.039*	0.012	-0.025
	[0.098]	[0.532]	[0.164]
Outcome mean	8.335	0.770	0.276
Observations	35,116	35,203	30,158
Regional Fixed Effects	YES	YES	YES
Year Fixed Effects	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): log of household income (winsorised); (2): unmet basic needs, where needs are type of dwelling, members per room, drinking water, waste disposal, education and subsistence capacity (possible values are 0,1,2,... depending on the number of needs that are unmet); (3): asset ownership index obtained from pca on durable goods, household goods, vehicles, housing characteristics. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. Regional trade exposure is a weighted average of the percent tariff reduction in Honduras and the US of all industries, where tariff reduction of a certain industry is apportioned to each region according to its share of national industry employment.

Table E.8: The effect of imports and exports on living standards

	(1)	(2)	(3)	(4)	(5)	(6)
	HH income (log)	HH income (log)	Deprivation	Deprivation	Wealth	Wealth
<i>Panel A</i>						
Imports	-0.118 [0.104]		0.101 [0.238]		-0.119 [0.132]	
Tariff reduction, Honduras		-0.100 [0.108]		0.034 [0.487]		-0.077 [0.108]
<i>Panel B</i>						
Exports	-0.730** [0.038]		0.454 [0.154]		-0.925** [0.014]	
Tariff reduction, US		-0.063* [0.098]		0.018 [0.500]		-0.037 [0.230]
Observations	35,116	35,116	35,203	35,203	30,158	30,158
Outcome mean	8.335	8.335	0.770	0.770	0.276	0.276
Regional Fixed Effects	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** p<0.01, ** p<0.05, * p<0.1

Notes: Columns (1-2): log of household income (winsorised); (3-4): unmet basic needs, where needs are type of dwelling, members per room, drinking water, waste disposal, education and subsistence capacity (possible values are 0,1,2,... depending on the number of needs that are unmet); (5-6): asset ownership index obtained from pca on durable goods, household goods, vehicles, housing characteristics. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. In odd columns, Panel A (B), regional trade openness exposure is a weighted average of regional imports from (exports to) the US of all industries, where trade flows of a certain industry are apportioned to each region according to its share of national industry employment. In even columns, Panel A (B), trade exposure is a weighted average of the percent tariff reduction in Honduras (the US) of all industries, where tariff reduction of a certain industry is apportioned to each region according to its share of national industry employment.

Table E.9: The effect of trade openness on living standards

Non-migrant households

	(1)	(2)	(3)	(4)	(5)	(6)
	HH income (log)	HH income (log)	Deprivation	Deprivation	Wealth	Wealth
Trade flows	-0.121*		0.108		-0.137**	
	[0.084]		[0.182]		[0.044]	
Tariff reduction		-0.035		0.014		-0.024
		[0.112]		[0.470]		[0.176]
Observations	33,471	33,471	33,551	33,551	28,760	28,760
Outcome mean	8.34	8.34	0.770	0.770	0.276	0.276
Regional Fixed Effects	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** p<0.01, ** p<0.05, * p<0.1

Notes: Columns (1-2): log of household income (winsorised); (3-4): unmet basic needs, where needs are type of dwelling, members per room, drinking water, waste disposal, education and subsistence capacity (possible values are 0,1,2,... depending on the number of needs that are unmet); (5-6): asset ownership index obtained from pca on durable goods, household goods, vehicles, housing characteristics. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. In odd columns, regional trade exposure is a weighted average of the sum of regional imports from and exports to the US of all industries, where trade flows of a certain industry are apportioned to each region according to its share of national industry employment. In even columns, regional trade exposure is a weighted average of the percent tariff reduction in Honduras and the US of all industries, where tariff reduction of a certain industry is apportioned to each region according to its share of national industry employment. The analysis is restricted to non-migrant households. A household is defined as non-migrant if five years ago the household head lived in the same region as they live now.

Table E.10: The effect of trade openness on living standards
ITT analysis

	(1)	(2)	(3)	(4)	(5)	(6)
	HH income (log)	HH income (log)	Deprivation	Deprivation	Wealth	Wealth
Trade flows (region of origin)	-0.117*		0.101		-0.129*	
	[0.080]		[0.138]		[0.066]	
Tariff reduction (region of origin)		-0.036		0.011		-0.024
		[0.104]		[0.550]		[0.236]
Observations	35,116	35,116	35,203	35,203	30,158	30,158
Outcome mean	8.335	8.335	0.770	0.770	0.276	0.276
Regional Fixed Effects	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** p<0.01, ** p<0.05, * p<0.1

Notes: Columns (1-2): log of household income (winsorised); (3-4): unmet basic needs, where needs are type of dwelling, members per room, drinking water, waste disposal, education and subsistence capacity (possible values are 0,1,2,... depending on the number of needs that are unmet); (5-6): asset ownership index obtained from pca on durable goods, household goods, vehicles, housing characteristics. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. In odd columns, regional trade exposure is a weighted average of the sum of regional imports from and exports to the US of all industries, where trade flows of a certain industry are apportioned to each region according to its share of national industry employment. In even columns, regional trade exposure is a weighted average of the percent tariff reduction in Honduras and the US of all industries, where tariff reduction of a certain industry is apportioned to each region according to its share of national industry employment. Every household is assigned to the region where the head lived five years ago.

Table E.11: The effect of trade openness on living standards

Weights on tradable sector only

	(1)	(2)	(3)	(4)	(5)	(6)
	HH income (log)	HH income (log)	Deprivation	Deprivation	Wealth	Wealth
Trade flows	-0.040*		0.028		-0.054	
	[0.074]		[0.116]		[0.138]	
Tariff reduction		-0.014*		0.005		-0.011
		[0.080]		[0.276]		[0.310]
Observations	35,116	35,116	35,203	35,203	30,158	30,158
Outcome mean	8.335	8.335	0.770	0.770	0.276	0.276
Regional Fixed Effects	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** p<0.01, ** p<0.05, * p<0.1

Notes: Columns (1-2): log of household income (winsorised); (3-4): unmet basic needs, where needs are type of dwelling, members per room, drinking water, waste disposal, education and subsistence capacity (possible values are 0,1,2,... depending on the number of needs that are unmet); (5-6): asset ownership index obtained from pca on durable goods, household goods, vehicles, housing characteristics. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. In odd columns, regional trade exposure is a weighted average of the sum of regional imports from and exports to the US of all industries, where trade flows of a certain industry are apportioned to each region according to its share of national industry employment. In even columns, regional trade exposure is a weighted average of the percent tariff reduction in Honduras and the US of all industries, where tariff reduction of a certain industry is apportioned to each region according to its share of national industry employment. Weights only consider employment in traded production sectors.

Table E.12: The effect of trade on migration

	(1)
	Migrant
Tariff reduction (region of origin)	0.012 [0.442]
Observations	35,203
Outcome mean	0.047
Regional Fixed Effects	YES
Year Fixed Effects	YES
P-values from wild cluster bootstrapping in brackets	

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: The outcome is a dummy variable for being a migrant household. A household is defined as migrant if five years ago the household head lived in a different region than they live now. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. Regional trade exposure is a weighted average of the percent tariff reduction in Honduras and the US of all industries, where tariff reduction of a certain industry is apportioned to each region according to its share of national industry employment. Every household is assigned to the region where the head lived five years ago.

Table E.13: Sector reallocation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Agriculture	Commerce	Construction	Finance	Manufacturing	Services	Transport
Tariff reduction	0.005 [0.196]	-0.002 [0.886]	-0.000 [0.936]	0.002*** [0.000]	0.000 [0.808]	0.000 [0.912]	0.001 [0.158]
Observations	86,608	86,608	86,608	86,608	86,608	86,608	86,608
Outcome mean	0.203	0.151	0.044	0.027	0.11	0.108	0.028
Regional Fixed Effects	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** p<0.01, ** p<0.05, * p<0.1

Notes: The outcome is a dummy variable for whether an individual is employed in the sector reported in each column. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. The analysis is performed on individuals aged 15 or older. Regional trade exposure is a weighted average of the percent tariff reduction in Honduras and the US of all industries, where tariff reduction of a certain industry is apportioned to each region according to its share of national industry employment.

Table E.14: The effect of trade openness on wages

	(1)
	Daily wage (log)
Tariff reduction	-0.022** [0.022]
Observations	29,304
Outcome mean	4.612
Regional Fixed Effects	YES
Year Fixed Effects	YES
P-values from wild cluster bootstrapping in brackets	

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: The outcome is the log of daily wage (winsorised) received by public, private, or domestic employees. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. The analysis is performed on individuals aged 15 or older. Regional trade exposure is a weighted average of the percent tariff reduction in Honduras and the US of all industries, where tariff reduction of a certain industry is apportioned to each region according to its share of national industry employment.

Table E.15: Evidence on sectoral wage changes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Agriculture	Commerce	Construction	Finance	Manufacturing	Services	Transport
Tariff reduction	-0.023*	0.001	-0.007	0.023	-0.027**	-0.015	-0.001
	[0.052]	[0.994]	[0.732]	[0.278]	[0.046]	[0.180]	[0.996]
Observations	5,853	4,487	2,416	1,747	5,786	7,418	1,207
Outcome mean	4.054	4.653	4.674	4.93	4.785	4.723	4.934
Regional Fixed Effects	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** p<0.01, ** p<0.05, * p<0.1

Notes: The outcome is log-(winsorised) wage received by workers employed in the sector reported in each column. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. The analysis is performed on individuals aged 15 or older. Regional trade exposure is a weighted average of the percent tariff reduction in Honduras and the US of all industries, where tariff reduction of a certain industry is apportioned to each region according to its share of national industry employment.

Table E.16: The effect of trade openness on unemployment

	(1)	(2)	(3)
	Unemployed	Unemployed #2	Unemployed #3
Tariff reduction	-0.006*** [0.002]	-0.006* [0.070]	-0.002 [0.516]
Observations	86,626	86,626	86,626
Outcome mean	0.028	0.323	0.377
Regional Fixed Effects	YES	YES	YES
Year Fixed Effects	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: Column (1): individuals are considered unemployed if they report not having a job but being actively looking for one, and being willing and able to work if offered employment; (2): individuals are considered unemployed if they report not having a job, whether or not they are actively looking for one, and not being in education or training; (3): individuals are considered unemployed as in Column 2, or if they define themselves as unpaid family workers. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. The analysis is performed on individuals aged 15 or older. Regional trade exposure is a weighted average of the percent tariff reduction in Honduras and the US of all industries, where tariff reduction of a certain industry is apportioned to each region according to its share of national industry employment.

Table E.17: Labour force participation

	(1)	(2)	(3)
	Inactive	Homemaker	Unpaid worker
Tariff reduction	0.002 [0.270]	-0.003 [0.366]	0.004 [0.182]
Observations	86,626	86,626	86,624
Outcome mean	0.019	0.277	0.054
Regional Fixed Effects	YES	YES	YES
Year Fixed Effects	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: Column (1): dummy variable for whether the individual is not engaged in employment, education, training, nor housework, and is not looking for a job; (2): dummy variable for whether the individual is not looking for a job because of being engaged in housework; (3): dummy variable for whether the individual is engaged in unpaid family work. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. The analysis is performed on individuals aged 15 or older. Regional trade exposure is a weighted average of the percent tariff reduction in Honduras and the US of all industries, where tariff reduction of a certain industry is apportioned to each region according to its share of national industry employment.

Table E.18: Category of occupation

	(1)	(2)	(3)
	Self-employed	Public employee	Private employee
Tariff reduction	0.006 [0.116]	0.001 [0.124]	-0.005 [0.228]
Observations	86,624	86,624	86,624
Outcome mean	0.278	0.048	0.276
Regional Fixed Effects	YES	YES	YES
Year Fixed Effects	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: Column (1): dummy variable for whether the individual is self-employed; (2): dummy variable for whether the individual is a public employee; (3): dummy variable for whether the individual is a private employee. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. The analysis is performed on individuals aged 15 or older. Regional trade exposure is a weighted average of the percent tariff reduction in Honduras and the US of all industries, where tariff reduction of a certain industry is apportioned to each region according to its share of national industry employment.

Table E.19: The effect of trade openness on low-skilled workers

	(1)	(2)	(3)	(4)
	Daily wage (log)	Unemployed	Unemployed #2	Unemployed #3
Tariff reduction×Low-skill	0.020*** [0.000]	0.002** [0.028]	-0.002 [0.324]	-0.003* [0.074]
Tariff reduction	-0.038*** [0.006]	-0.006*** [0.006]	-0.005 [0.128]	-0.001 [0.816]
Low-skill	-0.622*** [0.002]	-0.023*** [0.002]	0.077*** [0.000]	0.089*** [0.000]
Observations	26,185	80,919	80,919	80,919
Outcome mean	4.597	0.026	0.33	0.382
Regional Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** p<0.01, ** p<0.05, * p<0.1

Notes: Column (1): log of daily wage (winsorised) received by public, private, or domestic employees; (2): individuals are considered unemployed if they report not having a job but being actively looking for one, and being willing and able to work if offered employment; (3): individuals are considered unemployed if they report not having a job, whether or not they are actively looking for one, and not being in education or training; (4): individuals are considered unemployed as in Column 3, or if they define themselves as unpaid family workers. The outcome is regressed on a measure of regional trade exposure per worker, an indicator for low skills, year and regional fixed effects, and an interaction between regional trade exposure and low skills. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. The analysis is performed on individuals aged 15 or older. Low skills are defined as education level not higher than complete primary education. Regional trade exposure is a weighted average of the percent tariff reduction in Honduras and the US of all industries, where tariff reduction of a certain industry is apportioned to each region according to its share of national industry employment.

Table E.20: The effect of imports and exports on wages

	(1)	(2)
	Daily wage (log)	Daily wage (log)
<i>Panel A</i>		
Imports	-0.078** [0.036]	
Tariff reduction, Honduras		-0.057** [0.028]
<i>Panel B</i>		
Exports	-0.275* [0.076]	
Tariff reduction, US		-0.036** [0.020]
Observations	29,304	29,304
Outcome mean	4.612	4.612
Regional Fixed Effects	YES	YES
Year Fixed Effects	YES	YES

P-values from wild cluster bootstrapping in brackets

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: The outcome is the log of daily wage (winsorised) received by public, private, or domestic employees. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. The analysis is performed on individuals aged 15 or older. In Column 1, Panel A (B), regional trade openness exposure is a weighted average of regional imports from (exports to) the US of all industries, where trade flows of a certain industry are apportioned to each region according to its share of national industry employment. In Column 2, Panel A (B), trade exposure is a weighted average of the percent tariff reduction in Honduras (the US) of all industries, where tariff reduction of a certain industry is apportioned to each region according to its share of national industry employment.

Table E.21: The effect of imports and exports on unemployment

	(1)	(2)	(3)	(4)	(5)	(6)
	Unemployed	Unemployed	Unemployed #2	Unemployed #2	Unemployed #3	Unemployed #3
<i>Panel A</i>						
Imports	-0.022*** [0.002]		-0.018 [0.164]		-0.002 [0.862]	
Tariff reduction, Honduras		-0.013*** [0.004]		-0.015* [0.060]		-0.005 [0.574]
<i>Panel B</i>						
Exports	-0.061 [0.254]		-0.077** [0.040]		-0.046 [0.202]	
Tariff reduction, US		-0.009*** [0.002]		-0.010** [0.046]		-0.004 [0.538]
Observations	86,626	86,626	86,626	86,626	86,626	86,626
Outcome mean	0.028	0.028	0.323	0.323	0.377	0.377
Regional Fixed Effects	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** p<0.01, ** p<0.05, * p<0.1

Notes: Columns (1-2): individuals are considered unemployed if they report not having a job but being actively looking for one, and being willing and able to work if offered employment; (3-4): individuals are considered unemployed if they report not having a job, whether or not they are actively looking for one, and not being in education or training; (5-6): individuals are considered unemployed as in Columns 3-4, or if they define themselves as unpaid family workers. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. The analysis is performed on individuals aged 15 or older. In odd columns, Panel A (B), regional trade openness exposure is a weighted average of regional imports from (exports to) the US of all industries, where trade flows of a certain industry are apportioned to each region according to its share of national industry employment. In even columns, Panel A (B), trade exposure is a weighted average of the percent tariff reduction in Honduras (the US) of all industries, where tariff reduction of a certain industry is apportioned to each region according to its share of national industry employment.

Table E.22: The effect of trade openness on wages

Non-migrant households

	(1)	(2)
	Daily wage (log)	Daily wage (log)
Trade flows	-0.082** [0.038]	
Tariff reduction		-0.024** [0.014]
Observations	27,723	27,723
Outcome mean	4.613	4.613
Regional Fixed Effects	YES	YES
Year Fixed Effects	YES	YES

P-values from wild cluster bootstrapping in brackets

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: The outcome is the log of daily wage (winsorised) received by public, private, or domestic employees. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. The analysis is performed on individuals aged 15 or older. In Column 1, regional trade exposure is a weighted average of the sum of regional imports from and exports to the US of all industries, where trade flows of a certain industry are apportioned to each region according to its share of national industry employment. In Column 2, regional trade exposure is a weighted average of the percent tariff reduction in Honduras and the US of all industries, where tariff reduction of a certain industry is apportioned to each region according to its share of national industry employment. The analysis is restricted to non-migrant households. A household is defined as non-migrant if five years ago the household head lived in the same region as they live now.

Table E.23: The effect of trade openness on unemployment

Non-migrant households

	(1)	(2)	(3)	(4)	(5)	(6)
	Unemployed	Unemployed	Unemployed #2	Unemployed #2	Unemployed #3	Unemployed #3
Trade flows	-0.022*** [0.006]		-0.018 [0.146]		-0.004 [0.775]	
Tariff reduction		-0.006*** [0.002]		-0.006* [0.056]		-0.002 [0.564]
Observations	82,898	82,898	82,898	82,898	82,898	82,898
Outcome mean	0.028	0.028	0.324	0.324	0.378	0.378
Regional Fixed Effects	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** p<0.01, ** p<0.05, * p<0.1

Notes: Columns (1-2): individuals are considered unemployed if they report not having a job but being actively looking for one, and being willing and able to work if offered employment; (3-4): individuals are considered unemployed if they report not having a job, whether or not they are actively looking for one, and not being in education or training; (5-6): individuals are considered unemployed as in Columns 3-4, or if they define themselves as unpaid family workers. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. The analysis is performed on individuals aged 15 or older. In odd columns, regional trade exposure is a weighted average of the sum of regional imports from and exports to the US of all industries, where trade flows of a certain industry are apportioned to each region according to its share of national industry employment. In even columns, regional trade exposure is a weighted average of the percent tariff reduction in Honduras and the US of all industries, where tariff reduction of a certain industry is apportioned to each region according to its share of national industry employment. The analysis is restricted to non-migrant households. A household is defined as non-migrant if five years ago the household head lived in the same region as they live now.

Table E.24: The effect of trade openness on wages

ITT analysis

	(1)	(2)
	Daily wage (log)	Daily wage (log)
Trade flows (region of origin)	-0.077** [0.038]	
Tariff reduction (region of origin)		-0.023** [0.040]
Observations	29,304	29,304
Outcome mean	4.612	4.612
Regional Fixed Effects	YES	YES
Year Fixed Effects	YES	YES

P-values from wild cluster bootstrapping in brackets

*** p<0.01, ** p<0.05, * p<0.1

Notes: The outcome is the log of daily wage (winsorised) received by public, private, or domestic employees. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. The analysis is performed on individuals aged 15 or older. In Column 1, regional trade exposure is a weighted average of the sum of regional imports from and exports to the US of all industries, where trade flows of a certain industry are apportioned to each region according to its share of national industry employment. In Column 2, regional trade exposure is a weighted average of the percent tariff reduction in Honduras and the US of all industries, where tariff reduction of a certain industry is apportioned to each region according to its share of national industry employment. Every household is assigned to the region where the head lived five years ago.

Table E.25: The effect of trade openness on unemployment

ITT analysis

	(1)	(2)	(3)	(4)	(5)	(6)
	Unemployed	Unemployed	Unemployed #2	Unemployed #2	Unemployed #3	Unemployed #3
Trade flows (region of origin)	-0.020*** [0.004]		-0.018 [0.138]		-0.005 [0.680]	
Tariff reduction (region of origin)		-0.005*** [0.004]		-0.006* [0.058]		-0.002 [0.592]
Observations	86,626	86,626	86,626	86,626	86,626	86,626
Outcome mean	0.028	0.028	0.323	0.323	0.377	0.377
Regional Fixed Effects	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES

P-values from wild cluster bootstrapping in brackets

*** p<0.01, ** p<0.05, * p<0.1

Notes: Columns (1-2): individuals are considered unemployed if they report not having a job but being actively looking for one, and being willing and able to work if offered employment; (3-4): individuals are considered unemployed if they report not having a job, whether or not they are actively looking for one, and not being in education or training; (5-6): individuals are considered unemployed as in Columns 3-4, or if they define themselves as unpaid family workers. The outcome is regressed on a measure of regional trade exposure per worker, year and regional fixed effects. P-values are obtained by wild cluster bootstrapping of the t-statistic, with clusters at the regional level. The analysis is performed on individuals aged 15 or older. In odd columns, regional trade exposure is a weighted average of the sum of regional imports from and exports to the US of all industries, where trade flows of a certain industry are apportioned to each region according to its share of national industry employment. In even columns, regional trade exposure is a weighted average of the percent tariff reduction in Honduras and the US of all industries, where tariff reduction of a certain industry is apportioned to each region according to its share of national industry employment. Every household is assigned to the region where the head lived five years ago.

2.F Sectors of occupation

Table F.26: Sector of occupation by category of employment

	Self-employed			Public employee			Private employee		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	2003	2005	2007	2003	2005	2007	2003	2005	2007
Agriculture	0.420	0.461	0.398	0.000	0.001	0.000	0.305	0.289	0.278
Commerce	0.280	0.273	0.285	0.000	0.006	0.000	0.168	0.192	0.175
Construction	0.041	0.046	0.054	0.000	0.008	0.003	0.083	0.086	0.114
Finance	0.016	0.018	0.018	0.000	0.016	0.015	0.066	0.060	0.067
Manufacturing	0.136	0.117	0.126	0.000	0.005	0.003	0.243	0.240	0.232
Services	0.069	0.046	0.071	1.000	0.881	0.902	0.074	0.081	0.082
Transport	0.035	0.038	0.045	0.000	0.045	0.038	0.047	0.041	0.043
Other	0.003	0.002	0.004	0.000	0.038	0.040	0.014	0.010	0.009
Observations	5108	4471	14535	790	794	2588	4813	4991	14083
<i>HH income</i>									
Δ Self-employed – Public employee (HNL)				-5396***	-6218***	-6735***			
Δ Self-employed – Private employee (HNL)							-410***	-956***	-1543***

*** p<0.01, ** p<0.05, * p<0.1

Notes: The upper panel of the Table reports the distribution of workers across sectors of occupation by category of employment and year. “Other” is a residual category including Electricity, Mining, and other unspecified sectors. The lower panel reports the difference in average (winsorised) household income, measured in Honduran Lempiras, between self-employed workers and public and private employees for each year. The analysis is performed on individuals aged 15 or older.

CHAPTER 3

REMITTANCES AND FINANCIAL DEVELOPMENT: EVIDENCE FROM ITALY DURING THE AGE OF MASS MIGRATION

with Matteo Gomellini (Bank of Italy) and Francesco Vercelli (Bank of Italy)

3.1 Introduction

In the last twenty-five years, the stock of international migrants has increased by almost two thirds worldwide (International Monetary Fund, 2016): internationally remitted earnings, as a result, now outpace all other capital flows to poor and middle-income countries (World Bank, 2009), and have been widely shown to boost economic growth, poverty reduction, and improved household living standards (see e.g. Acosta et al., 2007; Adams & Page, 2005; Giuliano & Ruiz-Arranz, 2009; Yang, 2011). A relatively less investigated question (Aggarwal et al., 2011; Demirguc-Kunt et al., 2011) is whether and how remittances contribute to growth by affecting the pace of financial development in the source countries.¹

In this chapter, we study the effect of remittances on financial deepening in Italian provinces during the so-called “age of mass migration”, between the last decade of the Nineteenth century and the first of the Twentieth. Focussing on Italy during those years provides useful insights for the understanding of present-day patterns in low- and middle-income countries. As with many “emerging economies” of the time, Italy started building its financial sector from levels not dissimilar to current developing economies (Esteves & Khoudour-Castéras, 2011).² In that period, moreover, nearly 2 percent of the Italian population left the country

We would like to thank Rui Esteves, James Fenske, Douglas Gollin, Matthias Morys, Ferdinand Rauch, Paolo Tedeschi, Gianni Toniolo, Giovanni Vecchi, Peter Zeitz, and participants in the 2016 annual meeting of the European Association for Banking and Financial History in Vienna, in the XVII World Economic History Congress in Kyoto, and in seminars at the Bank of Italy.

¹Cf. Demirguc-Kunt & Maksimovic (1998); Jayaratne & Strahan (1996); King & Levine (1993); Rajan & Zingales (1998) for empirical tests of the link between financial development and growth.

²Esteves & Khoudour-Castéras (2011) report that, for their sample of Nineteenth-century emerging economies,

every year, searching for better earnings prospects elsewhere around the globe. Migrants also used to keep close ties with their families in the homeland, sending them such large remittances as to account for more than 5 percent of Italian GDP in certain years. These intense remittance flows played a crucial role in promoting macroeconomic stability and better living standards for poorer households – which prompted many commentators to draw the analogy with a “fantastic rain of gold” for the country (Massullo, 2001). Despite the higher barriers to movement faced by today’s migrants (cf. Esteves & Khoudour-Castéras, 2011), many close analogies can thus be drawn between the dynamics related to the Italian diaspora of the time and the emigration wave that the developing world has been experiencing in recent decades.

Like a number of existing papers on the subject (see e.g. Aggarwal et al., 2011; Demirgüç-Kunt et al., 2011; Esteves & Khoudour-Castéras, 2011), we proxy financial deepening by the aggregate level of deposits intermediated by the local banking sector. We exploit finely disaggregated data on bank balance sheets available from a dataset recently released by the Bank of Italy, which we complement with information on other types of financial intermediaries active in the deposit business at the time. As for our measure of remittances, we weight historical series at the national level by the earnings of potential remitters migrated from each Italian province anywhere in the world. These are in turn proxied by the average wage paid in receiving countries, weighted by the estimated province-level stock of migrants to each destination. To account for the potential endogeneity of migration and remitting decisions to the level of financial development at origin (the more advanced the financial system, the easier to transfer money from abroad), our preferred specification is instrumental-variables regression with fixed effects. We instrument our measure of provincial remittances for each year with an index that weights the remittance flows at the national level by the time-invariant provincial number of migrants before our period of analysis.

We find that remittances strongly contributed to the acceleration of financial deepening in Italy during the age of mass migration, and document a high elasticity between the two dimensions: based on our preferred results, a one percent increase in the flow of remittances induced a 0.4 percent increase in the five-year change in bank deposits. Disaggregating the analysis by type of financial institution, the effect is strongest for postal savings banks and commer-

the average ratio of total deposits on GDP is 30.9 percent, with a maximum level of 115.9 percent and a minimum of 0.5 percent. In Aggarwal et al. (2011)’s study on developing countries in 1975-2003, the corresponding figures are very similar: 29.2 percent average, 161.4 percent maximum, and 1.7 percent minimum.

cial banks, which crucially were the financial intermediaries with respectively the highest and lowest deposit-collection ability at baseline. To shed light on the most likely channels through which our results might have operated, we show that (i) remittances did not induce a change in the average interest rate offered on deposits; (ii) they boosted provincial GDP; and (iii) they contributed to increasing the density of financial institutions in the territory. Overall, we interpret these findings as evidence that (i) the average quality of the services offered by financial institutions was not significantly affected by remittance flows; but rather (ii) remittances relaxed household budget and investment constraints; and (iii) they favoured the rise of a more diffuse financial culture throughout the country.

The rest of the chapter is organised as follows: Section 3.2 summarises the literature on remittances, financial deepening, and post-Unification Italy, and highlights the original contribution of our study to each strand of research; Section 3.3 summarises the main facts of the age of mass migration and the most salient characteristics of financial institutions in Italy in our period of interest; Sections 3.4 and 3.5 respectively describe our empirical strategy and the data used for the analysis; Section 3.6 presents our main results along with some robustness checks, while Section 3.7 explores the mechanisms behind them; finally, Section 3.8 concludes.

3.2 Literature

Our paper contributes to the literature on the development effect of remittances in emerging economies. Existing research has shown that remittances may prove an effective tool for the reduction of poverty³ and inequality,⁴ and that their contribution to growth is non-negligible.⁵ Various authors have also documented positive impacts of remittance flows on more specific dimensions such as education,⁶ health,⁷ and micro-entrepreneurship.⁸

The question whether remittances have an effect on financial inclusion and financial de-

³See Acosta et al. (2007); Adams (2004, 2006); Adams & Page (2005); Anyanwu & Erhijakpor (2010); Imai et al. (2014); Martínez Alvear & Yang (2007); Taylor et al. (2005).

⁴Cf. Adams (1992); McKenzie & Rapoport (2007); Taylor & Wyatt (1996).

⁵Cáceres & Saca (2006); Giuliano & Ruiz-Arranz (2009); Imai et al. (2014); Mundaca (2009).

⁶Acosta et al. (2007); Adams & Cuecuecha (2010); Amuedo-Dorantes & Pozo (2011); Bredl (2011); Calero et al. (2009); Cox-Edwards & Ureta (2003); López-Córdova et al. (2005); Yang (2008).

⁷Amuedo-Dorantes et al. (2007); Antón (2010); Hildebrandt & McKenzie (2005); Kanaiaupuni & Donato (1999); López-Córdova et al. (2005).

⁸Dustmann & Kirchkamp (2002); Massey & Parrado (1998); Mesnard (2004); Woodruff (2007); Woodruff & Zenteno (2007); Yang (2006).

velopment had instead been relatively neglected until fairly recently, and research along these lines has only lately started to take off. A number of recent studies provide empirical evidence on the positive relationship between remittances and financial deepening, relying on both cross-country analyses (Aggarwal et al., 2011; Cooray, 2012; Esteves & Khoudour-Castéras, 2011; Inoue & Hamori, 2016; Williams, 2016) and case-studies in specific developing countries (Ambrosius, 2011; Anzoategui et al., 2014; Chowdhury, 2011; Demirguc-Kunt et al., 2011; Gupta et al., 2009; Martínez Pería et al., 2008; Sami, 2013).

The claim is usually that remittances should induce a higher demand for bank services in a variety of ways, for example if, trivially, they are transmitted through bank transfers. At the same time, being typically lumpy and generally consisting of non-negligible amounts of money, remittances may exceed the immediate consumption needs of recipients, therefore spurring demand for financial services like safe storage in bank deposits or savings accounts. Eventually, the increase in demand for financial services may also prompt financial intermediaries to open more branches in migration-intensive areas, or enable them to improve their service offer. According to the “induced financial literacy” hypothesis (Brown & Fayad, 2013), moreover, receiving remittances through banks or other financial intermediaries also makes it possible for otherwise isolated or unbanked potential customers to get in touch with financial institutions. In this way, their understanding of financial products and overall trust in the financial system should improve.

Other authors, however, have challenged this line of reasoning, and have provided evidence that remittances may relax the recipients’ consumption and investment constraints to the point of substituting for the domestic financial sector (Ambrosius & Cuecuecha, 2013; Brown & Fayad, 2013; Giuliano & Ruiz-Arranz, 2009; Uddin & Sjö, 2013; Woodruff & Zenteno, 2007). Coulibaly (2015), on the other hand, finds no substantial evidence in support of any correlation between remittances and financial development whatsoever. The author argues that this may owe to a diffuse distrust in financial institutions, which means that recipients resort to different ways of saving. Alternatively, binding subsistence constraints might push recipients to consume whatever sums they receive through remittances.

We contribute to this literature documenting a positive and significant relationship between remittances and financial deepening in Italy between the end of the Nineteenth century and

the start of the Twentieth. Moreover, unlike much of the existing literature, we also try to pin down the set of mechanisms which may be driving the effect of remittances on financial development. To our knowledge, the only other papers attempting a formal assessment of the mechanisms behind the remittances-financial development link are two studies by Anzoategui et al. (2014) and Brown & Fayad (2013). The former posits that, by relaxing credit constraints, remittances might reduce the need for external financing by financial institutions, while at the same time increasing the demand for savings instruments. The latter instead finds no evidence in support of the “induced financial literacy” hypothesis. In this chapter, we try to identify whether the impact of remittances works by (i) raising demand through an increase in household incomes; (ii) establishing a higher density of financial institutions; or (iii) enabling a better quality of the services provided by financial intermediaries. We find evidence in favour of channels (i) and (ii): in Italy during our period of analysis, remittances favoured a higher overall economic activity and induced banks to open new branches in the provinces where they were operating. Both these mechanisms may have translated into a higher increase in the level of deposits held in financial institutions.

Given the above, this chapter also substantially contributes to the historical literature on the impact of remittances in Italy during the age of mass migration.

In terms of broad national outcomes, various authors (Borgatta, 1933; Massullo, 2001; Sori, 1979; Stringher, 1912) document how remittances directly fostered Italian economic well-being,⁹ and many studies (Del Boca & Venturini, 2003; De Rosa, 1980, 2000; Esteves & Khoudour-Castéras, 2009; Massullo, 2001) equally report how this contributed to finance the deficit in the Italian balance of payments, nearly closing the current account deficit in certain years.¹⁰

On a more micro level, a number of qualitative historical accounts (Drinkwater et al., 2007; Glytsos, 2005; Sori, 1979) point out that on average around 30 percent of remittances were invested in entrepreneurial activities,¹¹ while the rest was mainly devoted to other uses, like financing the construction of new family houses, debt repayment,¹² or an increase in savings.

⁹The most recent reconstructions estimate that the average share of remittances on total GDP was around 2.7 percent in 1876-1913, ranging from 0.3 to 5.8 per cent (Baffigi, 2013; Balletta, 1976; Borghese, 2011).

¹⁰Foerster (1919) even drew a link between remittances, Italy’s ability to convert its foreign debt in 1906, and the lira’s sustained appreciation before the Great War. Similarly, Foerster saw the lira’s weakness in subsequent years as a result of the decline in the “export of labour services” (on this point, cf. also Cesarano et al., 2012).

¹¹Along the same lines, Cerase (1967) shows that, in the South, 16 percent of returning migration was motivated by the purpose of investing in the area of origin.

¹²For instance, the Calabria region saw a sharp reduction in mortgage debt on peasant properties at the turn of

Relatedly, De Rosa (2000) also argues that, although not feeding back into productivity convergence between the North and the South of the country,¹³ remittances nonetheless contributed to smoothing regional disparities in living standards.

Finally, as regards the link from remittances to financial development, Gomellini et al. (2017) document that repatriated savings held in postal savings banks facilitated the diffusion of financial know-how.¹⁴ In general, however, non-qualitative research on these topics is quite scarce at best, and, especially for what concerns the impact of remittances on financial outcomes, the relationship is usually stated rather than empirically tested. To be sure, the study by Esteves & Khoudour-Castéras (2011), which confirms a positive effect of remittances on domestic financial development, is performed on a sample that also includes Italy before 1914. That we know, however, our study is the first empirical assessment of the impact of remittances on financial development which focusses specifically on Italy during the age of mass migration. Moreover, the nature of our data, featuring information on the more than 1,200 balance sheets per year from the universe of Italian banks in our period of interest, allows us to perform a detailed analysis at the provincial level and by type of financial intermediary, which we should be the first to have implemented.

3.3 The historical background: Italy in the Nineteenth-Twentieth centuries

3.3.1 Emigration and remittances

Between 1870 and 1915, in an almost unfettered migration wave (cf. Hatton & Williamson, 1998), more than 14 million men and women left Italy, in what has been described as the largest human outflow from any single country in recorded history (Choate, 2008). The gross emigration rate, which was about 4.2 migrants per thousand Italian residents in the 1870-80 decade, increased almost six-fold in this period, peaking at 24.1 per thousand in 1913, with an average of nearly 18 per thousand between 1900 and 1913 (cf. Appendix Table A.1).

the century (Massullo, 2001; Sori, 1979).

¹³Cinel (1991) also claims that remittances had at best a marginal impact on the modernisation of the Italian South.

¹⁴In Italy as a whole, the volume of deposits in post office savings accounts rose from 323 million liras in 1890 to over two billion liras in 1913, while the share of emigrants' savings rose from 0.03 percent to 4.4 percent (Esteves & Khoudour-Castéras, 2009; Gomellini & Ó Gráda, 2013).

In terms of regional composition, Gomellini et al. (2017) document how Italian emigration was initially concentrated in the North-West of the country, which in 1876 accounted for almost half of the total. Emigrants from the South and the islands of Sicily and Sardinia were on the contrary originally a tiny minority, representing a mere 5 percent of all Italian emigration. The pattern however gradually reversed with the passing of time, and at the beginning of the Twentieth century the share of emigration from North-Western regions had fallen to 13 percent, whereas Southerners and Islanders came to account for nearly 50 percent of all Italian emigration (see also Appendix Figure A.1).

The favourite destinations of Italian migrants were Argentina, Australia, Brazil, Canada, France, Germany, Switzerland, and the United States (cf. Appendix Figure A.1). The fall in emigration from Northern Italy at the end of the Nineteenth century coincided with a drop in emigration towards Europe, which was gradually substituted by transoceanic destinations (first Argentina and Brazil, later joined by the United States). The change was certainly facilitated by a vigorous transport revolution that made overseas trips safer and cheaper, but owed primarily to the composition of the migrant pool: by then, in fact, emigrants were predominantly poorer agricultural labourers from the South, who lacked the skills required by hiring firms in European countries (*Giunta parlamentare d'inchiesta sulle condizioni dei contadini nelle Province meridionali e nella Sicilia*, 1911).

In general, there were strong links between each sending region and the various receiving countries, which worked through the network channels that were created in any particular destination among those coming from the same area back home. For example, Gomellini et al. (2017) report that nearly two-fifths of pre-1914 migrants to Brazil, who overwhelmingly clustered in the South and South-East of the country, were from Venice or Lombardy, whereas those who settled in Argentina predominantly came from Liguria, Piedmont, and again Lombardy.

Despite the long distances travelled and the establishment of close-knit communities abroad, Italian migrants mostly maintained very close ties with their families in the motherland, and indeed for many of them migration was just a temporary episode, to be followed by a move back home after a few years. This in turn increased the likelihood that Italian migrants would remit some of their earnings to the home country.

It is estimated that the inflow of money from abroad was considerable in that period, proving as high as almost 500 million liras in 1911 (*Commissariato generale dell'emigrazione*, 1911). Of these, the vast majority was directed to low-income regions, especially those in Southern Italy: Massullo (2001) estimates that, over the sums remitted through the *Banco di Napoli*¹⁵ between 1905 and 1913, those aimed to the South amounted to 60.6 percent of the total, of which the three regions of Calabria, Campania, and Sicily alone accounted for nearly 40 percent.

Given the high numbers at stake, the need for the institutionalisation of remittance transfer services soon became a pressing political priority. Remittances were in fact initially sent through a variety of formal and especially informal channels, including by hiding money in letters sent by ordinary mail or in the pockets of so-called *rondinelle* (Italian for swallows), Italians who travelled seasonally across the Atlantic. Many emigrants also resorted to self-appointed *banchieri* ("bankers"), individuals who started their own bank firms in the destination countries and specialised in the remittance business demanding exorbitant fees for their services – and who were often involved in outright theft of their customers' money.¹⁶

In 1901, this uncontrolled situation, which exposed Italian migrants to systematic exploitation and hardship, eventually prompted the Italian Treasury Ministry to entrust the transfer of remittances to the *Banco di Napoli*, a more reliable centralised institution (De Rosa, 1980). The role of the *Banco di Napoli* in reducing the risk and cost of making transfers was notable: in its first year of operation it remitted 9.3 million liras, and by 1914 the amount had grown almost nine-fold, accounting for roughly 10 percent of total remittances (cf. Choate, 2008; Massullo, 2001; U.S. Congress, 1911).

3.3.2 Financial institutions

At the turn of the century, a broad range of financial institutions were allowed to collect deposits in Italy.

Historically, the most important collectors of fiduciary deposits were savings banks, whose stated mission had in fact originally been the promotion of saving (Polsi, 1996). Their distinctive feature was the guarantee of stability, which was achieved by avoiding risky investment,

¹⁵The financial institution in charge of managing the remittance transfers since 1901, see *infra*.

¹⁶In the US, the wrongdoings by these predatory *banchieri* was regularly highlighted in the press (see De Rosa, 2000).

and which allowed these banks to attract deposits despite not offering particularly high interest rates. The largest bank of this type was the *Cassa di Risparmio di Milano*, which operated in Lombardy and accounted for more than 15 percent of all Italian deposits. In general, savings banks were widespread in Northern and Central Italy, but were less common in the South.

Another category of major collectors of private deposits was represented by postal savings banks, which became even more popular during our period of analysis.¹⁷ These banks were instituted in 1875 in order to raise funds for local public investment, turning postal offices into branches of a state-owned bank (*Cassa Depositi e Prestiti*). Postal offices were widespread all over the country, and were therefore within the reach of even poor, otherwise unbanked villages. This, together with a ceiling imposed by the law on the amount of money that could be held in postal accounts, made these banks particularly well-suited for the collection of savings from the poor (Conte, 2000).

A third family of financial intermediaries encompassed commercial joint-stock banks and cooperative banks. Despite the differences in their ownership structure, joint-stock banks and cooperative banks were the only institutional components of the financial sector that were not controlled by the government, as they were only subject to the requirements of the commercial legal code (Polsi, 1996). Deposits also accounted for around 50 percent of the liabilities of both types of institutions (Natoli et al., 2015). In terms of geographical location, cooperative banks were particularly present in the South, whereas joint-stock banks were almost equally split between Northern and Southern Italy (although in the latter they were concentrated in the regions of Campania, Puglia, and Sicily).

Finally, the Italian financial system was characterised by the presence of various banks of issue. Originally, there were as many as six banks of issue, which then were reduced to three (*Banca d'Italia*, *Banco di Napoli*, and *Banco di Sicilia*) after a severe financial crisis in 1893-94. In particular, the Bank of Italy merged three former banks of issue, and within a few years assumed the role of a proper central bank (Bonelli, 1991). Throughout our period of analysis, however, all banks of issue could collect deposits from private individuals, and could convert into notes the receipts given to depositors, which also circulated as a form of payment (Polsi, 1996). Even after the financial crisis, in 1895, fiduciary deposits accounted for nearly 10 percent

¹⁷Della Torre (2000) reports that postal accounts almost increased by a factor of six in just twenty years, skyrocketing from 310 million liras in 1890 to 1,743 million in 1910.

of the liabilities of banks of issue (*Servizio Ragioneria della Banca d'Italia*, 1993).

3.4 Empirical strategy

3.4.1 Estimating remittances

We build a measure of provincial remittances weighting the total amount of remittances sent to Italy by the earnings received abroad by migrants from each province. These, in turn, are estimated using geographical data on migration and average wages in destination countries (cf. Esteves & Khoudour-Castéras, 2011 and Morys, 2005 for similar approaches).

The Italian administrative system is constitutionally organised in State, Regions, Provinces, and Municipalities (*Comuni*), so provinces are Italy's second-lowest administrative level. As such, accurate data at the provincial level for our period of analysis are quite scarce. In particular, we have provincial figures only for migration to macro-areas (Europe vs. non-Europe), whereas more detailed information on destination countries and migrants' socio-demographic characteristics is available only at the regional level. We therefore construct our estimate of the stock of migrants from each province to each destination country relying on a number of generalisations.

First, considering province i in region S_i and country u located in macro-area A_u (Europe or extra-Europe), we estimate the number of migrants from i to u using information obtained at the level of region S_i . In practice, we weight the total number of migrants from i to A_u by the share of migrants to u from S_i over total migration to A_u from S_i . Denoting migration by M , the stock of migrants from province i to country u at time t is then computed as

$$M_{iut} = M_{iA_u t} \times \frac{M_{S_i u t}}{M_{S_i A_u t}}. \quad (3.1)$$

In line with the observation (Esteves & Khoudour-Castéras, 2011) that only male migrants aged 15-44 sent remittances, we also restrict the pool of potential remitters to men in that age range. To do so, we weight the provincial migrant stock in Equation (3.1) by the regional share of male migrants between 15 and 44 years old. Denoting the migrant men in those ages by $\tilde{M}$, we therefore compute male, remitting-age migration to country u from province i at time t as

$$\tilde{M}_{iut} = M_{iut} \times \frac{\tilde{M}_{S_it}}{M_{S_it}} \quad (3.2)$$

Finally, we note that Italian migrants usually stopped sending remittances around five years after migrating, when they either went back to Italy or they settled with their family in the new country. They were also unlikely to send remittances during their first year abroad, as they usually needed an adjustment period to find employment and accumulate a sufficient amount of savings to send home (*Commissariato generale dell'emigrazione*, 1926). In each year t , we thus define as potential remitters only those who emigrated in the previous four years, assuming no return migration within those four years. As a result, our estimate of potential remitters to province i from destination country u in year t , P_{iut} , is:

$$P_{iut} = \sum_{k=t-4}^{t-1} \tilde{M}_{iuk} \quad (3.3)$$

Having obtained an estimate of the number of remitters to province i from destination u , we estimate their potential earnings Y using real wages w in the receiving country, assuming that Italians abroad earned the average wage:

$$Y_{iut} = w_{ut} \times P_{iut}. \quad (3.4)$$

Aggregating earnings from all destination countries, we then obtain a measure of the total earnings received abroad by potential remitters from each province:

$$Y_{it} = \sum_{u \in U} Y_{iut}, \quad (3.5)$$

where U is the set of all destination countries.

The last step in the construction of our remittance index consists in assuming that remittances are a constant fraction of migrants' income, irrespective of their province of origin. In this way, we can use the ratio between the potential earnings of remitters to each province and their sum at the national level to weight total Italian remittances R in each period:

$$R_{it} = R_t^{IT} \times \frac{Y_{it}}{\sum_{j \in I} Y_{jt}}, \quad (3.6)$$

where IT refers to the national aggregate and I is the set of all Italian provinces.

3.4.2 Identification

In our analysis, we estimate how the change in provincial-level bank deposits between two consecutive periods in our sample is affected by the total amount of remittances received, in the same time span, by households living in each province. We estimate the latter as the sum of provincial remittances computed as in (3.6) over the years between each sample period and the previous one. Given that our sample periods are five years apart (cf. Section 3.5 *infra*), the resulting measure is

$$\tilde{R}_{it} = \sum_{k=t-4}^t R_{ik}. \quad (3.7)$$

The choice of regressing a change on a level is justified by our interest in how the cumulative effect of the remittances received year after year by the emigrants' families affected the gradual expansion of the financial sector from one period to the next.

As a benchmark, we start by performing simple fixed effects regression at the provincial level. Denoting the five-year change in deposits by ΔD , our regression equation for province i in year t is therefore

$$\log \Delta D_{it} = \alpha + \beta \log \tilde{R}_{it} + \delta_t + \eta_i + \epsilon_{it}, \quad (3.8)$$

where δ_t and η_i are respectively the time and provincial fixed effects, and ϵ is a random error term. Since we select a functional form with both ΔD and $\tilde{R}$ in logarithms, β represents the elasticity of deposits to remittances.

Estimation of β , however, is very likely to be inconsistent due to reverse causality, as it may well be that it is financial development which spurs remittance inflows rather than vice-versa. This may be the case if for instance financial development lowered the cost of transmitting remittances, or mechanically as a larger percentage of total remittances could be measured when channelled through formal financial institutions. Esteves & Khoudour-Castéras (2011) also argue that before 1914 many specialised banks were created in Europe precisely to attract (or improve the efficiency of) money transfer, and that in this sense better domestic financial

institutions might have actually attracted more remittances.¹⁸

The fact that we consider deposits in differences rather than levels should in principle ease this concern – the likelihood of a greater *change* in deposits attracting more remittances seems at least disputable. On the other hand, it is also true that a higher growth in deposits might have signalled to migrants a rapidly expanding financial sector, making the operations of financial institutions more salient and in turn remittances even more appealing. Nevertheless, we proxy remittances by the potential earnings of provincial migrants abroad, which means that the only data used to build our estimates are the composition of the migrant pool, various wages in the destination countries, and the total of remittances sent to the entire peninsula in a given year: as such, reverse causality from banking development to potential remittances at the provincial level seems unlikely. For reverse causality to affect our results, it would have to be the case that our outcomes of interest affect the sorting of emigrants from province i into destination countries with different average wages. This appears to be more of a concern in our setting as, for instance, higher savings may allow migration to countries associated with both higher migration costs and higher average wages.

For this reason, we instrument our measure of remittances R in Equation (3.6) with a measure that weights Italian remittances by the composition of the migrant pool as of 1885, before the first year in our sample.¹⁹ Our measure of fixed-weights remittances is therefore computed as

$$R'_{it} = R_t^{IT} \times \frac{Y_{i1885}}{\sum_{j \in I} Y_{j1885}}, \quad (3.9)$$

which can then be aggregated over time to obtain our instrument²⁰

$$\tilde{R}'_{it} = \sum_{k=t-4}^t R'_{ik}. \quad (3.10)$$

¹⁸From an empirical perspective, Adenutsi (2011) and Motelle (2011) in fact show that financial development Granger-causes international migrant remittances in Sub-Saharan countries.

¹⁹This approach has been widely used in the literature and dates back to Bartik (1991), who builds a measure of local labour demand that is independent of local labour supply, thanks to a weighting scheme based on fixed local industry employment shares.

²⁰By the way R'_{it} is constructed, we need to substitute province fixed effects with region fixed effects when running IV regression.

3.5 Data sources

We retrieve most of our data on bank deposits from ASCI (*Archivio Storico del Credito in Italia*), a dataset recently released by the Bank of Italy. ASCI collects the balance sheets of Italian banks over a period spanning from 1890 to 1973, for a total of more than 40,000 balance sheets. Crucially, the dataset includes the entire universe of Italian banks for the years 1890, 1895, 1900, 1905, and 1910 – the period relevant for our analysis.

ASCI provides a unique harmonised accounting scheme with 14 variables for the assets side, and 9 for the liabilities side: among these, we focus on the fiduciary deposits variable.²¹ Since most banks operated locally at the time (many were single-branch), we assign each bank to the province where the municipality of its legal headquarters is located. Upon further investigation, this turns out to be a sensible approach even for the twenty largest banks in terms of deposits, as many of them were active within a single province, despite their large size (Pinardi, 1907).²² However, we obtain information on the distribution of deposits for a number of banks²³ that operated in more than one province, by retrieving archive data from those banks themselves.

ASCI features data on joint-stock banks, cooperative banks, savings banks, and pledge banks, but not on other types of financial institutions:²⁴ to draw a more representative picture of the entire Italian financial sector in our period of analysis, therefore, we complement ASCI data with information from a number of additional sources. In particular, we are able to reconstruct the amount of deposits held in postal savings banks and banks of issue. Data on the provincial distribution of postal accounts is reported in the statistical report on postal and telegraph services and on postal savings banks for 1890-1910 (*Ministero delle Poste e dei Telegrafi*, 1910), whereas national-level information on the fiduciary deposits held in banks of issue can be found in *Servizio Ragioneria della Banca d'Italia* (1993). Since many banks of issue had branches in several provinces, however,²⁵ we also collect data on the geographical distribution of their deposits from the archive of the Bank of Italy²⁶ and the documentation provided for

²¹voce3200 in the dataset.

²²As the only source on bank branches we found relates to 1907 (Pinardi, 1907), the analysis ignores the possibility that some banks might have opened branches between 1908 and 1910.

²³*Cassa di Risparmio di Milano* (then *Cassa di Risparmio delle Province Lombarde*), *Banca Commerciale Italiana in Milano*, *Monte dei Paschi di Siena*, *Cassa di risparmio di Palermo Vittorio Emanuele*.

²⁴Specifically, it excludes banking firms, postal savings banks, banks of issue, and mutual cooperative banks.

²⁵In fact, the Bank of Italy had at least one branch in each province.

²⁶Information on *Banca d'Italia* and *Banca Nazionale Toscana*.

the annual meetings of some of these banks.²⁷

Information on average interest rates by province is collected from an electronic database of the Bank of Italy, based on *Bollettino Ufficiale delle Società per Azioni* and on *Bollettino delle casse di risparmio ordinarie*. The database reports, for most financial institutions featuring in the ASCI dataset between 1890 and 1910, the interest rate on deposits officially declared by the banks themselves. This information is however not available for banks of issue nor for postal savings banks.

Data on remittances at the national level come from the Italian Statistical Institute (Istat, 1957). Istat (1957) uses official data on remittances, based on income received by Italians temporarily abroad and money sent to Italy from emigrants who settled abroad.

We obtain data on migration from the yearly report on Italian emigration for 1876-1925 (*Commissariato generale dell'emigrazione*, 1926), which reports for each province the stock of migrants who left Italy in those years, distinguishing between European and non-European destinations. It also provides, at the regional level, a disaggregation of migrants by age and gender, as well as detailed information on individual destination countries.

To estimate the potential earnings of remitters, we use the comparable series of real wages that Williamson (1995) computes across several countries since 1830.

Finally, we retrieve provincial GDP from *Istituto G. Tagliacarne* (2011). Given that data are only available for 1881, 1901, and 1911, we estimate the remaining figures applying the growth rates followed by national value added in the same years (retrieved from Baffigi, 2013). More details about the precise interpolation process are reported in Appendix Section 3.B.

3.5.1 Descriptive statistics

We have complete data for 69 Italian provinces for the years 1895, 1900, 1905, and 1910. Descriptive statistics are reported in Table 3.1.

Our main outcome variables are the five-year changes in deposits of financial institutions, aggregated in various ways. Looking at the time trend in these variables, it can be noticed that deposits increased substantially over time, with a boom between 1900 and 1905. Only banks of issue experienced a decrease in private deposits, but this can be easily explained by the fact that, after the crisis that struck the Italian economy at the beginning of the 1890s, the number

²⁷ *Banco di Napoli* and *Banco di Sicilia*.

of issuing banks was halved from six to three. Apart from issuing banks, however, all the remaining series display an inflection point between 1900 and 1905, with deposits increasing by more than 50 percent (in certain cases even more than tripling).

The trend followed by deposits seems to parallel the one for the flow of remittances, which increases modestly from 1890 to 1900 and then more than doubles between 1900 and 1905.

Interestingly enough, a similar pattern is also shared by GDP and by its five-year growth rate. These common trends are precisely the dynamics that motivate our paper.

The average interest rate paid on deposits gradually decreases over time. This last observation could suggest an increase in the degree of competition within the banking sector, which is partly reflected by a modest increase in the number of banks over time. As a benchmark, we also compute and report the value of the Boone index, which proxies the extent of competition in a productive sector by the elasticity of profits with respect to marginal costs. The rationale behind the index is that higher profits are achieved by more efficient banks: hence, the more negative the index, the higher the degree of competition, because the effect of market-share reallocations is stronger (cf. Boone et al., 2013 for details). Looking at Table 3.1, the Boone index does indeed drop between 1900 and 1910, but the fact that its 1910 value is only equal to the 1895 level calls for caution in over-stretching interpretations.

Turning to the extent of Italian migration over time, Figure 3.1 shows the provincial distribution of the stock of migrants (computed as in Section 3.4.1) in 1890, 1900, and 1910. As expected, overall migration substantially increases in the entire peninsula. Provinces in the North-East of the country display the highest levels of migration in all three years, while migration from Sardinia and Central Italy (most notably the Tuscany region) booms later in 1910.

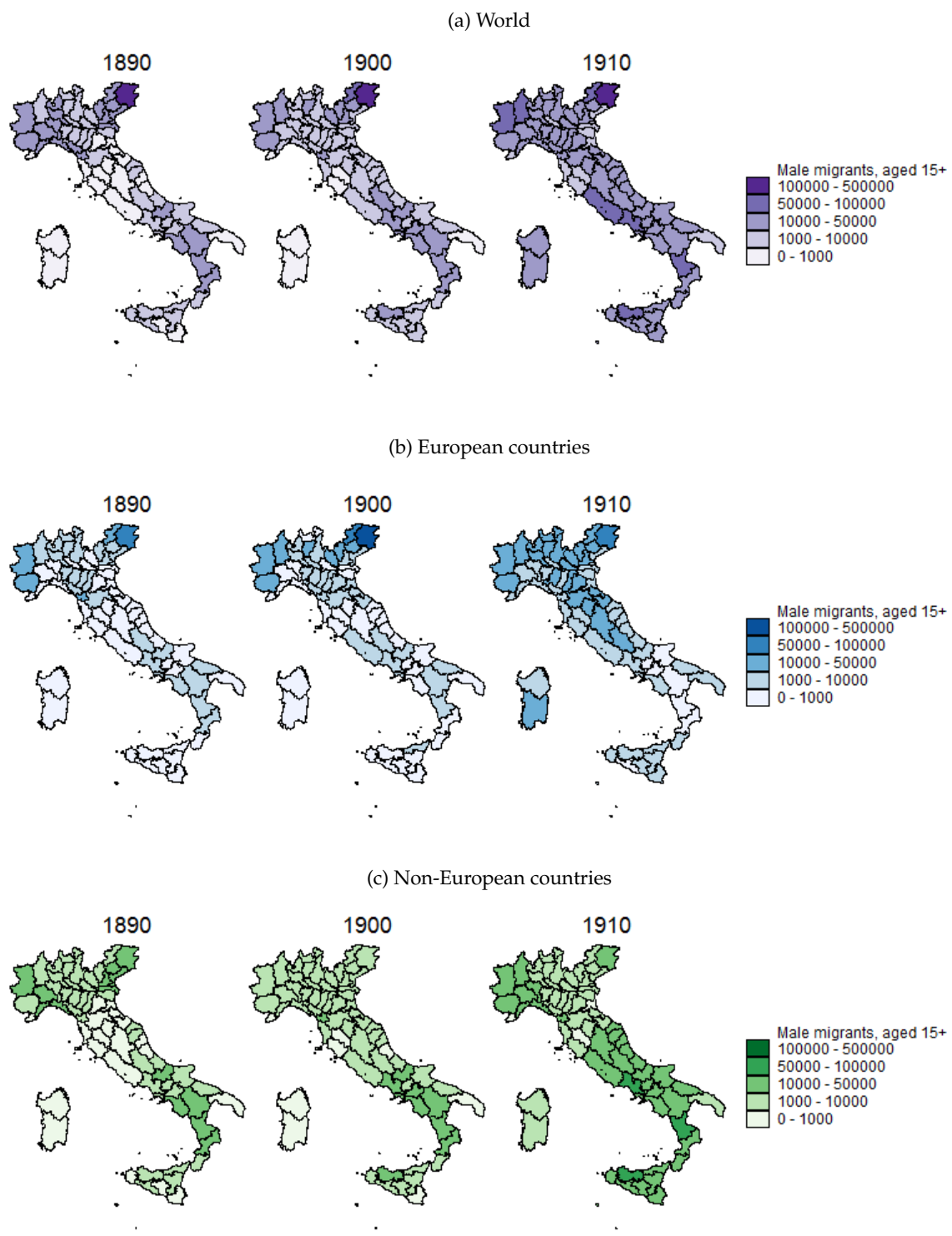
Looking more closely at the macro-destinations of migrants, the data reflect the patterns described in Section 3.3.1, with Northern Italy sending migrants prevalently to European countries and Southern Italian migrants being more concentrated in non-European ones.

Table 3.1: Descriptive statistics

	(1)	(2)	(3)	(4)
	1895	1900	1905	1910
	mean/sd	mean/sd	mean/sd	mean/sd
Change in deposits (5 years, 1,000,000 liras):				
All financial institutions	3.79 (8.40)	4.78 (11.77)	17.61 (29.78)	26.65 (35.02)
Postal savings banks	2.19 (3.21)	3.15 (4.58)	5.58 (15.87)	6.11 (17.44)
Banks of issue	-0.77 (4.14)	-1.02 (3.20)	-0.41 (1.86)	-0.00 (1.44)
Savings banks	2.67 (7.89)	3.45 (8.74)	6.78 (10.41)	10.93 (17.01)
Commercial and cooperative banks	-0.40 (7.63)	-0.21 (9.24)	6.74 (15.38)	11.28 (22.32)
Remittance flow (5 years, 1,000,000 liras)	12.65 (20.50)	16.88 (26.70)	37.16 (38.92)	45.92 (32.69)
GDP (1,000,000 liras)	189.81 (126.79)	205.45 (140.61)	247.29 (177.97)	304.68 (232.20)
Growth rate of GDP (5 years, %)	1.45 (0.45)	1.51 (0.45)	3.55 (0.61)	3.97 (0.73)
Interest rate (%)	3.89 (0.38)	3.70 (0.39)	3.55 (0.44)	3.39 (0.28)
Number of banks	18.54 (11.68)	19.00 (11.78)	19.49 (11.42)	19.78 (11.14)
Boone index	-0.28 (0.19)	-0.11 (0.22)	-0.20 (0.33)	-0.28 (0.17)
Population (1,000)	450.74 (254.06)	470.66 (271.96)	481.86 (283.75)	500.69 (303.84)
Observations	69	69	69	69

Notes: The unit of observation is the Province. Remittance flows are the sum of remittances sent to each province in each five-year span. The Boone index proxies the extent of competition in a productive sector by the elasticity of profits with respect to marginal costs: the more negative the index, the higher the degree of competition.

Figure 3.1: Stock of potential remitters



Notes: Historical borders. The stock of potential remitters is built as an estimate of the number of male migrants aged 15-44 who migrated to each destination in the last four years.

Data sources: Commissariato generale dell'emigrazione (1926).

3.6 Results

Table 3.2 reports the estimates for the effect of remittances on deposits. The first column of the table reports the results of fixed effects estimation, while results for the instrumental variables strategy are in Column 2. Recalling that both the dependent variable and the remittances regressor enter the regression equation in logarithm, the numbers reported in the table can be interpreted as the elasticity of the growth in bank deposits with respect to remittances. In Column 1, this elasticity is statistically significant and positive, at a value of 0.15. When turning to the IV column, however, the size of the coefficient on remittances increases substantially: a 1 percent increase in remittances spurs financial activity by 0.4 percent. These large differences between the two statistical models match the concerns about reverse causality expressed in Section 3.4.2.

Table 3.2: The impact of remittances on financial deepening

	Change in bank deposits (log)	
	(1)	(2)
	FE	IV
Remittances	0.149*	0.435***
	(0.083)	(0.086)
Observations	242	242
Number of Provinces	67	67
Outcome mean	15.789	15.789
Year FE	YES	YES
Location FE	YES	YES
First stage F-stat		41.69

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: The outcome is the log of the five-year change in total bank deposits at the provincial level. Fixed effects regression is performed on location and year dummies and the log of the total remittances sent by migrants from each province in the same five-year time span. Remittances are computed as a weighted average of national remittances, where weights are the potential earnings of male migrants aged 15-44 from each province, who migrated in the previous four years. In Column 1, fixed effects are at the provincial level. In Column 2, remittances are instrumented with a measure that weights national remittances with migrants' potential earnings as of year 1885, and fixed effects are at the regional level.

To get a rough idea of the overall impact of remittances on deposits implied by our estimates, the following back-of-the-envelope exercise can be performed. From 1895 to 1910, five-year remittance stocks increased by approximately 2.3 trillion liras, or around 264 percent of their initial level. During the same time span, deposits in the banking system increased by 3.38 trillion liras (116 percent of the 1895 level). The estimates in Column 1 of Table 3.2, in turn, imply that deposits should rise by 0.149 percent for a 1 percent increase in remittances. Pooling all these numbers together, the increase in remittances should therefore account for about 3 percent of the increase in deposits in the fixed effects specification. When turning to the IV estimate, then, the contribution of remittances to financial deepening is as high as 10 percent.

Table 3.3: The impact of remittances on financial deepening

	Bank types				
	Change in bank deposits (log)				
	(1)	(2)	(3)	(4)	(5)
	Cooperative banks	Savings banks	Postal savings banks	Banks of issue	Commercial banks
Remittances	-0.090 (0.156)	0.097 (0.168)	0.591*** (0.061)	-0.199 (0.205)	0.640*** (0.245)
Observations	196	184	261	114	149
Number of Provinces	65	57	67	60	58
Outcome mean	14.136	14.938	14.628	11.531	13.519
Year FE	YES	YES	YES	YES	YES
Location FE	YES	YES	YES	YES	YES
First stage F-stat	30.96	31.91	45.64	22.15	25.03

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: The outcome is the log of the five-year change in total bank deposits at the provincial level. Column (1): deposits in cooperative banks; (2): deposits in savings banks; (3): deposits in postal savings banks; (4): deposits in banks of issue; (5): deposits in commercial banks. Instrumental variables regression with location fixed effects is performed on year dummies and the log of the total remittances sent by migrants from each province in the same five-year time span. Remittances are computed as a weighted average of national remittances, where weights are the potential earnings of male migrants aged 15-44 from each province, who migrated in the previous four years. Remittances are instrumented with a measure that weights national remittances with migrants' potential earnings as of year 1885, and fixed effects are at the regional level.

3.6.1 Robustness tests and additional evidence

As a robustness test, we restrict to three rather than four years after migration the time span in which we allow migrants to transfer money home. In a separate exercise, we also weight national remittances by the simple migrant stock, without accounting for international wages (both with three- and four-year migrant pools). Results, reported in Appendix Tables C.2-C.4, stay however mostly unchanged.

In Table 3.3, we disaggregate our broad deposits variable into its various components, analysing separately the change in fiduciary deposits held in cooperative banks, savings banks, postal savings banks, banks of issue, and commercial banks (cf. Section 3.3.2 *supra* for a description of these institutions). The coefficient on remittances is significant only for postal savings banks and commercial banks. Results do not change if we run the same analysis using province-bank type pairs as our unit of observation (cf. Appendix Table C.5).

Crucially, postal savings banks were the financial institution attracting deposits from the widest public at the beginning of our period of analysis: being specialised in collecting deposits of small amount, they were well spread all over the country, even in poor villages not reached by other categories of financial institutions. Commercial savings banks were, on the other hand, generally less successful in the deposits business (*Giunta parlamentare d'inchiesta sulle condizioni dei contadini nelle Province meridionali e nella Sicilia*, 1909; Sori, 1979). The fact that results are significant for both types of financial intermediaries might have potentially interesting implications. For example, even though detailed micro-level data on financial literacy and inclusion would be needed to test the mechanism formally, it could mean that one powerful effect of remittances may have been to contribute to some sort of “financial culture” across the peninsula, spurring the overall financial development of the country.

3.7 Mechanisms

The impact of remittances on household incentives to acquire deposits can in principle be viewed under a range of different interpretations.

For one thing, the picture in Section 3.6 is consistent with a basic two-period model of consumption and savings, in which remittances are akin to a positive income shock inducing

an increase in the optimal level of savings (cf. Appendix Section 3.E).

Complicating the picture slightly, it is also possible to endogenise households' relative preferences in terms of different types of savings, and hypothesise that remittances might have made households more willing to invest in bank deposits *in particular*.

A higher level of remittances may have increased investment in bank deposits vis-à-vis other forms of savings if, for example, the more frequent interactions with banks when dealing with the sums received from abroad improved households' familiarity with banks. This may have also happened if the higher volume of remittances induced a revival and consequent proliferation of financial institutions in the territory. In addition, the improved familiarity with banks and bank products might in turn have fed back into higher trust, allowing a better assessment on the part of households of the riskiness of bank deposits. This, in turn, would have made households more willing to entrust their savings to financial institutions upon receiving remittances.

Clearly though, it is also perfectly plausible that banks actually improved the services they offered as a result of increased remittances, thus effectively becoming better and safer investors of their clients' money. This would result in either higher returns on the sums invested, or in overall lower investment risk, in any case still increasing the demand for bank services.

While an attempt at formalising these mechanisms is provided in Appendix Section 3.F, in what follows we address them from an empirical perspective.

3.7.1 Incomes, branch density, and interest rates

We start by checking whether the impact of remittances worked through a relaxation of household budget constraints, allowing for a higher level of savings. As we have no information on household incomes or consumption, we use the five-year change in provincial GDP as a proxy. Results, reported in Column 1 of Table 3.4, reveal that a 1 percent increase in remittances raises the change in GDP by 0.14 percent. Although there is always the possibility that our instrumental variable might still not insure us completely from endogeneity, and that we are picking up some reverse causality, the finding is in line with the narrative pushed forward by the historical literature (cf. Section 3.3), and provides suggestive evidence in favour of an income effect.

In Column 2 of Table 3.4, we then address the hypothesis of an infrastructural response to migration, whereby higher remittances might have increased the density of the financial institutions available in the territory. We therefore take the five-year change in the number of banks per province as our dependent variable, but we find no significant result. Finding a positive effect here, nevertheless, would have implied that either new banks had been born in a province in response to higher remittances, or that some institutions had expanded their activity beyond the boundaries of the province where they had originally been based. As reported in Section 3.5, though, most financial institutions of the time were active in one single province. In Column 3 of Table 3.4, we thus account for the possibility that existing banks might just have opened new *branches* in the provinces where they were already operating. Here, we find in fact that the coefficient on remittances is actually positive and statistically significant, although not huge in size: a 10 percent increase in the stock of remittances increased the change in the number of bank branches on average by 25 percentage points.

Finally, to check whether remittances increased deposits by raising the quality of the services offered by financial institutions, in Column 4 of Table 3.4 we turn to interest rates. In fact, interest rates are an indication of the riskiness of the investment in bank deposits, as financial institutions can offer higher rates to make up for a higher level of risk. If remittances made banks improve their financial services, we should therefore expect to find a reduction in the average interest rate paid on deposits. In Column 4 of Table 3.4, then, the dependent variable is the average interest rate paid on deposits by financial institutions in each province, again measured as five-year change. As noted in Section 3.5, information on interest rates on deposits is retrieved from ASCI, which for each bank features the rates they reported in official notices. To be sure, it is possible that by their nature these data suffer from measurement error; moreover, it is likely that ASCI does not provide a perfectly accurate proxy for the range of rates actually offered on the market, as the dataset does not account for banks of issue and postal savings banks. With these caveats in mind, however, in Table 3.4 we find no change in interest rates produced by remittances.

In conclusion, interpreting the evidence from Table 3.4 jointly, the financial deepening induced by remittances can be explained by two main forces. First, remittances made households at home better-off, which allowed them to increase their level of aggregate savings through an

income effect. Second, the high flows of remittances stimulated financial activity to the point where it prompted banks to open new branches in the territory, improving household access to financial institutions: this in turn is likely to have enhanced household familiarity with bank products and operations, tilting their preferences over different types of investment towards bank deposits. The fact that average interest rates did not respond to remittances, then, supports the idea that the shift in preferences was actually due more to improved access and trust than to a better quality of the financial services offered on the market.

Table 3.4: Mechanisms

	(1)	(2)	(3)	(4)
	Change in GDP (log)	Change in no. banks	Change in no. branches	Change in Interest rates
Remittances	0.143*** (0.051)	-0.023 (0.273)	2.499*** (0.560)	0.013 (0.028)
Observations	264	266	266	266
Number of Provinces	67	67	67	67
Outcome mean	3.058	0.361	8.353	-0.176
Year FE	YES	YES	YES	YES
Location FE	YES	YES	YES	YES
First stage F-stat	44.66	44.91	44.91	44.91

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: Column (1): log of five-year change in GDP; (2): five-year change in the number of banks; (3): five-year change in the number of bank branches; (4): five-year change in interest rates. Instrumental variables regression with location fixed effects is performed on year dummies and the log of the total remittances sent by migrants from each province in the same five-year time span. Remittances are computed as a weighted average of national remittances, where weights are the potential earnings of male migrants aged 15-44 from each province, who migrated in the previous four years. Remittances are instrumented with a measure that weights national remittances with migrants' potential earnings as of year 1885. Fixed effects are at the regional level.

3.8 Conclusion

This chapter studies the impact of remittances on financial development, focussing on Italy between the Nineteenth and the Twentieth centuries, when the country faced a huge emigration wave.

We provide evidence of a positive relationship between remittances and financial deepening: our instrumental-variable estimates suggest that, for a 1 percent increase in remittances, the five-year change in fiduciary deposits at the provincial level increased on average by 0.4 percent. The result seems to be driven by an increase in the incomes of recipient households and a higher density of financial institutions operating in the territory, which granted the same households an improved access to financial services.

The historical literature summarised in Section 3.2 documents strong links between the inflow of remittances during the age of mass migration and various measures of economic development in Italy. Our paper adds evidence on yet another channel through which the impact of remittances might have operated, and on how the emigration of thousands of Italian workers contributed to the modernisation of the country and to its convergence on a more sustained growth path.

More generally, an ever-growing strand of research is piling up evidence on the development impact of remittances in current developing economies. This appears to be so strong that the World Bank (2009) has gone as far as to argue that allowing a freer flow of labour across national borders would likely do more to reduce poverty in developing countries than any other single policy or aid initiative. Financial development has in turn also been shown to be strongly associated with faster growth and lower poverty (Beck et al., 2000a,b, 2007; King & Levine, 1993): among other things, access to adequate financial services can also directly improve the living conditions of the poor by providing them with additional tools of risk management, asset accumulation, and credit.²⁸ A number of studies also highlight the complementarity between remittances and the efficiency of the financial sector in promoting economic growth (cf. Bettin & Zazzaro, 2012), and the fact that linking remittances with financial services may magnify their developmental impact (Ambrosius et al., 2014; Ashraf et al., 2015; Orozco & Fedewa, 2006).

If remittance flows help improve access to financial services by low-income or geographically isolated households, or if they facilitate their access to credit through increased collateral and an improved scope for monitoring, they will therefore not only affect development through their direct impact on financial deepening and inclusion, but they may also trigger a

²⁸ Ambrosius et al. (2014); Demirguc-Kunt et al. (2011); Esteves & Khoudour-Castéras (2011); Orozco & Fedewa (2006).

virtuous circle that exploits their synergies with financial sector efficiency *itself*.

According to the International Monetary Fund (2016), the stock of international migrants reached 250 million in 2015:²⁹ of these, almost 95 percent were economic migrants. At the same time, competition and innovation in money transfer services³⁰ are allowing for sustained declines in remittance transaction costs (Yang, 2011). In 2015, remittances to developing countries totalled USD 450 billion (more than half of foreign direct investment inflows), and for some small countries³¹ the estimate of the sums remitted by international migrants was as high as 25 percent of national GDP (IMF, 2016). Many fear that, in a globalised world, emigration can gradually impoverish sending areas that are already economically and socially disadvantaged, mostly through brain drain effects.³² Clearly, the type of emigration from Italy during its episode of mass migration may differ in some important ways from today's emigration from developing countries, for instance in terms of the reasons for migrating, the overall socio-economic situation in the destination countries, and the profile of the emigrants themselves. This might imply that one should be cautious about the external validity of the results in this chapter. With these caveats in mind, however, and if the findings on remittances and development are correct, increasing migration rates in the years to come might constitute an opportunity rather than a challenge for current developing economies.

²⁹The figure excludes undocumented illegal migration.

³⁰For example, the advent of cellphone-based remittance services has been one of the most salient innovations in the sector, and has lately attracted increasing attention from researchers. See e.g. Jack & Suri (2014).

³¹Like Tajikistan, Nepal, and Moldova.

³²Cf. Cervantes & Guellec (2002); Clemens (2011); Docquier & Rapoport (2006); Gibson & McKenzie (2011).

Appendix

3.A Data on Italian emigration

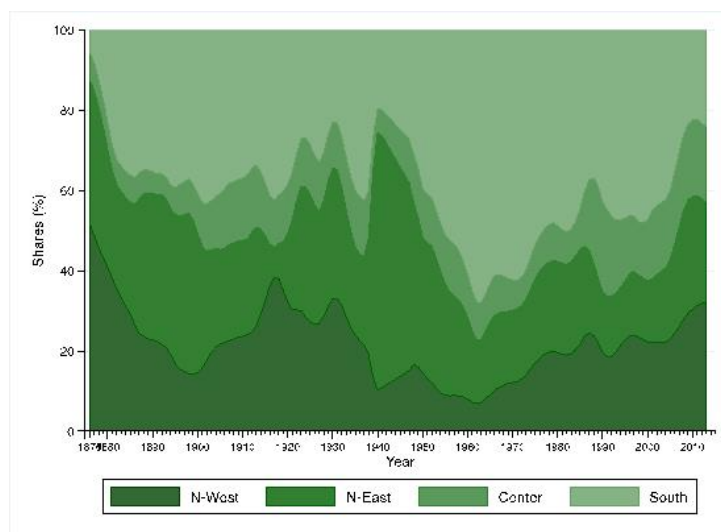
Table A.1: Italian emigration, 1870-2013

Decade	(1) Emigrants	(2) Gross rate (per 1,000)	(3) Migration balance
1869-1880	1,418,037	4.3	-
1881-1890	2,172,832	6.6	-
1891-1900	2,834,726	8.9	-
1901-1910	6,026,690	17.7	-
1911-1920	3,828,065	10.6	-2,672,298
1921-1930	2,405,793	6.8	-1,044,780
1931-1940	702,65	1.6	-112,793
1941-1950	1,144,775	3.5	-698,166
1951-1960	2,937,406	6.0	-1,613,817
1961-1970	2,646,994	5.1	-778,374
1971-1980	1,082,340	2.0	39,163
1981-1990	658,292	1.2	45,261
1991-2000	517,095	0.9	-126,071
2001-2013	868,405	1.1	-183,452
1870-2013	29,244,100	5.5	-7,145,327

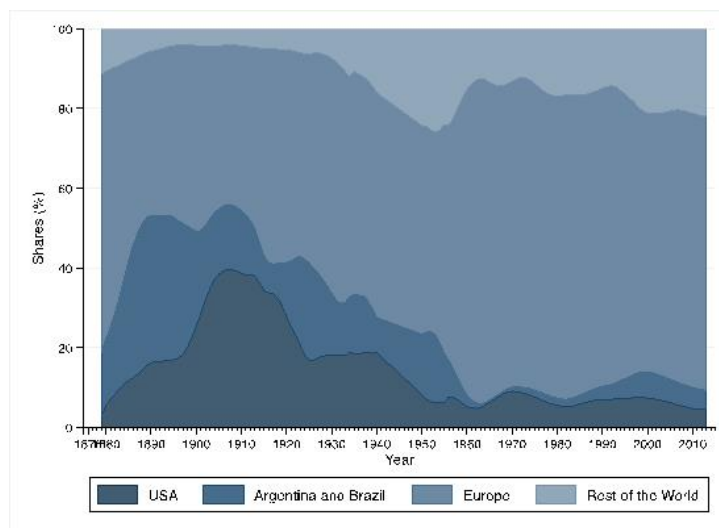
Notes: Source: Gomellini et al. (2017). Column (1): number of Italian emigrants per decade; (2): gross emigration rate (number of emigrants per 1,000 Italian residents); (3): net migration balance.

Figure A.1: Origins and destinations of Italian emigrants

(a) Area of origin



(b) Region of destination



Source: Gomellini et al. (2017).

3.B Interpolation of provincial value added

Given two time periods t_0 and T , for which we have data on provincial value added V_{t_0} and V_T , we estimate value added in the intermediate years $t = (t_0 + 1), \dots, (T - 1)$ using information on the growth rate of value added at the national level.

For each year t , the estimated value added for province i is

$$\hat{V}_{it} = V_{it_0} (1 + g_{i,T-t_0})^{\frac{t-t_0}{T-t_0}} \prod_{s=t_0+1}^t W_s, \quad (3.11)$$

where $g_{i,T-t_0}$ is the overall growth rate of value added in province i between T and t_0 . The W s are the annual weights for the interpolation of value added, which we define based on Italian growth rates:

$$W_t = \frac{1 + g_{IT,t}}{\left[\prod_{s=1}^{T-t_0} (1 + g_{IT,s}) \right]^{\frac{1}{T-t_0}}}, \quad (3.12)$$

where $g_{IT,t}$ is the national annual growth rate of value added in year t .

In our data, we have provincial-level information for the years 1881, 1901, and 1911, so we apply formula (3.11) to obtain estimates for the intervals [1882, 1900] and [1902, 1910].

3.C Robustness checks

Table C.2: The impact of remittances on financial deepening

Three-year migrant stock		
	Change in bank deposits (log)	
	(1)	(2)
	FE	IV
Remittances	0.097 (0.079)	0.432*** (0.083)
Observations	243	243
Number of Provinces	67	67
Outcome mean	15.78	15.78
Year FE	YES	YES
Location FE	YES	YES
First stage F-stat		39.86

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: The outcome is the log of the five-year change in total bank deposits at the provincial level. Fixed effects regression is performed on location and year dummies and the log of the total remittances sent by migrants from each province in the same five-year time span. Remittances are computed as a weighted average of national remittances, where weights are the potential earnings of male migrants aged 15-44 from each province, who migrated in the previous three years. In Column 1, fixed effects are at the provincial level. In Column 2, remittances are instrumented with a measure that weights national remittances with migrants' potential earnings as of year 1885, and fixed effects are at the regional level.

Table C.3: The impact of remittances on financial deepening

Weights without wages		
	Change in bank deposits (log)	
	(1)	(2)
	FE	IV
Remittances	0.141*	0.447***
	(0.081)	(0.088)
Observations	242	242
Number of Provinces	67	67
Outcome mean	15.789	15.789
Year FE	YES	YES
Location FE	YES	YES
First stage F-stat		39.70
Standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

Notes: The outcome is the log of the five-year change in total bank deposits at the provincial level. Fixed effects regression is performed on location and year dummies and the log of the total remittances sent by migrants from each province in the same five-year time span. Remittances are computed as a weighted average of national remittances, where weights are the number of male migrants aged 15-44 from each province, who migrated in the previous four years. In Column 1, fixed effects are at the provincial level. In Column 2, remittances are instrumented with a measure that weights national remittances with migrants as of year 1885, and fixed effects are at the regional level.

Table C.4: The impact of remittances on financial deepening
Weights without wages, three-year migrant stock

	Change in bank deposits (log)	
	(1)	(2)
	FE	IV
Remittances	0.090 (0.078)	0.444*** (0.086)
Observations	243	243
Number of Provinces	67	67
Outcome mean	15.78	15.78
Year FE	YES	YES
Location FE	YES	YES
First stage F-stat		37.87

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes: The outcome is the log of the five-year change in total bank deposits at the provincial level. Fixed effects regression is performed on location and year dummies and the log of the total remittances sent by migrants from each province in the same five-year time span. Remittances are computed as a weighted average of national remittances, where weights are the number of male migrants aged 15-44 from each province, who migrated in the previous three years. In Column 1, fixed effects are at the provincial level. In Column 2, remittances are instrumented with a measure that weights national remittances with migrants as of year 1885, and fixed effects are at the regional level.

Table C.5: The impact of remittances on financial deepening

Interactions with bank types	
	(1)
	Change in bank deposits (log)
Remittances $\times$ BP	0.303 (0.204)
Remittances $\times$ CRP	0.702*** (0.178)
Remittances $\times$ CRO	0.272 (0.201)
Remittances $\times$ OTH	0.764*** (0.204)
Observations	904
Number of units	307
Outcome mean	14.011
Year FE	YES
Location-type FE	YES
Chi-square test	
$H_0: BP=CRP=CRO=OTH$	
χ^2 : 12.364***	
Standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

Notes: The outcome is the log of the five-year change in total bank deposits at the provincial level. The unit of observation is bank type-province. Instrumental variables regression with location fixed effects is performed on year dummies, the log of the total remittances sent by migrants from each province in the same five-year time span, and interactions of remittances and bank type. BP identifies cooperative banks; CRO identifies savings banks; CRP identifies postal savings banks; OTH identifies commercial banks; and banks of issue are the reference category. Remittances are computed as a weighted average of national remittances, where weights are the potential earnings of male migrants aged 15-44 from each province, who migrated in the previous four years. Remittances are instrumented with a measure that weights national remittances with migrants' potential earnings as of year 1885, and fixed effects are at the regional level.

3.D First-stage regressions

Table D.6: First-stage regression for Table 3.2

	(1)
	Remittances
Year==1900	0.208 (0.128)
Year==1905	1.015*** (0.126)
Year==1910	1.246*** (0.128)
Region==BASILICATA	-0.348 (0.423)
Region==CALABRIA	0.216 (0.256)
Region==CAMPANIA	0.058 (0.234)
Region==EMILIA ROMAGNA	-0.828*** (0.212)
Region==LAZIO	0.166 (0.515)
Region==LIGURIA	-2.143*** (0.319)
Region==LOMBARDIA	-1.026*** (0.209)
Region==MARCHE	-0.670*** (0.256)
Region==PIEMONTE	-0.532** (0.245)
Region==PUGLIA	-0.232 (0.306)
Region==SARDEGNA	-1.855*** (0.373)
Region==SICILIA	0.003 (0.216)
Region==TOSCANA	-1.270*** (0.210)
Region==UMBRIA	0.140 (0.423)
Region==VENETO	-0.005 (0.211)
Remittances (instrument)	0.374*** (0.026)
Constant	10.478*** (0.441)
Observations	242
R-squared	0.781

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Remittances are computed as a weighted average of national remittances, where weights are the potential earnings of male migrants aged 15-44 from each province, who migrated in the previous four years. The instrument is a measure that weights national remittances with migrants' potential earnings as of year 1885.

Table D.7: First-stage regression for Table C.2

	(1)
	Remittances
Region==BASILICATA	-0.370 (0.447)
Region==CALABRIA	0.219 (0.271)
Region==CAMPANIA	0.073 (0.247)
Region==EMILIA ROMAGNA	-0.795*** (0.224)
Region==LAZIO	0.403 (0.545)
Region==LIGURIA	-2.105*** (0.338)
Region==LOMBARDIA	-0.975*** (0.220)
Region==MARCHE	-0.685** (0.271)
Region==PIEMONTE	-0.493* (0.258)
Region==PUGLIA	-0.133 (0.324)
Region==SARDEGNA	-1.769*** (0.394)
Region==SICILIA	0.036 (0.229)
Region==TOSCANA	-1.320*** (0.222)
Region==UMBRIA	0.244 (0.448)
Region==VENETO	0.017 (0.223)
Year==1900	0.299** (0.135)
Year==1905	1.093*** (0.133)
Year==1910	1.320*** (0.135)
Remittances (instrument)	0.380*** (0.027)
Constant	10.293*** (0.462)
Observations	243
R-squared	0.773

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Remittances are computed as a weighted average of national remittances, where weights are the potential earnings of male migrants aged 15-44 from each province, who migrated in the previous three years. The instrument is a measure that weights national remittances with migrants' potential earnings as of year 1885.

Table D.8: First-stage regression for Table C.3

	(1)
	Remittances
Region==BASILICATA	-0.322 (0.428)
Region==CALABRIA	0.214 (0.260)
Region==CAMPANIA	0.061 (0.237)
Region==EMILIA ROMAGNA	-0.585*** (0.214)
Region==LAZIO	0.049 (0.520)
Region==LIGURIA	-2.016*** (0.324)
Region==LOMBARDIA	-0.783*** (0.213)
Region==MARCHE	-0.553** (0.259)
Region==PIEMONTE	-0.335 (0.251)
Region==PUGLIA	-0.172 (0.310)
Region==SARDEGNA	-1.494*** (0.377)
Region==SICILIA	-0.076 (0.219)
Region==TOSCANA	-1.042*** (0.213)
Region==UMBRIA	0.458 (0.429)
Region==VENETO	0.312 (0.215)
Year==1900	0.235* (0.130)
Year==1905	1.077*** (0.128)
Year==1910	1.346*** (0.129)
Remittances (instrument)	0.368*** (0.027)
Constant	10.409*** (0.446)
Observations	242
R-squared	0.773

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Remittances are computed as a weighted average of national remittances, where weights are the number of male migrants aged 15-44 from each province, who migrated in the previous four years. The instrument is a measure that weights national remittances with the number of migrants as of year 1885.

Table D.9: First-stage regression for Table C.4

	(1)
	Remittances
Region==BASILICATA	-0.345 (0.452)
Region==CALABRIA	0.218 (0.274)
Region==CAMPANIA	0.074 (0.249)
Region==EMILIA ROMAGNA	-0.552** (0.226)
Region==LAZIO	0.255 (0.550)
Region==LIGURIA	-1.979*** (0.342)
Region==LOMBARDIA	-0.733*** (0.224)
Region==MARCHE	-0.568** (0.274)
Region==PIEMONTE	-0.298 (0.263)
Region==PUGLIA	-0.071 (0.328)
Region==SARDEGNA	-1.403*** (0.399)
Region==SICILIA	-0.038 (0.232)
Region==TOSCANA	-1.092*** (0.224)
Region==UMBRIA	0.573 (0.453)
Region==VENETO	0.329 (0.227)
Year==1900	0.324** (0.136)
Year==1905	1.159*** (0.134)
Year==1910	1.415*** (0.136)
Remittances (instrument)	0.374*** (0.028)
Constant	10.221*** (0.467)
Observations	243
R-squared	0.763

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Notes: Remittances are computed as a weighted average of national remittances, where weights are the number of male migrants aged 15-44 from each province, who migrated in the previous three years. The instrument is a measure that weights national remittances with the number of migrants as of year 1885.

3.E A model of consumption and savings with remittances

This section aims to illustrate the consumption and savings decisions of a household living two periods and receiving remittances from abroad in the first period. We use a simple framework drawing on a two-period, textbook model of consumption and savings, with the addition of a subsistence constraint in consumption and of an independent term for remittances in the budget constraint.

Let us assume that the economy can be described by the behaviour of a representative consumer household, living for two periods t_1 and t_2 and deriving utility from a composite consumption good c , whose price we normalise to 1 for the sake of convenience. We shall assume that the consumer's lifetime utility is additive with rate of time preference β :

$$U = u(c_{t_1}) + \beta u(c_{t_2}). \quad (3.13)$$

Furthermore, we assume that each period's utility is Stone-Geary, so that there exists a minimum subsistence level of consumption $\bar{c}$ that needs to be met in order for the utility function to be identified:

$$u(c_t) = \log(c_t - \bar{c}). \quad (3.14)$$

In each period, the household has constant income y , but in period t_1 they also receive remittances R from a relative who migrated abroad. If the sum of income and remittances allows the agent to consume at least the subsistence level $\bar{c}$, they are then left with the decision whether to allocate their remaining funds to additional current consumption or to savings s_{t_1} , which can be invested at a fixed rate of return r and consumed in t_2 . Hence, the consumption decision of the household in the two periods must satisfy the following budget constraints:

$$c_{t_1} + s_{t_1} = y + R \quad (3.15)$$

$$c_{t_2} = y + s_{t_1}(1 + r). \quad (3.16)$$

For our purposes, we can assume that a proportion ρ of savings will be invested in bank deposits, and the remaining $1 - \rho$ in money, land, or other productive activities. If ρ is fixed, this distinction is harmless with respect to the maximisation problem, and only serves the purpose

of better describing the investment opportunities of Italian households in the late Nineteenth-early Twentieth centuries. Consequently, we can still write the model in terms of s_{t_1} , and derive the optimal level of investment in deposits by simply applying the coefficient ρ to the optimal level of savings.

Combining (3.15) and (3.16) to obtain the intertemporal budget constraint, and plugging (3.14) into (3.13), the maximisation problem faced by the consumer is therefore

$$\max_{c_{t_1}, c_{t_2}} U = \max_{c_{t_1}, c_{t_2}} \log(c_{t_1} - \bar{c}) + \beta \log(c_{t_2} - \bar{c}) \quad (3.17)$$

$$\text{s.t. } c_{t_1} + \frac{c_{t_2}}{1+r} = R + \frac{2+r}{1+R}y. \quad (3.18)$$

Defining the Lagrange multiplier λ associated to the problem, the resulting first order conditions are

$$\text{FOC1 : } \frac{1}{c_{t_1} - \bar{c}} - \lambda = 0 \quad (3.19)$$

$$\text{FOC2 : } \frac{\beta}{c_{t_2} - \bar{c}} - \frac{\lambda}{1+r} = 0 \quad (3.20)$$

$$\text{FOC3 : } \frac{2+r}{1+R}y + R - c_{t_1} - \frac{c_{t_2}}{1+r} = 0 \quad (3.21)$$

After some manipulation, the FOCs can be combined to give the optimal level of savings $s_{t_1}^*$:

$$s_{t_1}^* = \kappa_0 + \kappa_1 R + \kappa_2 y \quad (3.22)$$

$$\kappa_0 = -\frac{(\beta(1+r)-1)(2+\beta)}{(1+r)(1+\beta)\beta}\bar{c}, \quad \kappa_1 = \frac{\beta}{1+\beta}, \quad \kappa_2 = \frac{\beta(1+r)-1}{(1+r)(1+\beta)}. \quad (3.23)$$

From expression (3.22), the optimal level of savings is positively dependent on the level of remittances R . At the same time, since the optimal level of bank deposits is simply $\rho s_{t_1}^*$, the offer of deposits will also rise in response to an increase in the amount of remittances.

3.F A model of capital allocation

To endogenise capital allocation choices, we sketch a theoretical framework borrowed from textbook models of portfolio choice. We assume that two investment products are available on the market: a risk-free asset s , and asset d , which is risky but more lucrative. To embed the model into our historical narrative, we can interpret household preferences on the two assets as their choice between keeping money at home and storing it in financial institutions, in the form of bank deposits.

Formally, risk is identified by the variance of each asset's returns: $\sigma_j^2, j = d, s$. To make the model more representative of our historical context of reference, however, we can posit that σ^2 reflects more the *assumed* riskiness of an asset as perceived by households, rather than its actual inherent risk. As s is risk-free, σ_s^2 is equal to zero. The return on s can also be set to zero without loss of generality. Given that d is more lucrative, defining its return as r_d , we can then write $E[r_d] > 0$.

If a household were to invest a fraction ρ of their savings on asset d and the remaining $(1 - \rho)$ on s , the expected value and variance of the return of the resulting investment portfolio would respectively be

$$E[r_p] = \rho E[r_d] \quad (3.24)$$

$$\sigma_p^2 = \rho^2 \sigma_d^2. \quad (3.25)$$

Now let us express household utility with respect to the investment portfolio as

$$U = U(E[r_p], A\sigma_p^2), \quad (3.26)$$

where A is a measure of risk aversion. We further assume that (i) U is separable in $E[r_p]$ and $A\sigma_p^2$; (ii) U has decreasing marginal benefits in expected portfolio yields: $U_{E[r_p]} > 0$, $U_{E[r_p]E[r_p]} \leq 0$; and (iii) U has increasing marginal disutility in portfolio risk: $U_{A\sigma_p^2} < 0$, $U_{A\sigma_p^2 A\sigma_p^2} \leq 0$.³³ The household is risk averse if $A > 0$, risk lover if $A < 0$. In our historical context, A can also be readily interpreted as the level of trust of households in financial insti-

³³Generally, financial models of this type assume a specific functional form for the utility function, which allows for a closed-form solution for the optimal investment level ρ^* . Typically, the textbook approach is to assume $U = E[r_p] - \frac{1}{2}A\sigma_p^2$. Nonetheless, nothing changes substantially if the functional form is left implicit, as we do here.

tutions, which we can in turn assume to be determined by how familiar households are with the financial system and its operations. For the sake of simplicity, and to reflect the Italian background in our period of analysis, we will therefore only address the case where $A > 0$.

Plugging (3.24) and (3.25) into (3.26) and maximising with respect to ρ , one obtains the first order condition for the optimal level ρ^* of investment in the risky asset:

$$\frac{\partial U}{\partial \rho} = U_{E[r_p]}E[r_d] + 2U_{A\sigma_p^2}A\rho\sigma_d^2 = 0. \quad (3.27)$$

For given values of A , σ_d^2 and $E[r_d]$, if Equation (3.27) has a solution ρ^* , then the implicit function theorem holds, and we can establish the following

RESULT 1. *The level of investment in the risky asset is decreasing in the asset's risk (R1) and in individual risk aversion (R2). If the asset's expected return is not too high, the level of investment is also increasing in the asset's expected return (R3).*

Proof. From the implicit function theorem:

$$R1 : \quad \frac{d\rho}{dA} = -\frac{2\rho\sigma_d^2(A\sigma_p^2U_{A\sigma_p^2A\sigma_p^2} + U_{A\sigma_p^2})}{E[r_d]U_{E[r_p]\rho} + 2A\sigma_d^2(U_{A\sigma_p^2} + \rho U_{A\sigma_p^2\rho})} < 0 \quad (3.28)$$

$$R2 : \quad \frac{d\rho}{d\sigma_r^2} = -\frac{2\rho A(A\sigma_d^2\rho U_{A\sigma_p^2A\sigma_p^2} + U_{A\sigma_p^2})}{E[r_d]U_{E[r_p]\rho} + 2A\sigma_d^2(U_{A\sigma_p^2} + \rho U_{A\sigma_p^2\rho})} < 0 \quad (3.29)$$

$$R3 : \quad \frac{d\rho}{dE[r_d]} = -\frac{\rho E[r_d]U_{E[r_p]E[r_p]} + U_{E[r_p]}}{E[r_d]U_{E[r_p]\rho} + 2A\sigma_d^2(U_{A\sigma_p^2} + \rho U_{A\sigma_p^2\rho})} > 0 \text{ if } E[r_d] < -\frac{U_{E[r_p]}}{\rho U_{E[r_p]E[r_p]}}. \quad (3.30)$$

■

CHAPTER 4

A SUFFICIENT STATISTIC FOR THE GAINS FROM TRADE: AN

APPLICATION TO ITALIAN TRADE HISTORY

with Matteo Gomellini (Bank of Italy)

4.1 Introduction

Over the last decade, the study of the gains from trade has gained momentum in the international economics literature.¹ In particular, international trade theory has increasingly been focussing on firm heterogeneity (Eaton & Kortum, 2002; Melitz, 2003), which induces productivity gains effects once economies open up to trade. Empirical research along these lines,² however, strongly relies on the collection and dissemination of detailed micro-level firm information, which in many instances is simply not available. This is the case for example for research in economic history, as firm-level data usually do not go adequately far back in time.

Recent theoretical contributions on the gains from trade (Arkolakis et al., 2012, 2015; Ossa, 2015), on the other hand, argue that the gains from trade predicted by theoretical models with firm heterogeneity or product variety can ultimately be summarised by simple “sufficient statistics”³ that have minimal data requirements. In particular, Arkolakis et al. (2012) build a measure of gains from trade that only depends on the share of expenditure on domestic goods and the elasticity of imports with respect to variable trade costs (hereafter, the trade elasticity). The measure can be complemented with insights from Sampson (2016), who accounts for the dynamic firm selection effects induced by technology spillovers from incumbent firms to new

We acknowledge insightful comments by Robert Feenstra, James Fenske, Douglas Gollin, Kevin O’Rourke, Ferdinand Rauch, Thomas Sampson, Massimo Sbracia, and participants in seminars at the Bank of Italy.

¹Cf. e.g. Arkolakis et al. (2008, 2012); Atkeson & Burstein (2010); Broda & Weinstein (2006); Feenstra & Kee (2008); Feenstra & Weinstein (2010); Goldberg et al. (2009).

²Cf. for example Iacovone et al. (2013); Bloom et al. (2015)

³The central concept of the sufficient statistic approach is to estimate the welfare consequences of policies through formulas that are functions of high-level elasticities rather than deep primitives (Chetty, 2009).

entrants on the market. Both Arkolakis et al.'s and Sampson's contributions are mainly intended to inform theoretical research: for Arkolakis et al. (2012), the point is mainly to show the policy limitations of sophisticated trade models; for Sampson (2016), to stress the relevance of the additional, dynamic channel of adjustment to trade. Their approach, nonetheless, offers a convenient way to overcome the lack-of-data issue, and to quantify the gains from trade predicted by a broad range of trade models.

In this chapter, we propose an application of the "sufficient statistic" approach, studying how the model-derived gains from trade evolved in Italy from soon after unification of the country until the end of the Twentieth century (a 131-year time span). To build our final estimator, we only need three aggregate variables and four parameters, all either easily retrievable from our data or available in the literature. In this way, our "sufficient statistics", though based on a sophisticated micro-level foundation, can be conveniently built over a small set of aggregate data, which favours ease of use and interpretation. In particular, our main parameter of interest is the trade elasticity, i.e. the elasticity of bilateral trade flows to variable trade costs. We estimate the trade elasticity through gravity equations run on bilateral trade between Italy and thirteen partner countries. This means that, for each country pair in each year in our sample, we estimate the trade elasticity as the coefficient on trade costs in a regression of the normalised (log) bilateral import share on (log) variable trade costs, together with importer and exporter fixed effects. To make our measures consistent with our historical setting, moreover, we allow the trade elasticity to vary over time, performing our gravity regressions separately on a number of periods that match the most relevant events in Italian economic and political history. This approach results in estimates for the trade elasticity that range from 2 to 7, against a fixed value of around 4 that would be obtained by performing the analysis pooling together our entire sample period.

Our estimates for the gains from trade can be interpreted as the increase in real GDP that would be obtained moving from a counterfactual autarkic scenario to the level of trade actually observed in the data, given the assumptions of trade models with product variety or heterogeneous firms. We show that over time this effect was on average akin to an increase in Italian GDP of around 8 percent per year. A major spike in total gains from trade in the inter-war period was followed by a slump that lasted until the 1970s, when they went back to

a sustained albeit noisy increasing path. We decompose these figures into a static and a dynamic component, respectively driven by gains from variety and firm selection effects, on the one hand, and dynamic productivity spillovers, on the other. The exercise reveals that the dynamic gains carried a higher weight throughout most of Italian history, but the slowing down of the growth rate of the economy in recent decades has lately brought the static gains from trade to a much more prominent role.

The rest of the chapter is structured as follows: in Section 4.2, we provide an overview of the recent literature on the gains from trade; Section 4.3 describes the main turning points of Italian trade policy over the course of the country's modern history; Section 4.4 describes the data used for the analysis, while Section 4.5 outlines our estimation strategy; in Section 4.6, we present our estimates of the gains from trade for Italy over the period 1870-2000; conclusions follow in Section 4.7.

4.2 The welfare gains from international trade

Our paper is rooted in the literature on the quantification and estimation of the gains from international trade.

The gains from trade can be defined as the increase in welfare accruing to a country as a result of trade liberalisation. In general, they are identified as changes in real wages (Eaton & Kortum, 2002; Melitz, 2003), or in real GDP (Arkolakis et al., 2012). Alternative measures are the consumption equivalents that align welfare in autarky and in free trade (Costinot & Rodríguez-Clare, 2014; Sampson, 2016), or the efficiency losses from misallocation of production in a closed economy (Edmond et al., 2015).

Apart from allocative efficiency and comparative advantage stemming from differences in technology or relative factor endowments, the growth literature identifies various channels of gains from trade. These range from economies of scale, to learning by doing through exporting, to research and development spillovers through the import of new technology (Harrison & Rodríguez-Clare, 2010). Wacziarg (2001) also points to positive effects of trade on government policy.

Theories of monopolistic competition, which consider models with firm or product heterogeneity, identify other avenues of trade-induced welfare improvement. Feenstra (2014) groups

the gains from trade arising from models of monopolistic competition into three main blocs. First, a “love of variety” effect benefits consumers as new import varieties become available on domestic markets (Helpman & Krugman, 1987; Krugman, 1980). Second, in a world of heterogeneous firms, a “pro-competitive” effect from greater foreign competition reduces producers’ mark-ups, squeezing profit margins and lowering domestic prices (Melitz & Ottaviano, 2008). Third, Melitz (2003) points to a “creative destruction” effect that increases the average productivity of the economy: market shares and workers are reallocated to the most productive domestic firms, which self-select into exporting (see also Melitz & Redding, 2013).

The literature abounds with attempts to address the gains from trade defined as above. Examples of studies focussing on the impact of the love for variety channel include Broda & Weinstein (2006), Feenstra (1994), Hausman (1981), and Romer (1994). The pro-competitive effect of trade has been analysed, among others, by Auer & Fischer (2010), Bugamelli et al. (2010), and Chen et al. (2009). Finally, the firm selection mechanism is investigated for example in Bolatto & Sbracia (2016), Iacovone et al. (2013), Pavcnik (2002), and Trefler (2004).

A well-known contribution by Arkolakis et al. (2012), on the other hand, adopts a more synthetic approach, and derives a simple formula for the gains from trade resulting from most of the models cited above (so-called “quantitative trade models”),⁴ regardless of their micro-level margins of change. In particular, Arkolakis et al. show that the gains from trade in all these models only depend on two statistics: the ratio of the country’s shares of expenditure on domestic goods after and before a trade shock, and a parameter ϵ . Depending on the specific theoretical framework underlying the analysis, ϵ can be interpreted in different ways: in the Krugman (1980) homogeneous firms model, for instance, ϵ reflects the elasticity of substitution in consumption, and captures the gains from new import varieties available to consumers; in Melitz (2003), with heterogeneous firms and Pareto-distributed productivity, instead, ϵ depends on the Pareto shape parameter and captures the gains stemming from firm selection.

Improving along these lines, Sampson (2016) introduces a “dynamic selection” adjustment margin in addition to the gains from trade as computed by Arkolakis et al., whose synthetic expression, it is claimed, only reflects a “static” equilibrium. In practice, in Sampson’s work,

⁴These models rely on four primitive assumptions: (i) Dixit-Stiglitz preferences; (ii) one factor of production; (iii) linear cost functions; (iv) perfect or monopolistic competition; and three macro-level restrictions: (i) trade is balanced; (ii) aggregate profits are a constant share of aggregate revenues; (iii) the import demand system has constant elasticity of substitution (CES). Example of quantitative trade models are Armington (1969); Eaton & Kortum (2002); Krugman (1980); Melitz (2003).

selection on firm productivity in export markets à la Melitz (2003) improves the average productivity of existing firms *and* causes knowledge spillovers to new entrants. As a result, the rate of creative destruction and the growth rate of average firm productivity and consumption per capita both increase, producing much higher total gains from trade than the “static” formulation of Arkolakis et al. (2012) alone would predict. The notion of a strong dynamic relationship between growth and trade has also found support in Alvarez et al. (2013), Anderson et al. (2015), Impullitti & Licandro (2016), and Ourens (2016).

In this chapter, we follow both Arkolakis et al. (2012) and Sampson (2016) to estimate the contribution of trade to economic growth in Italy over a 131-year time span. That we know, our paper is the first application of the work by Arkolakis et al. to the Italian case and considering such a long period of analysis. Moreover, although we directly use the gains-from-trade formulas derived from both Arkolakis et al. and Sampson, we make their approach more suitable to our historical setting, through the introduction of time-varying trade parameters.

In particular, we estimate the trade elasticity using a gravity equation with aggregate trade flows as in Arkolakis et al. (2012),⁵ but we acknowledge that the degree to which imports respond to trade obstacles should vary in response to historical and institutional evolutions over long periods of time. As a result, we estimate a number of Italian-, period-specific trade elasticities that reflect the often dramatic developments that drove Italian trade policy over time. The explicitation of the link between economic history and the estimation of structural parameters is, to us, a major contribution of our work.

4.3 A short history of Italian trade policy

4.3.1 From Unification to the Great War (1861-1914)

In the time span between the creation of the Italian Kingdom in 1861 to the outbreak of World War I in 1914, trade policy in Italy was mainly driven by occasional lobbying motivated by vested interests (Federico & Tena, 1998b).

Upon unification of the peninsula, the former Kingdom of Piedmont extended its liberal tariff structure to all other regions under its control, in an attempt to secure the support of large landowners scattered throughout the country by tilting the terms of trade in favour of

⁵Cf. Simonovska & Waugh (2014) for a similar approach.

agricultural products. With the gradual strengthening of industrial interests, however, the following five years were marked by a more protectionist attitude, which was supposed to shield the developing Italian infant industries from foreign competition: in 1863, a free trade treaty with France was abolished, followed by the establishment of new duties in 1864 and in 1866.

In 1878, a further major tariff reform granted protection to the cotton-textile, glass, and ceramics industries, as well as to the mechanical sector. Almost ten years later, intensive lobbying by certain sectors of both industry and agriculture achieved a yet more radical tariff revision in 1887, which imposed high duties on cereals, textiles, and iron and steel products (Toniolo, 1990).⁶

These developments, which also caused the interruption of trade relations between Italy and France, were nonetheless counterbalanced by the signing of a number of bilateral free trade agreements with other European partners in 1904-06, when Italy started to establish close commercial ties with Austria-Hungary, Germany, and Switzerland.

Although Federico & Tena (1998b) argue that the patterns of Italian trade policy before the Great War were misaligned with the process of efficient industrialisation of the country, the same authors (1998a) document how the impact of trade policy on the performance of individual sectors in this period was ultimately quite small. More recent research by James & O'Rourke (2013) comes to a similar conclusion, providing evidence that trade policy had at best a modest influence on economic growth and industrialisation in the late Nineteenth century (see also Toniolo, 1977).

4.3.2 Fascism and the two Wars (1914-1945)

The First World War induced a substantial restructuring of Italian industry composition: in particular, the war business boosted various “heavy” industries, such as the chemical sector, iron and steel, machinery, mining, and shipbuilding. This, in turn, resulted in the establishment of strong interest groups, who could successfully lobby for higher protection on chemicals, engineering, and steel products, achieved through a review of the tariff structure carried

⁶To get a sense of the skewness of the reform, the ad valorem duty on yarn came to amount to approximately 27 percent, as compared to a tariff of just 7 percent on clothing. Similarly, the engineering sector had to pay for very high duties on iron and steel, without being able to benefit from a similarly high protection on its own output. Wheat tariffs, on the other hand, were raised as to reach the equivalent of a 25 percent ad valorem tax (James & O'Rourke, 2013).

out in 1921 (Calderoni, 1961; Giordano & Giugliano, 2013).

With the advent of Mussolini and the Fascist regime in the early 1920s, however, the country entered what initially seemed to be a more liberal phase: the 1921 tariff was cut, and its effectiveness was also reduced in practice by the introduction of several bilateral treaties with various European countries.⁷ As a result, Toniolo (1980) reports that the average rate of protection on Italian goods fell from 10.3 percent in 1922 to 8.4 percent in 1925.

The later phase of the Fascist era, however, was marked by a sharp turnaround, first with the re-introduction of duties on wheat, cereals, and their derivatives, and then with the establishment of an explicitly autarkic regime. During this period, protectionism sky-rocketed to unprecedented levels, with steadily rising import duties, a tightening of exchange controls, the adoption of “Quota 90”,⁸ and other restrictive administrative measures (Toniolo, 1980).

Eventually, tariff policy even gradually lost importance, and was replaced by other forms of protectionist legislative action, such as a ban on the import and transit of goods supplied by enemy countries.

4.3.3 The post-war era: internationalism and European integration (1945-1970)

After the end of the Second World War, apart from occasional swings between openness and protectionism,⁹ Italian trade policy was shaped by the general movement towards international cooperation that characterised the global scene.

Soon after the War, the Bretton-Woods agreements led to the foundation of international institutions such as the International Monetary Fund and the World Bank, together with the enactment of the General Agreement on Tariffs and Trade (GATT) in 1948, which aimed at substantially reducing trade barriers among signatories.

The same year saw the birth of the Organisation for Economic European Co-operation (OEEC),¹⁰ which was set up to coordinate the efforts to restore Europe’s economy under the

⁷Between 1922 and 1926, Finance Minister De’ Stefani signed as many as nineteen agreements, most notably with Austria, France, Germany, Spain, and Switzerland.

⁸“Quota 90” was a drastic revaluation of the lira, undertaken by Mussolini in 1926, which pegged the exchange rate to 92.46 liras against the Pound sterling by December 1927.

⁹For example, between 1947 and 1949, Italy concluded 115 commercial treaties, initially based on reciprocity and private compensations. As soon as 1950, however, a new reform re-introduced ad valorem duties and granted a high level of protection to a broad range of products, including cars and tractors, electrical equipments, sugar, wheat, wine and spirits, yarns and textiles.

¹⁰Later superseded by the Organisation for Economic Co-operation and Development (OECD) in 1961.

European Recovery Programme (Marshall Plan). The OEEC played a decisive role in the Fifties in the promotion of trade liberalisation, by calling for the removal of quantitative restrictions and facilitating bilateral payments under currency inconvertibility through the institution of the European Payments Union.

The 1950s also laid the foundations of European integration, first with the signing of the European Coal and Steel Community (ECSC) in 1951, which established a preferential customs house for coal and steel products, and then with the Treaty of Rome in 1957, which founded the European Common Market (ECM). The ECM envisaged the complete removal of duties within the European Economic Community (EEC), as well as the application of a common external tariff within the framework of a Customs Union (Pierucci & Ulizzi, 1973). Within-EEC duties on industrial products however were completely abolished only in 1968, when member countries also converged to a single common customs tariff.

4.3.4 The end of the Twentieth Century (1970-2000)

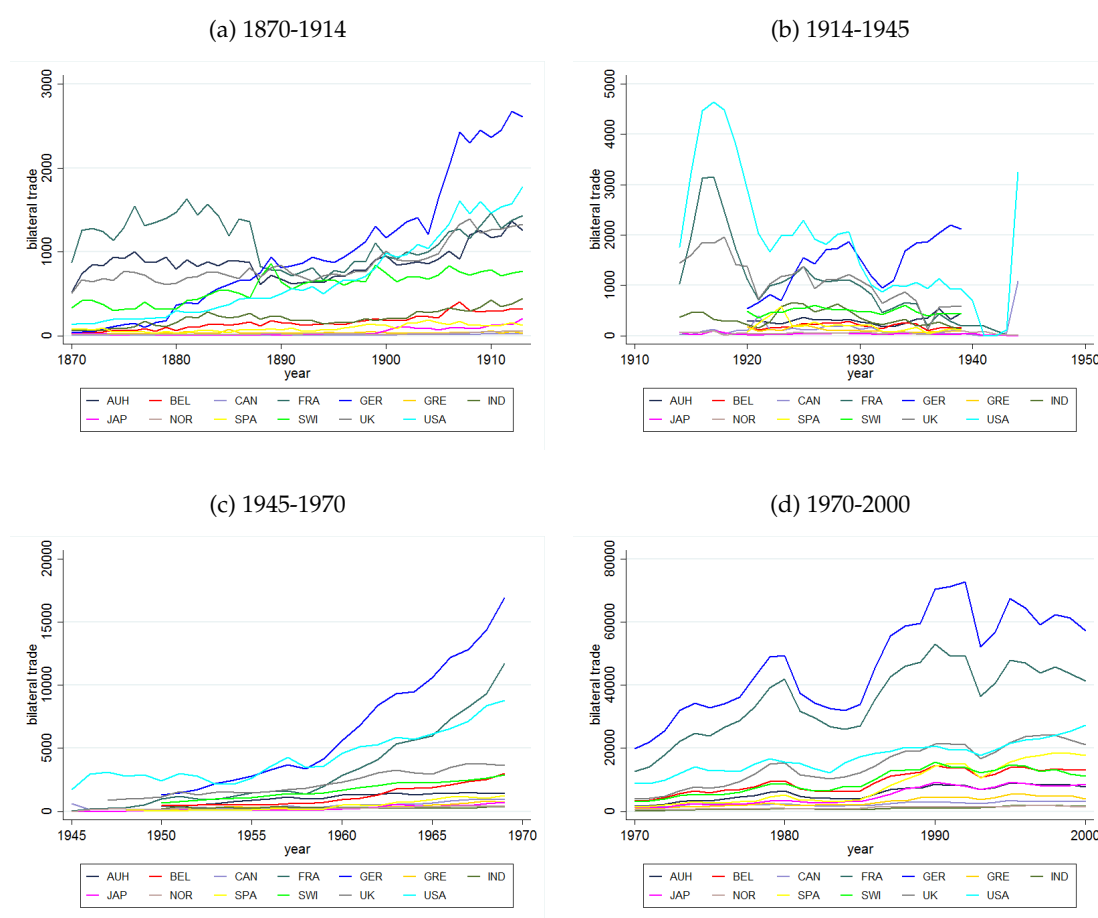
In the last decades of the Twentieth Century, common European trade policy and GATT negotiations drove the evolution of Italian trade policy. In particular, the Seventies were marked by progressive tariff reductions, fuelled by the GATT Tokyo Round in 1973-79.

The continued expansion of multilateralism, however, often overlapped with various episodes of rising non-tariff barriers that even gave rise to fears of “neo-protectionism” (cf. Grilli, 1984). One such example were the quantitative restrictions on imports and the increased administrative controls that spread in the aftermath of the oil shock of 1973 and the subsequent global recession of 1974-75. Similarly, the Multi Fiber Agreement, which governed world trade in textiles and garments from 1974 to 2004, imposed heavy quotas on the exports from developing countries to high-income economies. The Eighties also witnessed an increase in overall non-tariff protection, accompanied by measures to support production and exports. In 1995, the World Trade Organisation (WTO) was established to replace the GATT – but, given the above, many still question its effectiveness (together with that of other international institutions) in promoting actual trade growth in the following years (see for example Irwin, 1995; Rose, 2004; Subramanian & Wei, 2007).

At the regional level, on the contrary, the end of the Twentieth century was marked by a

further tightening of European ties, which led to the signature of the Maastricht Treaty in 1992. The treaty, which was intended to extend the European Economic Community to the areas of foreign policy, military, criminal justice, and judicial cooperation, established the “three pillars” of the European Union (the supranational European Community, Common Foreign and Security Policy, Justice and Home Affairs), and set the stage for the introduction of the euro in 2002.

Figure 4.1: Italian bilateral trade flows



Notes: Trade flows are expressed in 1990 PPP USD.

Data source: Jacks et al. (2011).

4.4 Data sources

For the analysis that follows, we mostly rely on the dataset on historical global trade flows built by Jacks et al. (2011). The dataset reports information on the volume of trade flows among 149

country-pairs from 1870 to 2000, along with other measures such as countries' GDPs, aggregate trade flows, mean tariffs and adherence to a fixed exchange rate regime.

Italy features in 1703 entries, which report trade with thirteen partner countries (Austria, Belgium, Canada, France, Germany, Greece, India, Japan, Norway, Spain, Switzerland, the UK, and the US). The time series of the bilateral trade flows with each country, computed for the four broad historical phases identified in Section 4.3, are visualised in Figure 4.1.

We also retrieve data on firm entry rates and the rate of growth of the Italian population. The former come from Assonime, the Association of the Italian Joint Stock Companies, while we infer the latter from the Italian National Accounts reconstructed by Baffigi (2013) for the Bank of Italy.

4.5 Estimating the gains from trade

4.5.1 The static gains from trade

Like Arkolakis et al. (2012), we define the gains from trade as the ratio of general welfare W after and before a trade event, and compute them as a function of the trade elasticity ϵ and the country's share of expenditure on domestic goods λ .

Given country i 's total expenditure x_i , which is composed of aggregate imports m_i and expenditure on domestic products x_{ii} , λ_i is defined as

$$\lambda_i = \frac{x_{ii}}{x_i} = \frac{x_{ii}}{m_i + x_{ii}}. \quad (4.1)$$

If one is able to estimate λ and ϵ , Arkolakis et al. show that the (static) gains accruing to country i from a trade shock in year t can be computed as

$$\frac{W_{i,t+1}}{W_{i,t}} = \left(\frac{\lambda_{i,t+1}}{\lambda_{i,t}} \right)^{\frac{1}{\epsilon}}. \quad (4.2)$$

In the case of a move from current trade to autarky (when the domestic trade share equals one), Equation (4.2) can be rewritten as

$$\frac{W_{i,t+1}}{W_{i,t}} = \lambda_{i,t}^{-\frac{1}{\epsilon}} \quad (4.3)$$

As ϵ is a negative value and λ is a quantity lower than 1, Equation (4.3) highlights that autarky always makes a country worse-off. Clearly, however, the higher the ex-ante domestic trade share (i.e. the lower the existing level of international trade), the lower the loss in welfare produced by a move from current trade to autarky.

In what follows, we will compute the static gains from trade GFT_S as the gains originating from the move from a hypothetical autarkic regime to the actual level of trade observed in each year, which therefore amounts to the reciprocal of Equation (4.3):

$$GFT_S = \lambda_{i,t}^{\frac{1}{\epsilon}} \quad (4.4)$$

4.5.2 Firm selection and the dynamic gains from international trade

For the estimation of the dynamic gains from trade, we draw on the work by Sampson (2016).

In Sampson's model, firms are heterogeneous and compete on a market with no barriers to entry. The productivity of new entrants is endogenous to the productivity distribution of incumbent firms: when new firms are created, innovators can thus learn from the incumbents. Firm selection in export markets along the mechanisms highlighted in Melitz (2003) therefore not only increases the average productivity of existing firms, but also causes productivity spillovers to new entrants. This in turn means that a higher exit productivity cut-off does not affect the probability of successful entry, but that, at the same time, the exit cut-off productivity must increase even further,¹¹ to ensure that free entry in the market is preserved. Eventually, this turns into an increased intensity of creative destruction, and boosts the growth rate of average firm productivity in the economy.¹²

Sampson states that the dynamic gains from trade originating from these mechanisms reinforce the static gains from trade computed à la Arkolakis et al. (2012), and that the resulting total gains from trade are the product of the two quantities:

$$GFT = GFT_S \times GFT_D, \quad (4.5)$$

where S and D stand for static and dynamic, respectively.

¹¹I.e., the level of productivity required for a firm to remain in the market increases.

¹²Sampson shows that this dynamic selection effect is not offset by countervailing general equilibrium effects.

In particular, one can work out from Sampson's model an appealing expression for the total gains from trade:

$$GFT = \frac{c_0}{c_0^A} \left[\frac{q^A(1-\gamma) + \gamma(\rho-n)}{q(1-\gamma) + \gamma(\rho-n)} \right]^{\frac{\gamma}{\gamma-1}}. \quad (4.6)$$

q , q^A , and $\frac{c_0}{c_0^A}$ respectively represent the actual growth rate of the economy, the growth rate of the economy under autarky, and the ratio of initial consumption in current and autarky economy, and are computed as:

$$q = \frac{NF-n}{\epsilon} + \frac{n}{\sigma-1} \quad (4.7)$$

$$q^A = \frac{\gamma}{1+\gamma(\epsilon-1)} \left\{ \frac{1-IPR}{\gamma\epsilon} \left[(1+\gamma(\epsilon-1))(NF-n) + \frac{n\epsilon(1-\gamma)}{\sigma-1} + \gamma\epsilon\rho \right] + \frac{\epsilon n}{\sigma-1} - \rho \right\} \quad (4.8)$$

$$\frac{c_0}{c_0^A} = \left(\frac{1}{1-IPR} \right)^{\frac{1}{\epsilon}} \left[\frac{1 + \frac{\sigma-1}{\epsilon\sigma+1-\sigma} \frac{n+\epsilon(q-\frac{n}{\sigma-1})}{n+\epsilon(q-\frac{n}{\sigma-1})+q\frac{1-\gamma}{\gamma}+\rho-n}}{1 + \frac{\sigma-1}{\epsilon\sigma+1-\sigma} \frac{n+\epsilon(q^A-\frac{n}{\sigma-1})}{n+\epsilon(q^A-\frac{n}{\sigma-1})+q^A\frac{1-\gamma}{\gamma}+\rho-n}} \right]^{-\frac{\epsilon\sigma+1-\sigma}{\epsilon(\sigma-1)}}. \quad (4.9)$$

IPR is the import penetration ratio,¹³ NF is the rate of firm creation, n the population growth rate, ϵ the trade elasticity, σ the elasticity of substitution in consumption, γ the elasticity of intertemporal substitution, ρ the discount rate.¹⁴

Rearranging Equation (4.5), one only has to divide Equation (4.6) by the expression of the static gains from trade in Equation (4.4) to obtain an estimate of the dynamic gains from trade.

Looking at Equations (4.6)-(4.9), the definition of the total gains from trade appears to con-

¹³The import penetration ratio IPR for a country i is defined as the degree to which domestic demand x_i is satisfied by aggregate imports m_i :

$$IPR_i = \frac{m_i}{x_i}.$$

As such, the concept of the IPR is directly complementary to that of the domestic trade share λ : rearranging Equation (4.1) yields

$$IPR_i = 1 - \lambda_i.$$

¹⁴Cf. Sampson (2016) for details on how Equation (4.6) is obtained.

veniently amount to a non-linear function of just three observables and four parameters:

$$GFT = f(IPR, NF, n, \epsilon, \sigma, \gamma, \rho), \quad (4.10)$$

where all variables are defined as above.

The measurement of the total gains from trade, therefore, ultimately boils down to the quantification of the dimensions listed in Table 4.1. For our analysis, we can easily estimate from our data the first three quantities in the table (the import penetration ratio, the rate of firm creation, and the population growth rate). We then set the intertemporal elasticity of substitution and the discount rate at respectively 0.33 and 0.04, as suggested in Sampson (2016) based on García-Peñalosa & Turnovsky (2005). Following Sampson again, we also constrain the elasticity of substitution in consumption to $\sigma = (|\epsilon|/1.06) + 1$. How we then proceed to estimate the trade elasticity is the subject of the next subsection.

Table 4.1: Quantities needed for the computation of the gains from trade

Quantity	Description	Value
IPR	import penetration ratio	observable
NF	firm creation rate	observable
n	population growth rate	observable
ϵ	trade elasticity	estimated, time-varying
σ	elasticity of substitution in consumption	$\frac{ \epsilon }{1.06} + 1$
γ	elasticity of intertemporal substitution	0.33
ρ	discount rate	0.04

4.5.3 Estimating the trade elasticity

We estimate the trade elasticity ϵ via gravity equation (Anderson, 2011). For each country pair i, j in year t , we estimate the trade elasticity as the coefficient on trade costs in a regression of the normalised (log) bilateral import share MS_{ij} on (log) variable trade costs T_{ij} , and importer and exporter fixed effects α_i, α_j (cf. Simonovska & Waugh, 2014 for a similar approach):

$$\log MS_{ijt} = \alpha + \alpha_i + \alpha_j + \theta \log T_{ijt} + \nu_{ijt}. \quad (4.11)$$

The normalised bilateral import share is defined as the ratio of the share of expenditure x_i of

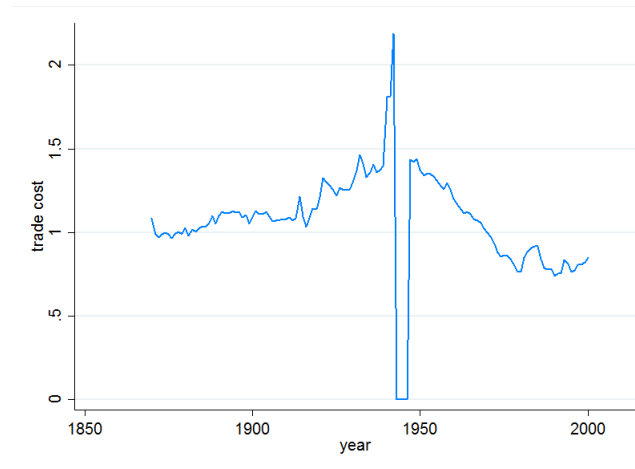
country i pertaining to its imports from its commercial partner j , over the share of expenditure that country i sources from itself:

$$MS_{ij} = \frac{x_{ij}/x_i}{x_{ii}/x_i} \quad (4.12)$$

Simplifying out x_i in (4.12), the dependent variable in (4.11) is in practice computed as the log of the ratio of imports from country j to country i to i 's expenditure on domestic goods, which we proxy by the importer's GDP minus its aggregate exports.

For trade costs, we use the tariff-equivalent index built by Gomellini (2016) following Jacks et al. (2011). The index allows us to indirectly account for all the obstacles a country faces when trading internationally, rather than just tariffs.¹⁵ Figure 4.2 plots the evolution of the trade cost measure during our period of analysis, and shows that, on average, trade costs for Italy have been equivalent to a 130 percent tariff on the value of Italian production.

Figure 4.2: Trade costs for Italy, 1870-2000



Notes: Being expressed in tariff-equivalent terms, the index can be interpreted as an implied mark-up on retail prices of foreign goods: values greater than 1 mean that the price of the same good is on average more than 100 percent higher when sold abroad.

Source: Gomellini (2016).

Running Equation (4.11) over the entire sample for every country pair in our dataset delivers a value for the trade elasticity equal to 4.02. If the analysis is then restricted to the

¹⁵On the relevance of non-tariff barriers to trade, see Anderson & Neary (1994); Anderson & Van Wincoop (2004); Greenaway & Milner (2003); Kee et al. (2009).

sub-sample of country pairs featuring Italy, the estimated trade elasticity is 3.89. Both measures are reasonably close to estimates obtained elsewhere in the literature (Bernard et al., 2003; Caliendo & Parro, 2015; Eaton et al., 2011; Simonovska & Waugh, 2014).

As a historically-sensible improvement, however, we proceed to make our estimates of ϵ time-dependent. We achieve this by running Equation (4.11) separately over various time intervals that reflect a number of relevant political or economic phases in Italian history, based on the narrative in Section 4.3 above.

As relevant milestones, we first identify the tariff-reform years 1878 and 1887, followed by 1893 which marked the beginning of a significant economic upturn (the so-called “Giolittian period”) and of a peaceful period that lasted until the beginning of the Great War in 1913. The following period comprises the First World War itself and the years immediately after it. The next one goes from 1921 to 1928, and identifies the Fascist liberalisation phase, followed by the marked autarkic regime pursued between 1928 and the last year before World War II in 1938. Next, we consider 1948 as a milestone, which closes the Second World War era and marks the creation of the GATT. The following phase reflects the Italian “economic miracle” that spread until 1963, during which Italy underwent intense economic and social development which turned it into a global industrial power. The next phase is the slowdown of the economic boom, which came to a halt with the oil shock of 1973; after that, 1982 represented a further year of deep economic crisis and stagnation. Finally, we select the signing of the Maastricht Treaty in 1992 as the year marking the beginning of the most intense phase of European integration.

All of these dates pass the Chow test for structural breaks for Equation (4.11).¹⁶ The resulting historical periodisation, together with the estimated values for the trade elasticity in each phase, is summarised in Table 4.2. The trade elasticities estimated for the 13 relevant historical periods span the range [2.36-6.58]. This wide variation, centred on, but quite dispersed around, the overall value of 4 obtained for the pooled sample, underscores the relevance of our time-dependent approach.

To address the potential concern about the arbitrariness of the choice of our relevant historical periods, we estimate time-varying elasticities splitting our sample in two additional ways as a robustness check.

Specifically, we first run Equation (4.11) decade-by-decade, and obtain estimates ranging

¹⁶Cf. Appendix Section 4.B.

in the interval [2.77-6.60], detailed in Panel A of Appendix Table A.1. Then, our second approach is to consider different structural breaks in Equation (4.11). To do so, we run regression (4.11) adding year fixed effects to the equation, consider the year dummies with a statistically significant coefficient as candidates to perform a Chow test, and then select the combination of years that allow for a sufficiently large number of observations in each period. Again, we obtain trade elasticities in the range [2.73-6.27], reported in Appendix Table A.1, Panel B.

Considering how close to our preferred ones the trade elasticities delivered by these two alternative approaches are, we are reasonably confident that our estimates are specific to the broad historical periods we consider, rather than depending on the exact years chosen to delimit each time interval.

Table 4.2: Historical trade elasticities

Period	Description	$ \epsilon $
1870-1878	Agrarian protectionism	3.71
1879-1887	Protection extended to industry	4.06
1888-1893	Tighter protectionism	3.88
1894-1913	Giolittian period	4.65
1914-1921	Great War	5.00
1922-1928	Fascism, phase I	2.88
1929-1938	Fascism, phase II	4.73
1939-1948	World War II	6.58
1949-1963	Italian miracle	4.38
1964-1973	Economic slowdown	4.27
1974-1982	Oil shock	2.83
1983-1992	Recession	3.09
1992-2000	European integration	2.36

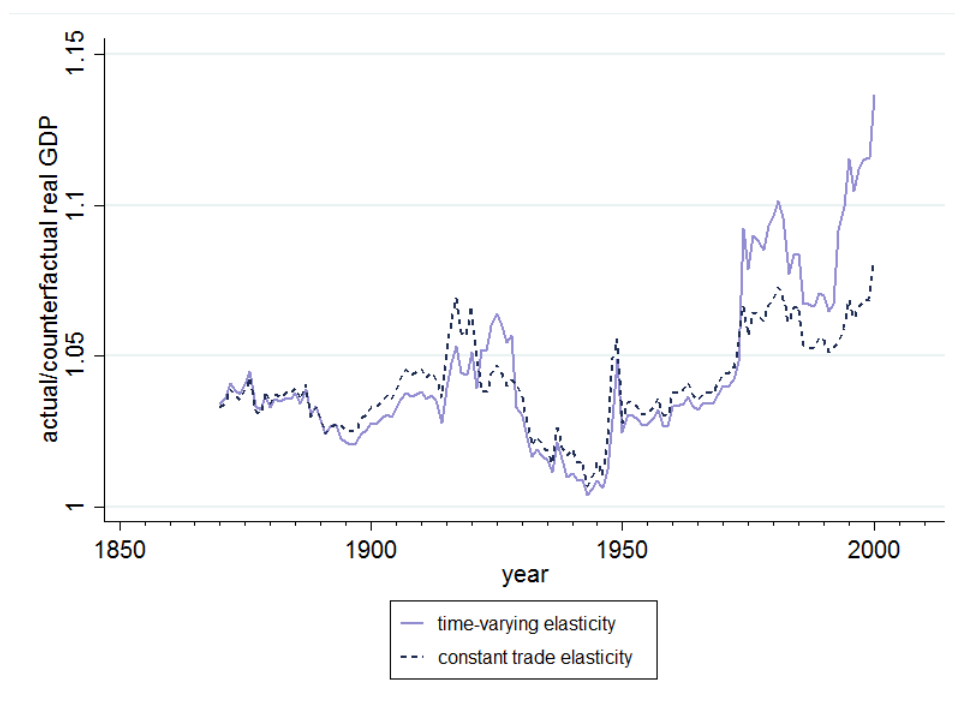
4.6 Results

The solid line in Figure 4.3 reports the static gains from trade experienced by Italy from 1870 to 2000.¹⁷ Values of the gains from trade close to 1 are indicative of no big “gains” as such, as general welfare is very similar to its counterfactual autarky value.

Overall, the average percentage gains over the entire period amount to a 4.4 percent in-

¹⁷Appendix Section 4.C replicates the analysis using the alternative sets of elasticity estimates discussed in Section 4.5.3.

Figure 4.3: Static gains from trade for Italy, 1870-2000



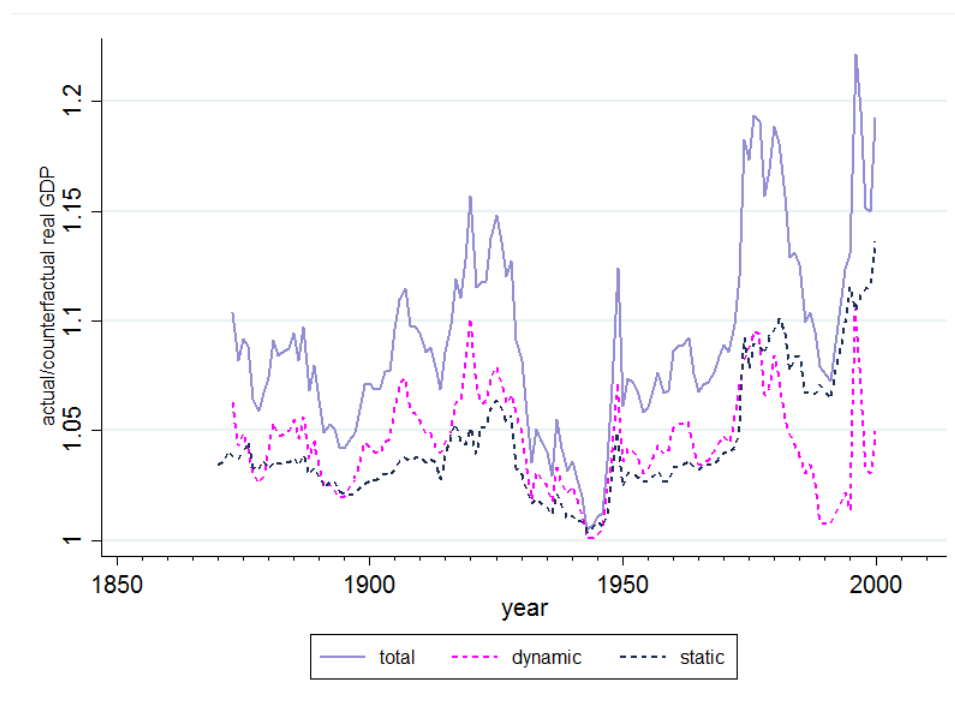
crease in real GDP per year. Starting from an average of around 2.5 percent per year in the Nineteenth century and in the first decade of the Twentieth, the gains from trade take off during the first phase of the Fascist era, reaching 6.4 percent in 1925. Predictably, the gains then start to fall after 1928, and they plummet to an all-time low of 0.6 percent in 1943, deep into the Second World War. With the restoration of peace and after-war economic recovery, the gains from trade increase again to 6.3 percent on average over the period 1950-2000, reaching 9 percent per year after 1973.

As a benchmark, the dashed, darker line in Figure 4.3 also traces the static gains from trade obtained using the value of the constant Italian-specific trade elasticity computed in Section 4.5.3. These follow a pattern which is roughly similar to the one computed with the time-varying elasticity, but here the estimates are generally smoother and less spread out. The first significant misalignment between the two series occurs in the decades between 1900 and 1930. After 1970, then, the gap between the two lines widens considerably, reflecting the much lower values taken on by the time-varying trade elasticities with respect to the fixed measure.

Adding the dynamic firm selection margin to the picture, Figure 4.4 reports the full set of gains from trade (static, dynamic and total) discussed in Section 4.5.

The average value of total gains from trade over the whole period 1870-2000 is 8.3 percent

Figure 4.4: Decomposition of the total gains from trade for Italy, 1873-2000



– almost twice as much as the average static gains from trade. The total gains from trade even reach values around 20 percent of GDP, in the mid-Seventies and mid-Nineties.

As regards the comparison between the static and dynamic components of the gains from trade, Figure 4.4 shows that the latter consistently account for a larger share of the total through most of Italian history. Dynamic gains from trade are particularly high relative to the static ones in periods of economic expansion, especially during the *Belle Époque* before World War I, the first Fascist phase, and the Italian economic miracle. From the 1980s onwards, however, the dynamic gains from trade are dramatically overtaken by the static ones. The pattern is explained by subdued population growth and a slower pace of firm creation in recent decades. If before 1978 new firms were created at an average annual rate of 11.2 percent, the figure dropped to 3.15 percent afterwards. Similarly, the average population growth rate after 1978 was almost a third of its level in previous decades (0.24 against 0.65 percent).

4.7 Conclusion

This chapter computes the gains from trade predicted by quantitative trade models for Italy over the Nineteenth-Twentieth Centuries. Using bilateral trade data, we measure the welfare

gains from trade quantifying the GDP increase that would be obtained in case of a hypothetical move from autarky to actual levels of trade.

Our findings indicate that trade brought significant positive effects to the Italian economy, which can be quantified in welfare increases of up to 20 percent of real GDP in some years. On average, over 1870-2000, total gains from trade amounted to 8 per cent of GDP per year, with important distinctions among periods. Breaking down the gains from trade into their static and dynamic components, the dynamic one turns out to be quantitatively relevant, driving variation for most of Italian history. However, the dynamic gains from trade have lost relevance in recent decades relative to their static counterpart, most likely due to a slowdown in the rates of firm creation and population growth.

Our estimation relies on a “sufficient statistic” approach, which allows the researcher to make welfare predictions without having to solve for all the endogenous variables in a general equilibrium model (Arkolakis et al., 2012). At the same time, sufficient statistics as such hold for broad classes of models, and can thus abstract from specific model assumptions, as well as from the mechanisms that generate observed behaviour in practice (Chetty, 2009). Our measures, similarly, potentially account for different sources of welfare gains envisaged by quantitative trade models, depending on how one interprets the elasticity parameter. In particular, our results reflect the gains from trade stemming from either new import varieties available to consumers as in Krugman (1980), or the firm selection effect outlined in Melitz (2003). However, as they are derived from a theoretical framework with CES (constant elasticity of substitution) preferences, which imply that firm mark-ups are constant, our estimators do not capture the pro-competitive effects of trade (Arkolakis et al., 2015; Melitz & Ottaviano, 2008). In this sense, our results can be considered a lower bound to the total gains from trade predicted by models with firm heterogeneity.

A second qualification regarding our “sufficient statistic” strategy has to do with the interpretation of our estimates. As highlighted in Chetty (2009), a sufficient statistic is a black box: although the researcher can dispense with a full specification of the model underlying the welfare analysis, and does not need to identify its primitives, sufficient statistics do require some modelling assumptions – but one cannot be sure whether the data are actually consistent with the model itself. In our case, the models underlying our analysis *assume* the existence of the

gains from trade, identifying them as a function of a narrow set of observables and parameters. Our paper, as such, cannot be regarded as a test of the desirability of trade for the economy: in no way, for example, the formulas we use for our computations could deliver a negative result – at most, if a country is not trading, its domestic trade share will be equal to one, tautologically yielding an estimate of zero gains from trade. We therefore largely abstract here from the question *whether* trade has brought benefits to the Italian economy at all, and rather quantify *how big* those benefits have been in a world consistent with the assumptions of the quantitative trade models recently developed by trade theory. The evidence we present suggests that those gains should indeed be quite substantial.

From a development economics perspective, it is nevertheless instructive to observe how the gains from trade, however computed, evolved during different phases of Italian history. In fact, we follow the entire development trajectory of a country whose status transited from that of emerging economy to leading global industrial power in modern days. For example, the marked prominence of the dynamic gains from trade in the first half of the country's history reflects the link between international trade, industrialisation and structural transformation, and growth.¹⁸ Similarly, the fact that the static gains from trade have become more pronounced in more recent times, well after Italy accomplished its transition into the club of high-income economies and especially in the context of European integration, most likely depends on the higher relevance of intra-industry trade and of gains from variety. In this sense, our paper highlights the contribution of different forces to the benefits that an economy can derive from trade, uncovering the margins that matter the most at different stages of the development process.

¹⁸See e.g. Matsuyama (1992); Tombe (2015); Uy et al. (2013).

Appendix

4.A Alternative time-varying estimates for the trade elasticity

Table A.1: Time-varying trade Elasticities, alternative estimates

Period	$ \epsilon $
<i>Panel A:</i>	
<i>By decade</i>	
1870-1879	3.69
1880-1889	4.29
1890-1899	5.63
1900-1909	4.15
1910-1919	5.80
1920-1929	3.30
1930-1939	4.81
1940-1949	6.60
1950-1959	3.94
1960-1969	3.20
1970-1979	3.09
1980-1989	3.19
1990-2000	2.73
<i>Panel B</i>	
<i>By structural breaks</i>	
1870-1883	3.54
1884-1938	4.65
1939-1954	6.27
1955-1964	4.43
1965-1989	3.68
1990-2000	2.73

4.B Chow tests for structural breaks

Table B.2: F-statistics from Chow test for structural breaks

Historical periods	
Year	F-stat
1878	5.77***
1887	6.34***
1893	9.12***
1913	16.54***
1921	4.09***
1928	9.97***
1938	3.74***
1948	6.01***
1963	10.90***
1973	19.17***
1982	8.65***
1992	13.99***

H_0 : year does not represent a structural break

Table B.3: F-statistics from Chow test for structural breaks

Periods derived from statistically significant year dummies

Year	F-stat
1883	8.88***
1938	17.25***
1954	5.95***
1964	19.24***
1989	11.79***

H_0 : year does not represent a structural break

4.C Results - alternative estimates for the trade elasticity

Figure C.1: Static gains from trade for Italy, 1870-2000

Elasticity estimated by decade

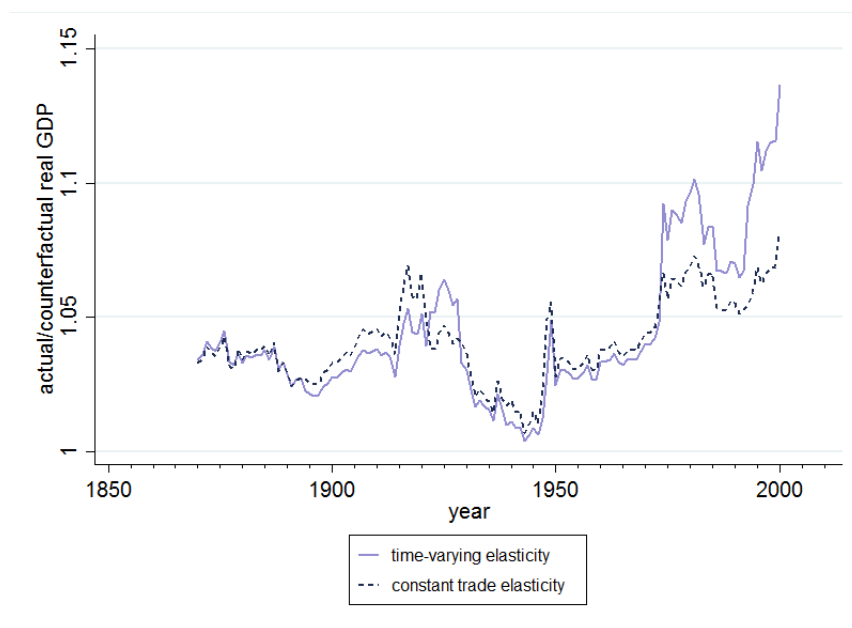


Figure C.2: Decomposition of the total gains from trade for Italy, 1873-2000

Elasticity estimated by decade

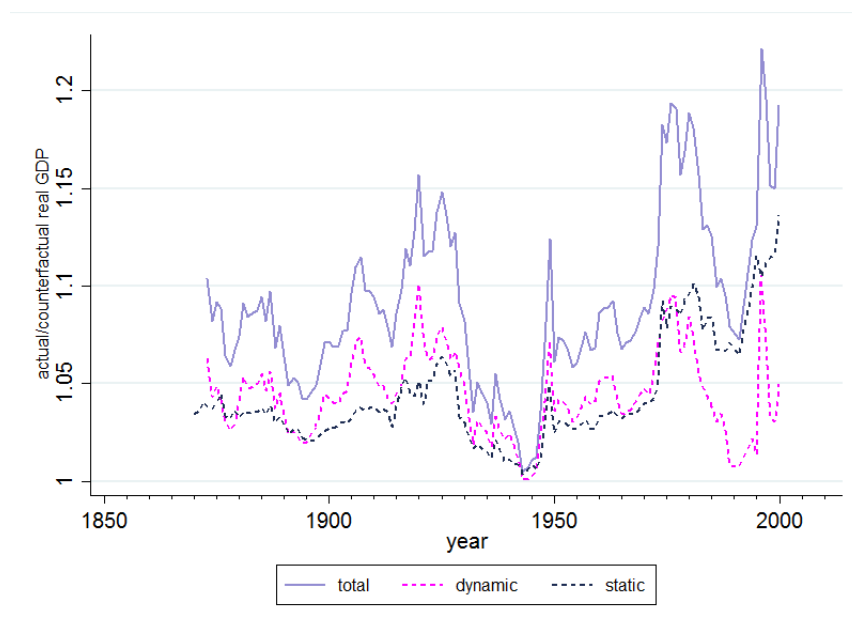


Figure C.3: Static gains from trade for Italy, 1870-2000

Elasticity estimated in periods derived from statistically significant year dummies

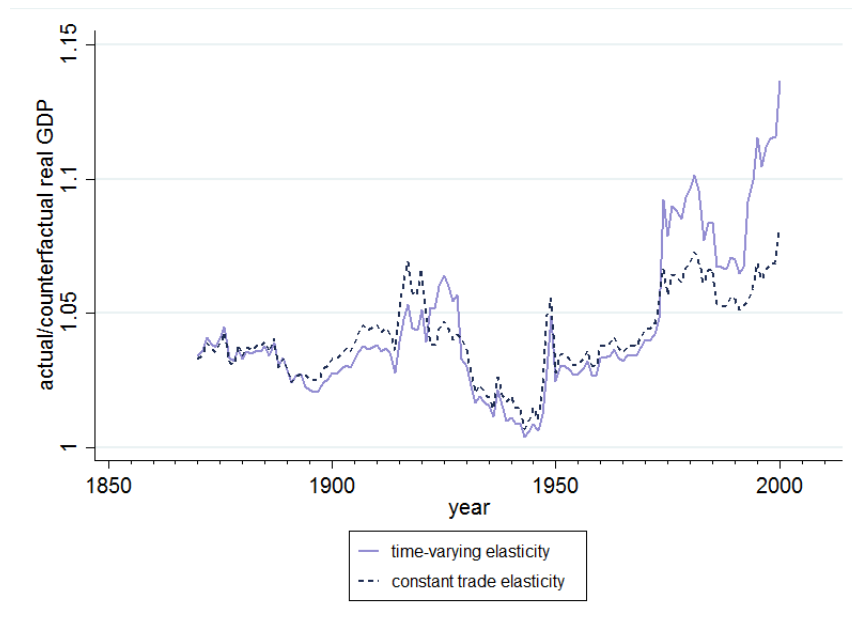
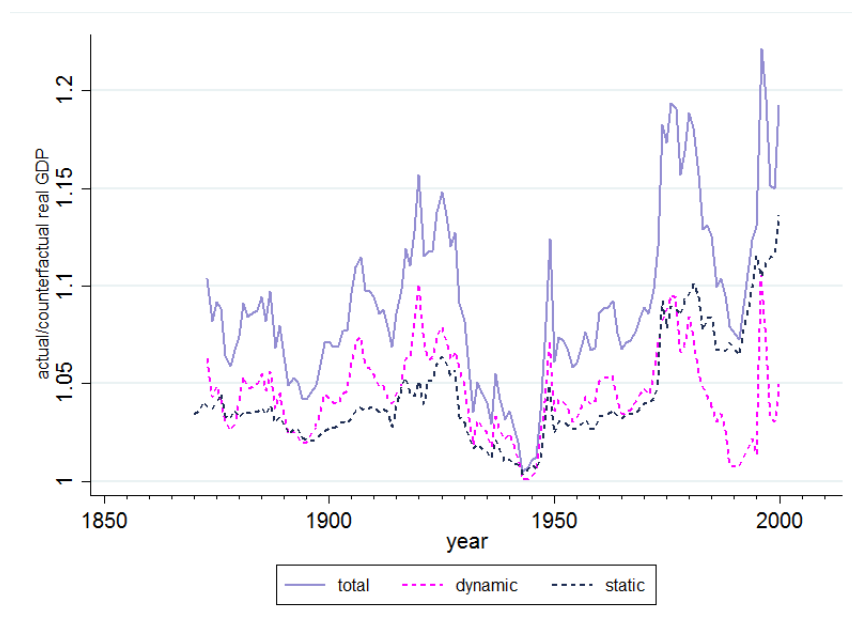


Figure C.4: Decomposition of the total gains from trade for Italy, 1873-2000

Elasticity estimated in periods derived from statistically significant year dummies



CONCLUDING REMARKS

DISCUSSION AND AVENUES FOR FUTURE RESEARCH

This thesis has explored the interdependencies between development and trade openness, shedding light on a number of channels through which developing economies stand to gain or to lose from integration into global value chains.

In Chapter 1, I have shown that transmission of international crop prices induces farmers in Uganda to increase their share of titled land. I have provided evidence that this effect results in part from a relaxation of households' budget constraints: when the value of their production increases, agricultural producers are better-off, and can afford the higher costs implied by dealing with titled land. I have also shown that this is especially true when the land is ex-ante more profitable, for example when it is harvested with more valuable cash crops, or when it features some form of sunk investment. On the other hand, the increase in demand for land titles also arises in response to land insecurity. Absent any sort of land certification, in fact, farmers frequently feel threatened in their right to use the land. When the prospect of higher revenues induced by increasing prices makes the land more valuable, they have even more to lose from potential land grabbing: consequently, they tend to prefer holding land whose ownership or right to use they can prove. Although farmers in my sample seem to believe that land titles are an effective shield against land grabbing, however, this may not be the case in practice. For instance, in Uganda, the state has the power to compulsorily acquire land if it is considered to be in the public interest (Ministry of Lands & Urban Development, 2011; see also Alden Wily, 2011; Tanner, 2010). Some scholars have even argued that a number of traditional, informal types of tenure might ultimately be more efficient in granting land security (Brasselle et al., 2002; Van Leeuwen, 2014, 2017). In terms of future research, it would therefore be instructive to study whether land titles are actually effective in preventing land threats. Another promising direction for future work is represented by the channels through which

market forces affect social interactions and social capital. In this thesis, I have documented that access to titled land differs across various socio-economic groups, and that this heavily depends on social capital. The measures of social capital I have used in my analysis, however, were all built on time-invariant characteristics of the farmers' communities, whereas it is more than likely that price dynamics affect social capital *as well*. A hint in this direction is the fact that in high-social-capital areas weaker groups respond more to an increase in prices, whereas in low-social-capital ones it is the powerful who do. Taking this logic to the extreme, in fact, one may even envisage a self-reinforcing mechanism in which cooperative communities get better and better, while more particular ones become more and more unequal. Given existing evidence on the role of social capital in boosting both economic performance and the efficiency of political institutions,¹ one cannot over-emphasise the relevance of this kind of questions for research in development economics.

Turning to a more direct link between trade openness and living standards, in Chapter 2 of this thesis I have evaluated the impact of a free trade agreement across regions in Honduras. I have shown that trade liberalisation produces a reduction in household income in regions more exposed to trade, and have provided evidence that the cause of this pattern lies in adjustment costs driven by local labour market effects. In the regions hit by foreign competition, workers suffer from a reduction in wages that reverberates across various sectors of the economy. This in turn either produces an increase in informal employment, or discourages participation in the labour force altogether. A puzzling finding from my robustness checks, nevertheless, is that these results appear to be the product of both import *and* export exposure. True, I have shown that import- and export-intensity are strongly correlated in Honduras, so that the regions that are most exposed to import competition tend to be the most export-intense too. This was indeed the rationale for considering trade openness as my treatment variable rather than the two individual trade flows. However, whether living standards could have deteriorated also through the export channel, and in which way this might have occurred, still remain open questions. One possible explanation could be the expansion of the *maquila* industry, which the press and activists regularly denounce as not respecting international labour standards. De Hoyos et al. (2012), however, report positive wage differentials between *maquila* and other manufacturing industries, and Ham (2015) shows a relatively high compliance

¹See e.g. Rothstein (2003); Temple (1998); Whiteley (2000); Woolcock & Narayan (2000).

with minimum wage regulations in the *maquila* sector. Other possibilities could then be competition with other DR-CAFTA partners for access to the US market, which would drive down both product prices and factor rewards, or power imbalances between Honduran producers of export goods and big buyer firms or retailers in the United States. Disentangling which mechanisms lie at the heart of the negative impact of export growth on household living standards seems like another fruitful topic for future research.

While Chapters 1 and 2 deal with recent events, Chapter 3 of this thesis is grounded in economic history. Together with my co-authors, I have addressed the relationship between migrant remittances and financial development, across Italian provinces, between the end of the Nineteenth century and the beginning of the Twentieth. We have shown that remittances had a positive impact on the growth of bank deposits, especially for commercial and postal savings banks. We have also provided evidence that remittances were associated with higher GDP and an increase in the number of active bank branches. We have argued that this evidence supports the hypotheses of an income effect of remittances, and of their contribution in spreading a financial culture throughout the country. Future work could assess the role played by remittances and financial deepening in determining poverty levels and well-being in Italy (Vecchi, 2017). A possible further extension could then be to analyse whether differing patterns of financial sector evolution contributed to the emergence of the “regional divide” between development in the North and the South of the country (De Rosa, 2000; Felice, 2013).

Finally, Chapter 4 is an empirical application of theoretical models of trade with product variety and firm heterogeneity. With my co-author, we have measured the gains from trade predicted by these models for Italy between 1870 and 2000. The main methodological contribution of the chapter has been the introduction of time-varying trade elasticities, which we have estimated accounting for developments in Italian economic and trade history. In future work, we plan on extending this methodology to the other parameters we have used to build our estimators. Moreover, we will try to empirically estimate the GDP and poverty-reduction gains that the country actually derived from trade throughout its history, to check whether their patterns match those of the “sufficient statistics” predicted by trade theory that we have analysed in the chapter.

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