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**EXPLAINING LONDON'S DOMINANCE IN
INTERNATIONAL FINANCIAL SERVICES, 1870-1913**

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Explaining London's Dominance in International Financial Services, 1870 - 1913*

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Abstract

Contemporaries and historians have highlighted London's position as the world's leading financial centre, and its dominance of both trade financing and international capital investment at this time. The current historical literature focuses on the presence of the London Stock Exchange and Britain's role as leader of the Gold Standard as the key reasons behind the City's position. This paper presents a richer explanation, that treats the international financial services industry as a footloose sector that can migrate around the globe. By focusing on how the individual merchant banks operated and the forces that were important in driving the banks to agglomerate to the City, this work provides an alternative explanation for London's dominance of financial services prior to 1913, and can explain how London was able to maintain its position for so long, despite competition from other centres.

Key words: Financial Services, City of London, pre-WWI, agglomeration, CGE Simulations

JEL classification: N23, F14, G21

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1 Introduction

The observation that London was the world's leading financial centre c.1900 is not startling. Both contemporaries and historians since the period have highlighted London's dominance in both trade financing and international capital investment at this time, and her position at the centre of the financial world (for example Cassis (2006), Cain & Hopkins (1987), Michie (2000) and Flandreau & Jobst (2005)). The current historical literature focuses on the presence of the London Stock Exchange and Britain's role as leader of the Gold Standard as the key reasons behind the City's position. This paper presents a richer explanation, that treats the international financial services industry as a footloose sector that can migrate around the globe. By focusing on how the individual merchant banks operated and the forces that were important in driving the banks to agglomerate to the City, this work provides an alternative explanation for London's dominance of financial services prior to 1913.

The narrative historical literature on the City of London, such as Chapman (1984), Cain & Hopkins (1987) and Cassis (1994) takes London's position as a given, instead focusing on individual firms and the men that ran them. This body of work highlights the fact that the City contained a large number of banks, who typically specialised in one type of instrument, and in most cases a specific geographical location (e.g. CJ Hambros focused almost exclusively on Scandinavian securities issues). Although this literature provides plenty of information on the banks' characteristics, it does not connect this with how the banks and the City operated and interacted. More recent work however has attempted to analyse how the City's merchant banks worked (e.g. Flores 2007, Flandreau 2008), and has highlighted both the importance of information in production and that information is asymmetric (creating a role for a bank's reputation). This paper builds on these ideas, analysing the way banks operated to provide insights into why they chose to agglomerate to the City.

Work has also been done on competing financial centres, in particular Paris and Berlin. Cassis's (2006) work leads the field and highlights Paris' position as the world's second centre behind London, with Berlin characterised as up-and-coming competition. Neither centre was able to break into the trade financing market, and despite their best efforts could only access this market by relocating to the City (as Deutsche Bank did). In capital issuing these centres had more success, and Cassis points out that Paris in particular was a major player in long term capital issues. More recent work by Esteves (2008) adds to this with a new data set that highlights Berlin's position as a capital issuer for particular regions of the globe (Southern Eu-

rope, Turkey and the German colonies). The data indicate that London is not the only operator in the issuing market, and that other centres were able to enter and compete with London in certain areas.

Related to the narrative literature, a large body of work has focused on the development of stock exchanges in financial centres in the nineteenth century. The focus has been on the London, Paris, Berlin and New York markets, explaining their dominance as a result of the benefits to large, centralised markets. Gehrig (1998) highlights investor preference for a liquid market¹, information spillovers and the informational complexity of financial instruments² as three possible generators of agglomerated financial markets. In more recent work, Hautcoeur & Riva (2009) argues that competition between centres offering different services to the market (price stability over liquidity, investor insurance but at a premium etc) is an important part of the story in this period, and implicitly should be included in any explanation of why the London market was so large.

The presence of a large, liquid market was undoubtedly beneficial to the City's merchant banks, but it may not have been the key reason for the banks to locate in London. The trade financiers in particular were one step removed from the markets, and it is not clear that the presence of the LSE would have been beneficial. For the capital issuers, it is more obvious how they benefitted (they needed a market to float the debt), but even here there is a gap in the story. All of the major financial centres had some form of free market operating in this period, and as Davis, Neal & White (2003) point out, investors in security issues were not necessarily residents in the country of issue, and the stock could be traded on any exchange. This fact was also noted at the time; "...this country has become the chief centre for foreign loans...this has become the great centre for lending the money of foreigners to foreigners, as Holland formerly was." (Clarke 1878). Therefore, whilst the LSE was a part of the story, it can not completely explain the City's grip on international financial services.

In more general theoretical literature, agglomeration of an industry is generated by external economies of scale that are limited geographically. Transport costs are the most obvious reason for a firm to locate in a specific area, to locate close to either the final good market or intermediate in-

¹Risk averse investors prefer to trade (and therefore locate in) a liquid market so that their actions do not significantly affect the market price of the instruments.

²Gehrig presents a model where regional financial centres maintain the market for instruments that have some information that is very costly to transfer e.g. company securities. This is in contrast to markets e.g. foreign exchange trading where the information is freely available globally. As a result these marketplaces are footloose and typically fragmented.

puts, and this is the key insight from the economic geography literature (e.g. Krugman 1991*b*, Krugman & Venables 1993, Krugman & Venables 1995*b*). A similar mechanism can be generated by the labour market, where firms locate close to the largest pool of skilled labour to facilitate matching. Finally technological spillovers, first suggested by Marshall as 'spirits in the air' are put forward as a possible explanation. Added to this, the work done on city formation argues fixed cost shared capital (for example a stock exchange) is a motivator to agglomerate (Fujita & Thisse 2002).

Despite the suggestions from the theoretical literature, the current historical literature on the City of London has not yet explained why the banks themselves were drawn to operating in the same geographic location, and the implications this has for the City's position as a leading financial centre. Increasing returns are hinted at in the literature, but there has not been a systematic theoretical analysis of how the City operated and interacted with other financial centres. This paper will draw the theoretical and analytical literature together, adding to the work already done on how the City operated as an institution and the implications of this for London's position as a financial centre. By going beyond the usual narrative approach, I can assess what aspects of international financial services production drove agglomeration, highlighting facets of the City which the purely financial literature has so far not discussed.

I begin in Section 2 with a discussion of the day-to-day workings of the City and its banks, gathered from both the literature and the archives of four major merchant banks that operated in this period. Section 3 uses this evidence to build a model, which generates agglomeration through input-output linkages between firms³. These linkages are combined with a centre-specific network institution, which is built up between firms as a result of agglomeration. As a co-located industry, centres could use their power to influence political decisions and ensure that government policy was beneficial, e.g. putting pressure on other governments to honour their debts. However, this influence was limited, and linked to the political and cultural ties a centre's country had with particular geographical areas⁴. Having built the model, Section 3.3 presents some simulations, to illustrate the equilibrium market structure and its stability in the face of shocks. More archive evidence is then used in Section 4 to support the predictions of the simulations and the assumptions needed to generate realistic equilibria.

³This model fits into the family of new Economic Geography models, where agglomeration is generated endogenously within the model.

⁴This creates a sorting equilibrium, and explains the partial specialisation of centres in this period on certain areas, e.g. Berlin's dominance of capital issues to Turkey, London's dominance of issues to the Empire etc

Section 5 concludes, arguing that the strong input-output linkages between banks can explain how London (having begun as a leading financial centre in the 1820s) was able to consolidate its position over time. The result was an industry able to dominate international financial services unchallenged into the twentieth century.

2 Evidence

To build up the model's underlying assumptions and properties, I use the current literature and evidence from the archives to answer two key questions.

- What were the benefits to banks from locating close to each other?
- How did the banks operate individually? What were the key inputs into the production function?

The archive material is taken from four merchant banks operating in the City at the time. Although the sample is small (4 of approximately 100 banks operating in London during the period), it provides important general insights and given the small number of surviving archives it would be very difficult to improve. The four archives examined are Antony Gibbs & Sons, Brown, Shipley & Co, Kleinwort, Sons & Co and JS Morgan & Co⁵. The archives for Antony Gibbs and Kleinwort appear to be complete; no ledgers or correspondence files were missing from any series and an extensive amount of material has survived. The JS Morgan archive is in almost the same condition, with very few (but some) ledgers and files missing from series. In these three banks, I am therefore confident that the inferences about the firms and their operations are correct. The Brown, Shipley archive is less complete, with a number of ledgers, books and files missing from various series. Nevertheless, a substantial amount of the internal correspondence has survived, and by extrapolating from this and from the ledgers that do exist, I am fairly confident that my interpretation of the business is accurate.

2.1 Evidence of agglomeration

The City's control of the financial world in the 19th century is one of the most well-known historical stylised facts. This dominance was coupled with a belief that this position was unassailable, as this quote from 1903 shows

⁵All of these archives are held at the Guildhall Library in the City of London. The only other immediately accessible archives I have found belong to Barings and N M Rothschild.

”We are, it is admitted, the financial centre of the world; this is more than a phrase, it is a fact. Our position has indeed been assailed, but so far without effect.” (Felix Schuster, quoted in Chapman (1984)). The quote highlights the fact that the City went largely unchallenged in this period. Despite some competition from Berlin and Paris in capital issuing (Esteves 2008), London remained at the heart of the financial world.

The concentration of the financial houses in the square mile has also been noted by the literature. Using address data from Skinner’s annual trade directory of financial firms in Britain (Skinner 1880 onwards) and plotting this on a map of the City (Figure 2.1), we can see the extent of the agglomeration. By 1913, 84.3% of international financial services firms were located within the outer box (0.16 squared miles), with 69% within the inner box (0.06 squared miles). This degree of concentration suggests that the benefits from locating close to other firms is strongly related to proximity, i.e. the bankers wanted to be within easy walking distance of each other.

2.2 Benefits from co-location

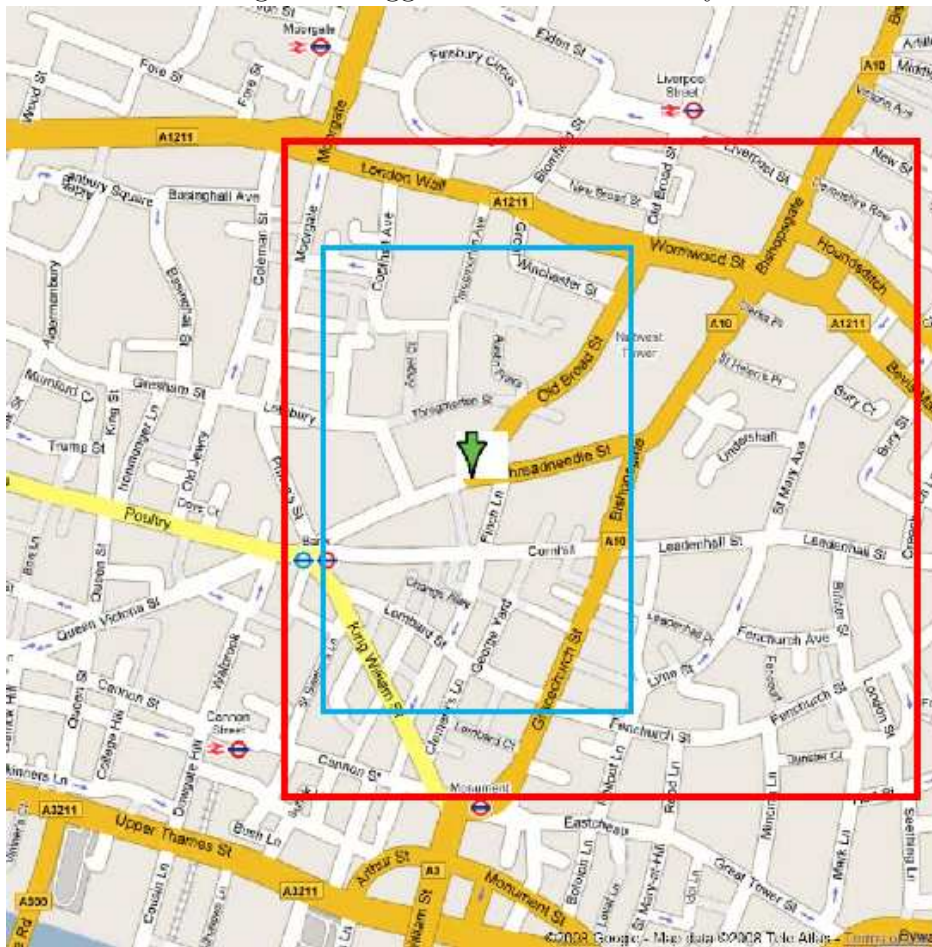
The data from Skinner highlights the importance to firms of locating close together, but it does not tell us what the benefits of co-location were. Davis & Galman (2002) highlight network-type externalities as an important driver of agglomeration of financial institutions, but they do not discuss explicitly the benefits. Flandreau (2008) and Flores (2007) take this further, and argue that banks used each other as sources of information and as ways of spreading reputation (one of their most valuable assets)⁶. This paper continues in the same vein, and using the archive evidence I can build up a picture of how the banks operated and interacted.

All of the banks sampled used their proximity to other firms to gather information informally. For example, a volume titled ‘Extract of Correspondence’ from the JS Morgan archive⁷, dated 1900-1902, records the information gathered by partners from the City. Many of the entries regarding potential issues refer to consultations with other houses, and most of these issues were in areas where Morgan had little experience, for example the St Petersburg Viarka Railway Company (who were introduced to Morgan in 1901 by the railway’s London agent Susherst). Not only is this an example of the firm using other banks to garner information, it also highlights the fact that the wider City institution (including insurance brokers and underwriters, shipping brokers etc) were key sources of information for firms. This

⁶In his study of the Barings crisis of 1891, Flores argues that the market used Barings’ reputation as a substitute for information.

⁷The volume is held at the Guildhall Library, London, reference no. MS21799.

Figure 1: Agglomeration of the City



hints at the role of the City as a complete institution in London's dominance, something which has so far been missed in the historical literature.

Even more compelling than this evidence are the records regarding other merchant banks. Here it is obvious that this information was gathered by word of mouth. For example, JS Morgan's entry regarding Kleinwort begins with 'It is generally known in the City...' and goes on to document Kleinwort's position in the City (as one of its largest trade financing houses), their focus on continental credit, in particular Germany, and the liquidity problems they had in the run-up to World War I as the political situation disintegrated. This kind of detailed information was only available within the City, and clearly indicates that information was shared between the banks.

Brown, Shipley used the City for similar purposes, as a letter dated c.1882 sent from the Liverpool to the London house of Brown Shipley⁸. The letter refers to speculation in Liverpool about a potential J Henry Schroeder⁹ issue. Although this appears to be information coming from outside the City, it is highly likely that the London office first mentioned this and Liverpool were reporting back (Schroeder worked out of London). Unfortunately none of the Brown, Shipley out-letter books have survived and I can not confirm this.

There is also evidence that reputations were transmitted around the City and beyond. The extracts from the correspondence volume from the JS Morgan archive contains detailed entries for all of the major merchant banks in London at the time, recording changes in their financial position, the impact of major events on their business (for example the First World War) and in general how each bank was perceived in the City. An example entry for Gibbs notes that the bank was the leader in global nitrate selling and financing. The firm profitted greatly during WWI, as government demand for nitrates rocketed, but the entry notes that the slump in demand (caused by an inability to pay) in the 1921-22 recession lost the firm £3 million in 1921 alone. As with the Kleinwort entry, it is clear that not only was the information gathered from the gossip and news in the City, but that the bank's reputation (derived from this information) within London was transmitted.

Documents in the Brown, Shipley archive corroborate this fact. Brown, Shipley appear to have been held in high regard within the City as an ultra-reliable and trustworthy private bank and issuer¹⁰. Their reputation was

⁸Letter is held in the Brown Shipley archive at the Guildhall Library, reference no. MS20107.

⁹Another merchant bank that specialised in Latin American and Carribean railway issues.

¹⁰Uniquely in my sample, Brown, Shipley operated as a deposit account bank as well as being a significant player in international financial services.

spotless, and as a result they were used by many people as a guarantor when entering into business. Their archive contains a volume entitled 'letters of introduction'¹¹ and records all of the letters of introduction written (218) by the bank in the period 1896 - 1901. These letters were used as a way of indicating financial credibility and trustworthiness to potential business partners, and indicate how far the Brown, Shipley reputation had spread throughout Britain and the globe, despite the fact that their main business operated out of London. For example, Park Brothers & Co were customers of Brown Shipley and used Brown Shipley's reputation to introduce themselves as honest, sound partners in potential business deals. The mechanism for this reputation development is that it spread through London first, and then filtered out to the outside world.

Material in the archives of the other banks supports the suggestion that the City was a reputation builder and spreader. For example the Kleinwort archive contains a volume of enquiries received from firms about other firms (who may or may not have had dealings with Kleinwort)¹². Over the period 1880 - 1899, approximately 14,260 enquiries were made, most by letter but some in person (direct evidence of the City's face-to-face reputation mechanism). Kleinwort's reputation was such that a positive response from the bank signalled trustworthiness to the market. By working within London and establishing contacts in the financial services sector, the banks' reputations were spread across the globe.

2.3 Characterising the banks' production function

The existing historical literature notes that London's merchant banks tended to specialise. My findings confirm and extend the current historical literature. At the broadest level, the banks can be separated into two groups, the trade financiers (Kleinwort and Gibbs) and the issuers (Morgan). All of the banks were highly concentrated, with over half of their business coming from their primary market. The archives also indicate that information was the key to production, with the correspondence series between the banks and their agents abroad forming the backbone of the firm (along with the client ledger series). These findings will be used to build the theoretical model in Section 3.

A cursory glance at the Kleinwort archive shows that the firm's interests were based in Europe, in particular Germany, the UK and Spain¹³. The

¹¹Volume is held at the Guildhall Library, reference no. MS20116.

¹²Volume is held in the Kleinwort archive at the Guildhall Library, reference no. MS22034.

¹³In 1895 the firm went into partnership with Goldman Sachs, a merchant bank based in New York. As a result of this a fair amount of Kleinwort's business in the later half of

Table 1: Kleinwort, Sons & Co Breakdown of the Ledger Data

Area	Ledgers	Period
Germany - Hamburg	30	1876–1924
Germany - Bremen	11	1875–1925
Germany - Prussia	60	1868–1929
Germany - Rest	14	1868–1923
UK - London	32	1868–1925
UK - Rest	26	1868–1923
Spain - Barcelona	28	1872–1925
Spain - Rest	11	1872–1925
Switzerland & Italy	11	1871–1923
Austria, Eastern Europe & Middle East	25	1871–1923
Scandinavia	16	1876–1923
Russia	15	1876–1923
USA - pre 1900	20	1865–c.1900
USA - post 1900	71	c.1900–1931
Eastern South America	14	1866–1925
Central & Western South America	12	1866–1924
West Indies	16	1862–1919
Cuba	7	1910–25
Cape Colonies, East Indies, China, Japan & Australia	14	1865–1923

Data are taken from the ledgers in Kleinwort archive held at the Guildhall Library, London.

completeness of the archive presents lots of evidence in agreement with the general consensus, but the best evidence can be found in the firm’s client account ledger series. Table 1 clearly indicates the firm’s specialisation in German and Eastern European clients.

The other key find in the Kleinwort archive was an accounts series recording the payments made to agents abroad for information received by the firm¹⁴. As you’d expect, the firm’s main business areas had the most spent on them, but what is important is the amount of money paid out. For exam-

our period was based in the US. In particular Kleinwort invested in a number of American firms and acted as bill acceptor for some American companies, based on information passed to them by Goldman.

¹⁴Volume is held at the Guildhall Library as part of the Kleinwort archive, reference nos. MS22124 and MS22125.

ple, in 1897 £645,206 was paid in commission to agents abroad. Although I was unable to find any data to relate this to revenue or profit, for the time this was a vast sum of money, and gives an indication of how expensive it was to gather information, how important it must have been for production and how much could be saved if that information was re-used.

I have focused extensively on Kleinwort because their archive is so complete, but a number of documents in the archives of the other firms support the ideas of specialisation and information at the heart of production. Antony Gibbs concentrated on nitrate production, and came to dominate this trade in the late-nineteenth and early twentieth centuries. Again even a cursory glance at the Gibbs archive suggests that this was the case. The majority of the correspondence is between London and agents based in South American cities (most of which are in Chile) such as Iquique, Antofagasta and Valparaiso¹⁵. The letters are long and very detailed and contain information about all aspects of production, market conditions and general economic and political conditions for the region/country. Combining this with the Gibbs ledger, where nitrate merchants make up over 50% of the firm's business clients c.1900¹⁶, and I can convincingly argue that the firm specialised in this area.

JS Morgan was an issuing bank that specialised in North American railroad bonds. As with the first two banks, the firm gathered extensive information about the companies it dealt with (potentially and actually), recording it meticulously in the 'extracts from correspondence' series already mentioned. As with Kleinwort, the Morgan archive appears to be almost complete and the details of its day-to-day work is meticulously documented. Of the 68 issues it undertook between 1870 and 1910, 81% were American (private companies, state municipalities and city corporations) and 57% were American railroad companies¹⁷.

3 Building a model of the industry

The existing and new evidence presented highlights a number of characteristics that must be included in any theoretical model of the financial services industry and the firms within it. Firstly, London is at the heart of the finan-

¹⁵This conclusion was drawn from various documents in the Antony Gibbs archive held at the Guildhall Library, London.

¹⁶calculated from the client lists in the bank's ledger series (reference nos. MS11053 & MS11054).

¹⁷Statistics calculated from information in the JS Morgan archive, held at the Guildhall Library (reference nos. MS28176 & MS28178).

cial world, but other centres do exist and operate. The model must therefore produce a dominant core with smaller satellites around it. Secondly, banks' use of each others output (in the form of information about clients, issues etc), coupled with the outside information gathered from the City's network connections with government etc, formed the core of a typical bank's production function. Both of these characteristics must be included in the model, with the implicit assumption that these benefits are linked to the spatial location of firms.

The existing theoretical literature on financial centre formation tends to focus on markets/exchanges as the driver of agglomeration. Gehrig (1998) highlights a number of explanations, with the desire for liquid markets the most realistic¹⁸. Gehrig then reconciles this model (which in the extreme predicts one global centre with markets for all financial products) with the presence of lots of centres in reality by assuming that information relating to some instruments is very costly to transport. With risk-averse investors, a potential outcome is a regional centre that produces the instrument concerned without moving the information¹⁹.

This explanation can reconcile the empirical observation of a few large financial centres, but it can't explain London's historically very large share of the sector; Amsterdam, Berlin, New York etc all had large, liquid stock markets, offering alternatives to the LSE (Hautcoeur & Riva 2009). The model presented here attempts to fill the gap, by focusing on the banks themselves and their location decision. The lower costs available from locating with similar producers drove the banks to agglomerate to the City to take advantage of the external economies. Only the location-specific benefits available in different centres prevented London from completely dominating the international financial services sector.

I begin the modeling with a discussion of how the individual firms operated. The archival evidence highlighted two key facts about the banks; specialised output and high levels of competition between banks. In theoretical terms, this is a monopolistically competitive industry. Consistent with recent modelling, I use Chamberlain's (1936) monopolistic competition framework, where each firm produces a differentiated product and has some degree of market power. To capture the benefits of co-location, I combine the

¹⁸Risk averse investors like liquid markets as the price of the asset is less volatile the more liquid the market.

¹⁹With risk-averse consumers, a potential equilibrium is to have regional centres that produce the instruments that make use of the hard-to-move instrument. This is despite the fact that the base cost of production is lower in the global centre; consumers prefer to pay more for the instruments to be produced in the regional centres than to have them produced at the global centres with incomplete or uncertain information.

monopolistic competition set-up with input-output linkages between firms, defining these linkages as location-specific. The linkages generate a reason for firms to locate in the same location, a clear match-up with the historical reality.

All of these facets are pulled together into a production function with internal increasing returns to scale. This assumption is needed to replicate reality, where there is a finite number of varieties; to create this internal increasing returns to scale must be assumed. Despite this assumption being necessary theoretically, I will also show that it is true in reality in Section 4.1. The production function is then be combined with a utility function that values different varieties; without this, consumers opt for the cheapest producer, who then becomes a monopolist. Again this is theoretically necessart but also a reflection of reality; a nineteenth century investor would have optimised his portfolio by buying a number of different securities issued by a number of different firms. Theorists use Dixit & Stiglitz's (1977) variety-loving preferences to incorporate this into their models.

Modelling the industry in this way ties into New Trade Theory and the New Economic Geography literature, where Krugman in particular has used variety-loving preferences and linkages between firms to generate agglomeration effects (e.g. Krugman 1991*b*, Krugman & Venables 1995*b*).

London was clearly not the only centre operating at the time, and other centres were able to compete in specific areas e.g. Berlin in Turkish securities issues (Esteves 2008). To capture this observation, I use a simple network variable to quantify the external benefits a financial centre offered to its 'members'. These benefits were location-specific, e.g. London had close political ties with the Empire, and size-specific; the more banks that were operating in a centre, the larger the network, and the more information was brought in and passed around, the more influence the industry had etc. This factor allows for an equilibrium with more than one centre, each partially specialised in particular areas of output.

To summarise, the model has agglomeration forces generated by the input-output linkages, but these are offset by different centres' cost advantage in particular areas, e.g. Berlin and Turkish debt issues²⁰. As a result, the model predicts that one centre will dominate the industry, whilst other smaller producing locations will partially specialise to use their cost advantage in specific areas. Although not all aspects of financial services production c.1900 have been captured, the model does highlight a number of

²⁰Note that having a number of banks producing a particular type of output will result in that centre generating its own agglomeration effects, and may result in some of the 'footloose' output shifting location. This result hints at the importance of first mover advantage in the model, which will be discussed later.

important features of the industry, and will be able to explain how London was able to lead international financial services throughout the long 19th century.

3.1 The firm's production function

To say more about the equilibrium of the model, I need to define specific functional forms for both the production and consumption sides of the economy are defined. I begin with the merchant banks, constructing a production function that captures how they operated on a day-to-day basis. As has already been outlined, the production function is built up using Chamberlain's monopolistic competition/increasing returns to scale framework combined with the linkages input first defined by Krugman (1991*b*). Internal Increasing returns to scale are a necessary assumption, but they are also intuitively attractive. Given that all information can be re-used, connections with customers only have to be established once etc, I would expect all financial institutions to exhibit some internal increasing returns to scale. This assumption is captured in the production function in Equation 1 by the presence of a fixed cost α (which means that doubling inputs, combined together into G_i , more than doubles final output H_i).

The fixed cost α can be thought of as an initial investment in getting started, and I have assumed that the fixed cost takes the same form as the variable costs of production²¹. The bank's variable costs are defined in Equation 2, and when combined together create an intermediate input G_i . This intermediate input can be thought of as the day-to-day production of the bank once it has started up. However, to actually produce a final issue or accept a bill (H_i), the bank has to draw on the start-up work done at the beginning of its life²². The composite input G_i is 'constructed' out of the inputs the archive evidence highlighted as factors of production for the banks. The four inputs included are labour (L), information (A), the location-specific network (N) and the linkages between firms (M). The first two factors are fairly obvious, but the second two factors need a little more explaining, and I will start with the linkages between firms.

²¹Although this is a standard theoretical modeling trick which simplifies the maths, it is intuitively attractive. If we think that a merchant bank's initial start-up costs involve gathering information, hiring workers, making connections with other banks etc(All of these will form part of the variable costs and will be discussed next), and that continuing to produce means doing more of the same, then this assumption is a good approximation of reality.

²²Clearly the bank did not make this distinction in real life, and would not differentiate between these two, but theoretically this is needed to generate tractable equilibria.

$$H_i = \beta G_i - \alpha, \quad (1)$$

$$G_i = L_i^\mu A_i^\delta N_i^\zeta M_i^{1-\mu-\delta-\zeta}, \quad (2)$$

$$M_i = \left[\sum^{n_m} m_i^{(\kappa-1/\kappa)} \right]^{\kappa/(\kappa-1)}, \quad (3)$$

$$\text{Where } \begin{aligned} 0 &< \delta, \mu, \zeta < 1, \\ \alpha, \beta &> 0. \end{aligned}$$

The linkages input captures each bank's use of other banks output in the production of their output. The archive evidence provides plenty of examples of this; Gibbs' use of another bank's knowledge of a particular merchant's financial position (this could only be found out initially by doing business with the merchant and noting how promptly he paid his bill etc), Morgan's enquiries about the standing and financial position of the Viarka railway company (again something that could only be learnt by interacting with the company) are just two. A key assumption in separating financial centres is that the useful information from other banks' activities, which this input captures, could only be gathered face-to-face²³. This final point is key. It creates a need for the banks to agglomerate/locate in the same location as other banks, brokers, underwriters etc that dealt with their clients. This variable therefore drives agglomeration within the model.

To add these observations to the production function, I use Krugman's input-output linkages framework developed in the early 1990s (Krugman 1991*a*, Krugman & Venables 1993, Venables 1996). In this framework, firms can reduce their costs by employing the output of all other firms in production, and the more firms' output they have access to the more their costs are reduced. Having access to an increasing number of merchant bank's output decisions is likely to be more beneficial to a particular bank, as there is more chance of cross-over between clients. Combining this with the assumption that these linkages can only operate on a face-to-face basis, and the model creates agglomeration²⁴.

In the production function, the linkages are captured in Equation 3. Here M is the total amount of linkages input firm i uses in production, and it

²³The need for businessmen in banking and other businesses to travel to meet with each other today suggests that some information can still only be passed on face-to-face (Boshuizen 2007).

²⁴Krugman's original work focused on the manufacturing sector, and instead of assuming that face-to-face contact was needed to gather the other firm's output he applied a transport cost if the firms were not located in the same place. Firms would then agglomerate to avoid this transport cost.

is a sum of all the input it draws from firms in its location (n_m). The benefit of having many different firms' input is captured in parameter κ . This parameter can be thought of as the effect one extra 'variety' of linkage input has on firm i 's total costs. A low value for κ results in the extra variety having a big impact and vice versa. As a result, the lower the value of κ , the stronger the agglomeration forces; if an extra variety will reduce costs significantly, banks gain a lot by locating in the same location. If an extra variety does not reduce costs significantly, banks don't gain as much from agglomerating²⁵.

The final piece of the production function is the network variable (N). Going back to the archive evidence, this variable is designed to capture all benefits other than input/output linkages to the banks from co-locating, some of which may be location specific. Examples of this include the reputation-transmitting role the City played, where a bank could spread its positive reputation through its City connections, and as a result generate more business and eventually become a guarantor to other firms (the examples from the Brown, Shipley and Kleinwort archives showed this mechanism in action). This variable also captures the spreading of outside information around the network, and the benefits derived from the City acting as an institution and applying political pressure to ensure positive outcomes in foreign policy etc²⁶.

To include these benefits within the production function, I include the factor N as a natural advantage in each location. This factor clearly does not have a market (you can not buy a piece of the network), but it does have a shadow price and as a result generates rents to firms.

A second facet of the network is its usefulness in production. As has already been suggested, the benefits the network brought to the banks were location-specific, e.g. merchant banks in the City could influence British government policy towards the Empire, enforcing good behaviour in the colonies (such as not defaulting on loans etc). This gave British merchant banks an advantage when it came to Empire capital issues. To capture this within the model, I vary the productiveness of the network in production, with its productivity dependent on the particular centre. Output is therefore split into three areas; one where the City of London has an advantage (capturing Empire issues etc), one where other centres have an advantage (e.g. Berlin taking advantage of Germany's political ties with Turkey) and one where no

²⁵An alternative model to ours is presented in Storper & Venables (2004), where face-to-face interaction is used to enforce good behaviour on both parties in a contract. The archive evidence presented so far does not really support this kind of set-up, the banks were voluntarily trading information and generally did not work together.

²⁶Esteves (2008) notes that this is an important feature of all financial centres in this period.

centre has an advantage.

To vary the productivity of the network, I use the following formula; $N_I = (1 + \tau)N_O$ ²⁷. In this set-up $N_I \geq N_O$, so that in areas where a centre does not have an advantage, $\tau > 0$ which implies that the centre must 'use' more the network to produce the instrument. The equation therefore reduces the usefulness of the network in production by τ , and by varying τ I can vary the productivity of the network in each area of the financial services industry.

3.2 Demand for financial services

Having laid out a production function for international financial services, it is now time to turn to the demand side²⁸. The production function was built up using Chamberlain's monopolistic competition framework, where firms produce different varieties and have some degree of market power. I argued that this was an intuitively attractive framework, but could not say anything about the number of firms operating in the market in equilibrium. A key result from the theoretical literature is that with standard utility functions, that do not 'give credit' to different varieties, the equilibrium will be characterised by one monopoly producer, who takes over by under-cutting everyone else (due to the internal increasing returns to scale). This is clearly not a reflection of reality in most industries which exhibit product differentiation and specialisation by firms. The solution to this problem are variety-loving preferences. Dixit & Stiglitz's (1977) formalisation of these is now standard in the theoretical literature. Preferences of this form imply that consumers gain utility from being able to consume different varieties of the same good, and that the more varieties the better. As has been discussed, applying this to financial services, this is intuitively attractive; investors wanting to diversify their portfolio obviously place value on consuming different varieties of capital issues.

The basic form of these preferences is given in Equation 4. Good P is a homogenous good that enters the utility function with elasticity α . Good W is the good which has a number of different varieties. The total amount consumed (W) is a function of the number of varieties of the good (MW), the

²⁷ $\tau \geq 0$, where N_I is the 'amount' of network used by the firm, and N_O the network that is actually used in production.

²⁸Unlike most goods traded in this period, international financial services were not necessarily consumed as final goods in their own right. The service of accepting of bills to finance trade is best thought of as an intermediate input into a supply function for final goods. In contrast to this, the service of facilitating a capital issue is a final good; the borrower directly 'consumes' being able to borrow and the investor the ability to invest their capital. Despite this difference, to keep the model simple financial services will be defined as a final good and consumed directly by the consumer.

amount of each variety consumed (w_i) and the elasticity of substitution between each variety σ . This elasticity measures how much the consumer likes being able to consume different varieties, with a lower elasticity signifying a stronger preference for variety. This elasticity is crucial in determining the number of firms (in this theoretical setting this is equivalent to the number of varieties)²⁹ that operate in equilibrium.

$$U = P^\alpha W^{1-\alpha}, \quad (4)$$

$$W = \left[\sum^{MW} w_i^{(\sigma-1)/\sigma} \right]^{\sigma/(\sigma-1)}. \quad (5)$$

To complete the general equilibrium model, two further pieces of the model need to be discussed. Firstly, as is standard in New Trade Theory, I assume free entry and exit to the industry, so that in equilibrium price equals average cost. Again this is also a reflection of reality. With over 100 banks operating and no barriers to entry (e.g. capital requirements), free entry and exit is a good approximation of the industry. This leaves consumers as the only income earners. As in any standard model, consumers provide labour in return for a wage³⁰. In addition, the rents generated by the network (this relates back to the discussion in Section 3.1) and the income from the ownership of the information used in production are paid to consumers. Intuitively, the model is constructed so that firms (as an entity) make no profit; they are owned by the representative agent (the consumer). This means that any rents that accrue to the firm ultimately feed back to the consumer. With this final assumption, I am now ready to present the general equilibrium model of the industry, where producers and consumers interact to determine the location of the industry and the market share of each location.

3.3 The general equilibrium model

Having defined the production and consumption side of the sector, I now move on to build these two into a general equilibrium model that can be simulated. Doing this will provide insights into how the agglomerating and de-centralising forces work together to produce a final outcome, shedding

²⁹The number of firms operating in equilibrium is determined endogenously within the model, as a function of the cost-structure of the firms and σ . A lower value of σ results in more firms operating in equilibrium (consumers really like the variety, so lots of firms can enter and produce).

³⁰Consumers' labour income is derived from working in financial services and in the wider economy. Section 3.3 will discuss how the rest of the economy is modelled.

light on what drove the sector to form a core centre with smaller satellites around it and the forces that could have disrupted this equilibrium. Before the simulations can begin however, more needs to be said about the structure of the model.

To capture the minimal essence of late nineteenth century financial markets, it is necessary to include three economies in the model. Two economies are capable of producing financial services, and a third can only produce income. All three consume income and financial services. The income-only producing economy (Rest of the World (ROW)) 'sells' income to import financial services. The other two economies (Britain (GB) and other developed economies³¹ (Other)) produce both income and financial services. These economies export and import financial services and income.

Having broadly described how the model functions, we now pin down the production function for financial instruments to a specific country (i) and instrument type (k), (see Equations 6, 7 & 8)³². The model is kept simple by assuming the same production function for all instruments in all centres; the only difference is the efficiency of the network, as discussed in Section 3.1. An intuitively attractive way to think about this assumption is as a sorting mechanism; centres find it easiest to deal with the areas that they have the closest ties to (relative to everyone else).

$$G_{ik} = L_{ik}^{\mu} A_{ik}^{\delta} N_{ik}^{\zeta} M_{ik}^{1-\mu-\delta-\zeta}, \quad (6)$$

$$H_{ik} = \beta G_{ik} - \alpha, \quad (7)$$

$$M_{ik} = \left[\sum^{n_m} m_{ik}^{(\sigma-1/\sigma)} \right]^{\sigma/(\sigma-1)}, \quad (8)$$

$$\text{Where } \begin{aligned} &0 < \delta, \mu, \zeta < 1, \\ &\alpha, \beta > 0. \end{aligned}$$

The model will have two broad output sectors (financial services and income). To make sure that the changes that occur when parameters change etc all come from the financial services sector, I model income as a simple

³¹We are aggregating together all other financial centres that were operating at the time. Although we could break this economy down further, it would add more complexity for not much gain in understanding.

³²In order to simulate the model, the elasticity of substitution between varieties for consumers and producers must be the same. This assumption is standard in the New Economic Geography literature and is imposed by setting κ , the elasticity of substitution between varieties for firms in Equation 3, equal to σ , the elasticity of substitution in Equation ??.

one-for-one transformation of labour into output (see Equation 9). This is a simple constant returns production function, where labour is able to produce income on a one-for-one basis. By explicitly modeling this, labour is given a fixed alternative to financial services production, and I am able to see how the sector size changes relative to a constant alternative under counterfactual experiments.

$$Y_k = L_k. \tag{9}$$

3.3.1 The simulation process

Combining the production functions for income and financial services with the utility functions in Section 3.2 gives the full general equilibrium model to be simulated. To understand what follows, it is necessary to understand the analytical approach being undertaken. As in the Krugman papers of the early 1990s³³, the model I have constructed has two possible equilibria when both locations are the same, i.e. have the same size network, there is no productivity difference over any of the instruments, the same access to information etc. If production is initially split equally between the two centres, this can remain an equilibrium over time. However it is not steady-state stable. Any shock that results in one centre producing more output than the other will change the equilibrium, to one characterised by the complete agglomeration of the industry to one location.

This is a key result from Krugman and Venables' work in New Economic Geography; if one area has a first mover advantage in an industry (Krugman's example is the car industry in Detroit), this area will become the centre of the industry, with all firms agglomerating to take advantage of lower costs from the input-output linkages. This equilibrium is steady-state stable, that is only a large shock which prevents the agglomerated industry from producing will shift the location of the sector³⁴. The model I have constructed is more complex than the basic Krugman specification, but the insights from this earlier work are that a first mover advantage, and in what sectors of the financial services industry, will be crucial in determining the final outcome.

A second implication of using this Krugman-type model is that the analysis carried out by the simulations are run starting from disequilibrium i.e. giving London some sort of first mover advantage. This is done to replicate

³³For more information on the basis of this model and the approach being taken, see Krugman (1991*b*), Krugman (1991*a*), Krugman & Venables (1993), Krugman & Venables (1995*b*) and Krugman & Venables (1995*a*).

³⁴In reality, this implies that a persistent restriction on a location's output is needed to significantly alter the location of the industry.

reality, as London obviously did have a first mover advantage over other centres in this period³⁵. The implications of this assumption for the simulation results will be discussed in Section 3.5.

3.4 Parametising the model

As with a number of models in the New Economic Geography area, the model can only be solved using numerical methods, i.e. computer simulations. This technique has been used in a number of papers, e.g. Krugman & Venables (1993), and in all cases the parameters within the model must be specified to create a benchmark. As its name suggests, this is the starting point for any analysis using the model. Varying certain key parameters within the model will then tell us how the system is working, and what the key mechanisms driving the outcome are.

The full benchmark table is presented in Appendix 1 (Table 3). Some of the key parameters, drawn from late 19th century data, are not changed in the robustness checks. I have set financial services to be 8% of total output, which is similar to the share of financial services in Britain’s GDP c.1900 (Mitchell 1988). On the demand side, ROW takes 60% of output, with Britain and Other sharing the rest. Again this is based on the very limited consumption data that is available for the period (trade shares, taken from Harley (2004)).

In the production function for financial services, the output elasticity of information (δ) is fixed at 0.5, labour (μ) to 0.25, the network (ζ) to 0.1 and the linkages input ($1 - \delta - \mu - \zeta$) to 0.2. Although these values can not be matched to any historical evidence, they do capture the key points highlighted in Section 2. Information is the key input into production (as it has the highest output elasticity), which is consistent with the literature (e.g. Flandreau 2008) and the archival evidence. Labour is given a relatively small elasticity compared to aggregate production functions for this period (where the value is usually assumed to be around 0.6 (e.g. Crafts, Leybourne & Mills 1989)), but this was done to give information a leading role. However, this assumption is not essential to the model’s outcome, as these inputs are available to all firms at the same cost³⁶. For the network and linkages inputs, the elasticities are again not derived from historical evidence, but by imposing a larger elasticity on the linkages input the benefit from agglomeration is given more weight than the centre-specific network. The higher the

³⁵This paper does not address why this was the case, it takes this position as given.

³⁶This simplifying assumption was done to ensure that only the endogenous linkages input drove the agglomeration of the industry.

output elasticity of the linkages input, the stronger the agglomeration forces; conversely the centre-specific network benefits are less important.

Finally I have set the elasticity of substitution between the different varieties of financial services from the same location (σ) at 8. The lower this value is, the less willing consumers are to move between varieties, and the more benefit consumers get from an increase in different products. This elasticity also determines the strength of the agglomerating force; the lower the elasticity the more benefit to firms of more varieties, hence the stronger the agglomeration effects. Simulations will show that $\sigma = 8$ is within a sensible range; for lots of different varieties (firms) to survive and prosper, consumers and firms must gain significant benefits. It also corresponds to the trade costs literature, which uses variety-loving preferences in a Gravity Equation setting, (e.g. Jacks, Meissner & Novy 2009).

3.5 The model's equilibrium

Although the outcome of the model is not surprising, the simulations tell something about the different mechanisms working within the industry and is key to understanding how the City and the industry as a whole functioned c.1900. The simulations will focus on the parameter σ . This is the elasticity of substitution between different varieties produced in the same location, and represents how much consumers like different varieties, and how much benefit firms get from having different varieties of the intermediate input available for production. Relating back to Section 3, this implies that σ determines the strength of the agglomeration force within the model, and therefore the industry's predicted equilibrium I will also consider the role of first mover advantage, which is crucial to generating agglomeration. Although I do not discuss the City's rise to be the world's leading financial centre, I will be assuming that London had a first mover advantage³⁷. This does not seem unreasonable, although it does raise an interesting question for further research; how was London able to get into this position c.1820?

The model presented here does not generate the extreme result of only

³⁷London having a first mover advantage is crucial to replicating reality. Without it, and assuming all centres had equal access to the inputs used in production, the model's equilibrium is for both centres to produce 50% of the total output. Introducing first mover advantage changes this. Giving London an initially larger share of the market (this is the standard definition found in the NEG literature) results in the City ultimately producing more than 50% of output. This result is driven by the intermediate/linkages input. When one centre is initially producing more than the other, it is producing more intermediate input. This lowers the cost of production for all banks in the centre, and as a result that location can expand its output. In the NEG papers of the early 1990s, this resulted in an extreme outcome; the industry would be completely concentrated in one location.

one location producing, because there is an off-setting mechanism. As has already been discussed, certain locations had advantages over others in producing particular instruments. These advantages were derived from outside the sector, coming from political connections between countries, foreign policy decisions etc. To capture this, I break the international financial services sector down into sub-sectors, and allow the productivity of firms in each sub-sector to depend on their location. In this way, the first mover cost advantage is offset by the productivity advantage available to follower centres in certain areas³⁸. The model's equilibrium shows this clearly; the follower centre dominates its own sub-sector. This is an attractive property of the model, as the historical evidence presented in Cassis (2006), Esteves (2008) and others suggests that centres such as Berlin and Paris thrived by producing instruments that were not available in London, and that they grew to dominate certain areas.

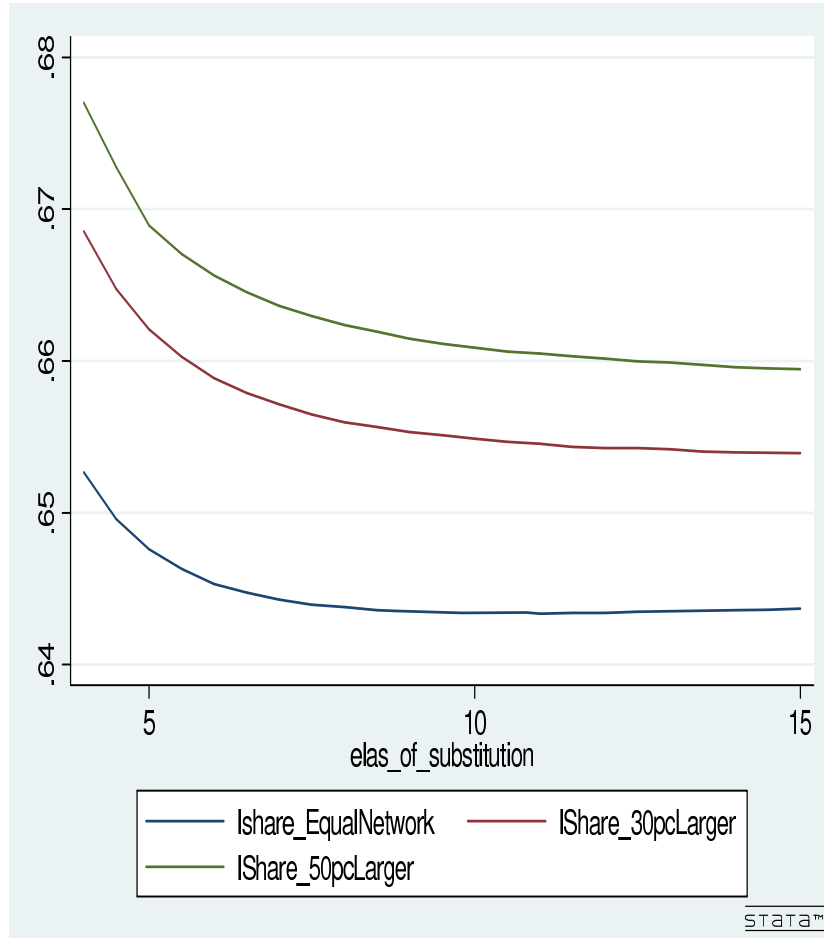
As has already been mentioned, the parameter σ is at the heart of the model. It determines both the value consumers place on the different varieties, and the cost advantage firms derive from having other producers located in the same location. A lower value of σ implies greater value to both groups³⁹. Whilst the distribution of output across the financial services sub-sectors (split by each location's cost advantage) remains constant, the share of total output does change. As sigma increases, the agglomeration benefits are reduced. Coupling this with the follower's advantage in part of the market, and London's share of total output falls. Although there is no change in the distribution of output across sectors within the simulated model, the expansion of the follower's sector at the expense of London's output can be seen as the follower expanding into areas in which it has less of an advantage. In other words, if the model had a continuum of output across the different areas (London's advantage, Other's advantage and the free area) instead of discrete sectors, the followers expansion as the benefits of agglomeration (and therefore the benefits of having a first mover advantage) fall can be seen as the follower being able to expand further along the continuum into the leader's territory.

The simulation results which show this are presented in Figure 3.5. Here I have also simulated the effect of different endowments of the network, which

³⁸The first mover advantage can also be offset by the size/power of the network. In all of the simulations, London's network is assumed to be as powerful as the other centre's, but imposing the assumption that the City was larger and therefore offered more to its merchant banks results in London's share of output being even greater.

³⁹Theoretically there is no reason for the value of the benefit to firms to be the same as the benefit to consumers. However computationally it is not possible for these two values to differ.

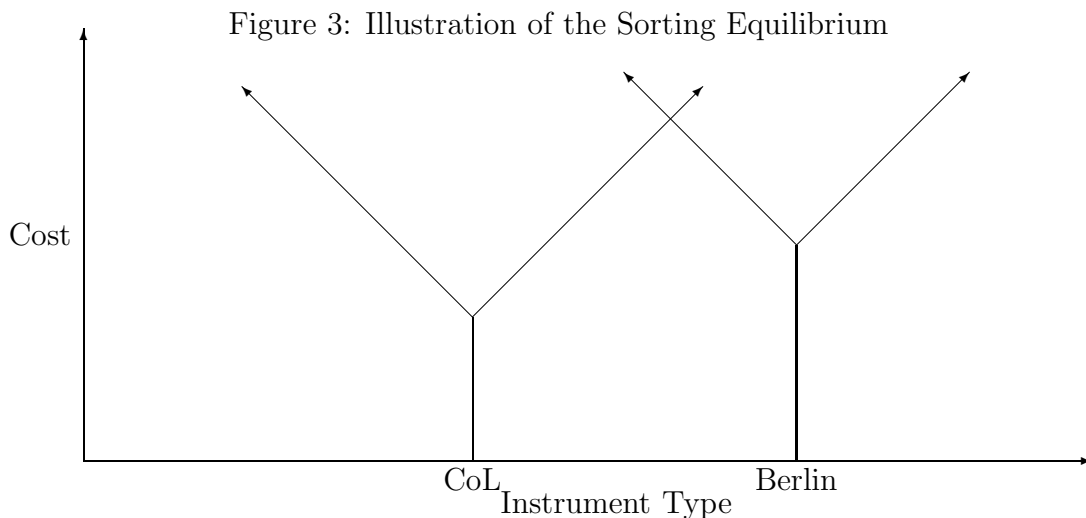
Figure 2: Simulation Results



captures the location-specific benefits of a location. It can be seen that London having a larger network creates a level effect. At all values of sigma, output is higher, but this exogenous difference between the locations does not affect the agglomeration forces, which are purely determined by the linkages between firms.

Simulations suggests that σ must have been relatively low, in the range 6 - 10⁴⁰. Although London was the dominant producer in this period, centres such as Berlin and Paris did provide some international financial services and in the case of Berlin, were able to enter the industry relatively late but still prosper (particularly in the areas where they had an advantage).

⁴⁰Without accurate production and output data it is hard to say more than this, as so many of the model's parameters have had to be fixed without firm empirical evidence.



The model's equilibrium can be illustrated graphically, as shown in Figure 3. Here, the horizontal line marks the specific location of each instrument. The closer an instrument is to a centre, the easier it is for that centre to produce it (as captured in the network advantage in certain sub-sectors). Off-setting this is London's first mover advantage, which is represented by the lower vertical cost line. In equilibrium, centres capture the instruments they are cheapest at producing, with the marginal instrument located where the two cost lines cross⁴¹. This equilibrium can be conceptualised as a sorting equilibrium, with centres capturing the markets that they are relatively good at providing for first. Expansion into other areas becomes increasingly more difficult, as the agglomeration benefits accruing to London made it competitive in all areas.

Drawing this section to together, other centres could only operate by taking advantage of either their low-cost instruments or new products that came to the market. In essence the smaller centres had to use consumers' preference for diverse products and their cost advantage in certain areas. The model also implies that absent any major shock to the system, this equilibrium is extremely stable. London's position was reinforcing; with the largest concentration of firms the City was the cheapest supplier of output. This implies that the only way a centre could seriously challenge the City was through expanding output, but with the City as competition this was

⁴¹To fully capture reality, this diagram could be extended to include more than one centre and closed to form a circle. It is also true that complete specialisation and domination of certain instruments do not occur, e.g. London did issue some Turkish securities, but the key predictions from the model can be illustrated.

not possible before World War I.

4 Relating the model to the evidence

The theoretical model and simulations made a number of assumptions and predictions about how the City operated and was able to dominate the sector. Returning to the archive evidence, I will now assess whether these were true in reality. One of the model's key assumptions was that banks were subject to internal increasing returns to scale. This was needed to support an equilibrium with product differentiation and a finite number of firms, and is central to the model's predictions. Secondly, the model can only predict agglomeration and dominance of a centre through a first mover advantage, which is reinforced by the input-output linkages between firms. From the qualitative literature, we know that London was the largest agglomeration of financial houses, but I must assess how important the linkages between firms were and whether or not banks moved to London to take advantage of the external economies. Finally, to generate an equilibrium with more than one centre, I had to assume that these centres were producing different products, based on the outside political, cultural etc ties a centre had, and that this variety is liked by consumers. Again there is plenty of evidence and theory explaining why consumers diversify in their financial transactions, but whether or not centres specialised and cornered certain markets needs to be established.

4.1 Assuming internal increasing returns to scale

One of the key assumptions underpinning the model is that firms operated under increasing returns to scale. This is an essential assumption, as it ensures an equilibrium with a finite number of firms. The evidence so far has not addressed the question of whether or not banks operated under increasing returns to scale, but the answer can be found in the archives.

The backbone of the Kleinwort archive was the ledger series already referred to in Table 1 and their information books. The info books were used to record all of the information the firm received (by request or otherwise) about merchants, banks etc based in countries across the globe. Actual and prospective clients were included, as well as general market conditions for the commodities their clients were trading. The books are organised by country/region, implying the more business done in a country the more books, and run from approximately 1870 - 1920. Combining these books with the client account ledgers (which were organised on the same geographical lines)

Table 2: Kleinwort, Sons & Co Ledgers and Information Books

Area	Ledgers	Info Books
Germany	115	6
UK	58	3
Spain	39	4
France & Benelux	56	6
Scandinavia and Russia	31	8
Rest of Europe	36	3
USA	91	4
Eastern South America	14	2
Central & Western South America	35	2
Cape Colonies, East Indies, China, Japan & Australia	14	2

The number of ledgers and information books cover the period c.1866 - c.1925. Data are taken from the Kleinwort archive held at the Guildhall library, London.

will indicate whether or not the firm was operating under increasing returns to scale.⁴²

The first thing to note is the amount of information that was gathered; 40 ledger-sized volumes over a 40 year period⁴³. Focusing on Table 2, the economies of scale in information are clearly highlighted. By conducting repeat business with merchants from the same area, Kleinwort was able to extract a lot of profit from the information it gathered. The German archive is a good example, as it contains 115 ledgers of clients for just 6 information books. In contrast, in the areas where Kleinwort did hardly any business the cost per transaction of the information gathered must have been high, for example eastern South America information was recorded in two information books but just 14 ledgers were needed to cover the clients.

The JS Morgan archive also shows evidence of increasing returns to scale. The firm would conduct a number of different issues for the same company, for example the New York Central and Hudson River Railroad Company, which issued shares in 1880, 1884, and 1898⁴⁴. This allowed Morgan to re-

⁴²I have not examined every single ledger and information book held in the Kleinwort archive, so it is possible and likely that some of the ledgers were not fully used and as such any inference based on the number of books or ledgers must be treated cautiously.

⁴³This is the minimum amount they gathered. It is highly likely that what was noted down in the books was a summary of what they actually received.

⁴⁴Derived from documents held at the Guildhall library, reference no. MS28176.

use information over a number of issues, both for the same company and for issues in similar areas. By building up relationships with clients and issuing similar stock over time, Morgan could minimise its information costs per issue.

4.2 The Value of the linkages in production

Information books in the archives of Antony Gibbs and Kleinwort give strong support for the information gathered (in the form of output) from other firms as a key input in production. As primarily trade financiers both houses focused on merchants and made enquiries and received information regarding the reputation, financial position and history of actual and potential merchant clients; as this information was available as a result of a bank's prior dealings with a firm, it comes directly from the bank's output. For example, the Gibbs archive contains a confidential information book on firms and banks covering the period 1883 - 1905⁴⁵. It contains approximately 200 entries, most of which refer to merchants, their trustworthiness and standing, with most of this information being gathered from the London network. An example of one of these entries refers to H Ellis & Son, "We have asked Mr Stubbs about this firm and he does not give a very favourable account of them, evidently short of means" and later "We made more enquiries respecting this firm this morning and ascertained that it would not do to trust them in any way." (October 1884). Given the date and style of writing, the information was almost certainly gathered from sources within London (particularly the second set of enquiries).

Another indirect source of the importance of the linkages can be found in the portfolios of investments, stocks and shares all of the firms held, both on their own account and as fund managers for private individuals (this was a particularly important part of Brown, Shipley's business). As has already been suggested, all of the banks investigated specialised in particular areas of the financial system. As a result, the typical bank would know very little about what was going on in most areas of the globe, but all of the banks analysed held very diverse investment portfolios; for example Antony Gibbs held stocks and shares in approximately 150 different ventures at any one time⁴⁶. In today's world it is easy to access information, and as a result to optimally diversify your portfolio to minimise risk and maximise return. In the late nineteenth century this was not necessarily the case. Although some

⁴⁵Information book is held at the Guildhall library, reference no. MS11038C.

⁴⁶Calculated from Antony Gibbs' ledgers, held at the Guildhall library (reference nos. MS11053 & MS11054).

information was publicly available (in the form of issue prospectuses, circular notices and dividend notices), the amount that issuing banks gathered clearly indicates that asymmetric information was present in the market; the banks traded shares on a daily basis, re-optimising their holdings given the information they gleaned from the workings of other merchant banks.

A second key prediction of the model is that banks would choose to locate in London to take advantage of the external economies, thus producing agglomeration of the sector. By 1870 London was well-established as the leading financial centre; in the rhetoric of the model the agglomeration has already happened and we are in a steady equilibrium. Going further back than this, the agglomerating forces can be seen. There are countless examples of foreign and domestic bankers and financiers relocating to London c.1830. From the banks already looked at, Antony Gibbs re-located from Portugal to London in the 1840s. Outside of my sample, Nathan Rothschild moved from Manchester to London in 1809 to take advantage of the City's position, as did CJ Hambros (a Danish banker from Copenhagen) in 1839. Other examples include Henry Schroder, a Russian merchant banker who established himself in London in 1804, and Lazard Brothers & Co, who moved to the City from France in 1877 (Balogh 1947). These three examples clearly support the model's predictions, and suggest that locating in London was necessary for the banks to take advantage of the City's external economies of scale.

4.3 Financial centre specialisation?

To conceptualise information and its transport costs, I broke the financial services sector down into sub-sectors, where a centre's network determined which areas it had an advantage in. The network captures both the outside information that was fed into the centres and the influence the sector as a whole had on government policy. This generated an equilibrium where London dominated the footloose sector, but other centres are able to lead the way in areas where they have an advantage in gathering information. The current historical literature suggests that centres did differentiate by the particular types of products they offered. Esteves (2008) shows that the destinations of capital issued in Berlin and London were significantly different, for example 66.5% of the issues undertaken in Germany⁴⁷ in this period went to Europe and Turkey, whilst the corresponding figure for London is just 10%. These figures strongly imply that there is some sort of cost differential across centres that is related to specific instruments and geographical regions.

⁴⁷This is the figure Esteves (2008) calculates for Germany in the period 1883-1913. At this time, Berlin issues 81% of the total foreign securities issues undertaken in Germany.

The relationship between Kleinwort and Goldman Sachs, and JS and JP Morgan in New York supports this point. Kleinwort appear to have benefitted by gaining access to the domestic American capital financing and stock market. In return, Goldman were able to move into trade financing (using Kleinwort as the bill acceptor) and investing in the London issuing market. The key point is that neither bank alone could enter the market of the other; the information-gathering costs were too great. For the Morgan sister-banks, the same explanation applies. Each used the other to tap into the information and markets of the other, with JP Morgan providing JS Morgan with invaluable information that supported the JS Morgan London monopoly on American railroad issues.

5 Conclusion

The current literature tends to assume that some sort of increasing returns were involved in the production of international financial services instruments, but does not attempt to formalise these in a model of the industry. By using an analytic approach, I now have a clear idea of what form the increasing returns took, and the implication of this for London's position in the financial world prior to 1913.

Using the empirical observations from the literature and the archives, I built a theoretical model which generates agglomeration through input-output linkages between firms. This captures the broad-based nature of the City's advantage over other locations, as the linkages are not restricted to just the merchant banks that operated in London at the time. Combining this with the centres' network, that gathered and spread outside information and influenced government policy (at least partially location-specifically), the pattern of specialisation within and between centres can be explained. The simulations indicated that to re-create London's position c.1900, the external economies of scale must have been extremely strong. They also indicated that to compete with London different centres had to diversify and offer consumers variety. By implication firms must have been operating as product-differentiating entities and subject to internal increasing returns to scale.

In summary, the City's linkages coupled with the utility gains from the increasingly specialised instruments on offer allowed the City to dominate and thrive, but never monopolise, the industry. This explanation goes beyond the traditional finance literature by highlighting the broader base for the City's lead in financial services, as well as telling us more about how these firms operated on a day-to-day basis. Conceptualising the industry in this way

provides a platform for further analysis, in particular the impact of World War I on London.

Having established how both the City and the individual merchant banks worked, I can now comment on what this implied for Britain's place in the world economy. In the global trading network, Britain's position was unique (Saul 1960), and financial services have already been identified as one of the areas the country dominated. By attempting to explain how the industry worked at a micro level, I can add to the macro literature; in particular drawing attention to increasing returns to scale models as a possible explanation for Britain's dominance of certain industries despite its resource and technological similarities to other countries, in particular continental Europe.

6 Appendix

6.1 Consumers' utility function

The specific consumers utility function used in the simulations is given in Equation 10. This function is the same for all consumers, irrespective of their location, and is built up using a number of nests, each containing a Dixit-Stiglitz preference for variety function within it. The key idea is that consumers derive utility from the three sub-types of financial services on offer (X, V and Z), and that these are substitutable within the Cobb-Douglas function. Total consumption of each sub-type is the sum of the output from both centres (Equations 11-13), and the output from each centre is substitutable with elasticity γ . I assume that consumers do not care where their output is produced; the key benefits are derived from firms specialising, and once this has happened it does not matter where the firm is located. As a result, the elasticity of substitution between output from different locations γ is assumed to be large (50). Below this nest is the final nest, which aggregates the output of each sub-type from each centre (Equation 14 - 19). It is here that the benefit from different varieties of output are captured, by the elasticity parameter σ . In the simulations, σ was set relatively low, and the robustness checks showed that this is a good approximation for demand in this period.

$$U_j = Y_j^\alpha X_j^\epsilon V_j^\epsilon Z_j^{1-2\epsilon} \quad (10)$$

$$X_j = [X_{GBj}^{(\gamma-1)/\gamma} + X_{Otherj}^{(\gamma-1)/\gamma}]^{\gamma/(\gamma-1)} \quad (11)$$

$$V_j = [V_{GBj}^{(\gamma-1)/\gamma} + V_{Otherj}^{(\gamma-1)/\gamma}]^{\gamma/(\gamma-1)} \quad (12)$$

$$Z_j = [Z_{GBj}^{(\gamma-1)/\gamma} + Z_{Otherj}^{(\gamma-1)/\gamma}]^{\gamma/(\gamma-1)} \quad (13)$$

$$X_{GBj} = \left[\sum^{nxi} x_{GBj}^{((\sigma-1)/\sigma)} \right]^{\sigma/(\sigma-1)} \quad (14)$$

$$X_{Otherj} = \left[\sum^{nxj} x_{Otherj}^{((\sigma-1)/\sigma)} \right]^{\sigma/(\sigma-1)} \quad (15)$$

$$V_{GBj} = \left[\sum^{nvi} v_{GBj}^{((\sigma-1)/\sigma)} \right]^{\sigma/(\sigma-1)} \quad (16)$$

$$V_{Otherj} = \left[\sum^{nvj} v_{Otherj}^{((\sigma-1)/\sigma)} \right]^{\sigma/(\sigma-1)} \quad (17)$$

$$Z_{GBj} = \left[\sum^{nzi} z_{GBj}^{((\sigma-1)/\sigma)} \right]^{\sigma/(\sigma-1)} \quad (18)$$

$$Z_{Otherj} = \left[\sum^{nzj} z_{Otherj}^{((\sigma-1)/\sigma)} \right]^{\sigma/(\sigma-1)} \quad (19)$$

6.2 Simulation benchmark

In order to simulate the model, the parameters, output levels, prices etc need to be given initial values. This is done in Table 3. These values are not based on real data, as this has not survived. For simplicity, the table shows two symmetric locations (there are no agglomeration effects in this symmetric equilibrium). Sector Y is income, produced under constant returns to scale using labour. Sectors V, X and Z are financial services, with V being Other's network-advantage and X London's (Z is the footloose sub-sector). The FC.. and N.. rows and columns capture the internal increasing returns to scale in these sectors, and are used computationally to make sure the model solves. The inputs into production are A (information), S (labour), N (the network) and F (the input-output linkages). These are used by firms and owned by the agents (Ci, Cj and Ck). Welfare (W.) is consumed by consumers and derived from the consumption of final goods. Finally, to generate internal and external economies of scale, the firms in the financial sector are defined (E..). These firms 'consume' both fixed costs (Mk..) and the linkages input, and are defined as making zero profits.

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Table 3: Benchmark Matrix for Simulations

	Yi	Yj	Yk	Vi	Vj	Xi	Xj	Zi	Zj	NVi	NVj	NXi	NXj	NZi	NZj	Wi	Wj	Wk	Ci	Cj	Ck	EVi	EVj	EXi	EXj	EZi	EZj
PYi	940															-939.5	-0.5										
PYj		965														-0.5	-964.5										
PYk			3820													-15	-15	-3790									
PVi				150												-20	-20	-80					-10	-10	-10		
PVj					150											-20	-20	-80					-10	-10	-10	-10	
PXi						150										-20	-20	-80					-10	-10	-10		
PXj							150									-20	-20	-80					-10	-10	-10		
PZi								150								-20	-20	-80					-10	-10	-10		
PZj									150							-20	-20	-80					-10	-10	-10		
FCVi										30													-30				
FCVj											30													-30			
FCXi												30													-30		
FCXj													30													-30	
FCZi														30													-30
FCZj															30												-30
Ak				-60	-60	-60	-60	-60	-60	-15	-15	-15	-15	-15	-15												450
Si	-940			-24		-24		-24		-6	-6		-6					990									
Sj		-965		-24		-24		-24		-6		-6		-6							1015						
Sk			-3820																								3820
Ni				-12		-12		-12		-3		-3		-3					45								
Nj					-12	-12		-12		-3	-3		-3	-3						45							
Mi				-24		-24		-24		-6		-6		-6									30	30	30	30	
Mj					-24	-24		-24		-6		-6		-6										30	30	30	30
PWi																1075			-1075								
PWj																	1100			-1100							
PWk																		4270									-4270
MkVi				-30																			30				
MkVj					-30																			30			
MkXi						-30																			30		
MkXj							-30																			30	
MkZi								-30																			30
MkZj									-30																		30

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