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**THE ORIGIN AND DISTRIBUTION  
OF MONEY MARKET INSTRUMENTS:  
STERLING BILLS OF EXCHANGE  
DURING THE FIRST GLOBALISATION**

Olivier Accominotti, Delio Lucena and Stefano Ugolini

**ECONOMIC HISTORY  
FINANCIAL ECONOMICS**



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## Abstract

This paper presents a detailed analysis of how liquid money market instruments – sterling bills of exchange – were produced during the first globalisation. We rely on a unique data set that reports systematic information on all 23,493 bills re-discounted by the Bank of England in the year 1906. Using descriptive statistics and network analysis, we reconstruct the complete network of linkages between agents involved in the origination and distribution of London bills. Our analysis reveals the truly global dimension of the London bill market before the First World War and underscores the crucial role played by London intermediaries (acceptors and discounters) in overcoming information asymmetries between borrowers and lenders on this market. The complex industrial organisation of the London money market ensured that risky private debts could be transformed into extremely liquid and safe monetary instruments traded throughout the global financial system.

JEL Classification: E42, G23, L14, N20

Keywords: money market, Industrial Organisation, information asymmetry, bill of exchange

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# The Origination and Distribution of Money Market Instruments: Sterling Bills of Exchange during the First Globalisation

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This paper presents a detailed analysis of how liquid money market instruments – sterling bills of exchange – were produced during the first globalisation. We rely on a unique data set that reports systematic information on all 23,493 bills re-discounted by the Bank of England in the year 1906. Using descriptive statistics and network analysis, we reconstruct the complete network of linkages between agents involved in the origination and distribution of London bills. Our analysis reveals the truly global dimension of the London bill market before the First World War and underscores the crucial role played by London intermediaries (acceptors and discounters) in overcoming information asymmetries between borrowers and lenders on this market. The complex industrial organisation of the London money market ensured that risky private debts could be transformed into extremely liquid and safe monetary instruments traded throughout the global financial system.

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## 1. Introduction

A liquid money market is required for the functioning of any economy and financial system (Gorton, 2012, 2017; Gorton and Ordoñez, 2014). Assets traded on a money market are short-term debt instruments, issued by either the government or the private sector, whose principal is exchanged at face value in all transactions (Dang, Gorton and Holmström, 2012; Gorton, 2012; Gorton and Ordoñez, 2014). Private agents need such liquid and safe assets in which to place their savings and wealth, banks post them as collateral for borrowing, and central banks rely on them for the conduct of monetary policy (Caballero, Farhi and Gourinchas, 2017; De Fiore, Hoerova and Uhlig, 2018).

Our paper presents a detailed analysis of how liquid money market instruments were produced during the first globalisation, which spanned the period 1880–1914. During those years, the pound sterling was the global currency, London was the world’s most liquid money market, and the reference asset for money market transactions was the “sterling bill of exchange” (or “bill on London”). The *sterling bill of exchange* was a trade finance instrument used by firms worldwide to obtain short-term credit from the London financial centre. It was one of the most liquid financial assets of the time (Jacobs, 1910; Warburg, 1910; Withers, 1920).<sup>1</sup> In *Wealth of Nations*, Adam Smith (1776, book II, chap. II) had already noted how the high liquidity of sterling bills gave them a money-like character: “money is more readily advanced upon them than upon any other species of obligation.” Sterling bills formed part of the liquid reserves of UK commercial banks and of the foreign currency reserves of commercial and central banks abroad.<sup>2</sup> Contemporaries generally considered that the sterling bill was “a kind of world currency”, “the

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<sup>1</sup> See, for example, “Liquid Assets of Banks”, *The Economist*, 12 September 1891, p. 1181. In this article, a banker noted that the “rightful place for bills of exchange amongst the liquid assets, or the readily available resources of a bank should, in my judgment, be next to Consols.”

<sup>2</sup> The central banks of several countries were allowed to hold sterling bills as part of their cover reserves backing domestic currency circulation (Eichengreen and Flandreau, 2016).

same as gold” or “the equivalent of a bullion certificate” (resp., Baster, 1935, p. 13; Gillett Brothers, 1952, p. 16; Greengrass, 1931, p. 37).

At the turn of the century, bills on London were traded in virtually all significant financial centres (Flandreau and Jobst, 2005). The sterling bill’s highly liquid nature made it an extremely popular instrument for firms looking to borrow and finance their trading activities. Just before the First World War, most of world trade was financed through the London bill market (Kynaston, 1994, p. 8).

How was the production of bills of exchange organised in London before the First World War? In order to answer this question, we rely on a detailed data set constructed from a unique archival source: the Bank of England’s *Discount Ledgers*. These ledgers report systematic micro-level information on a profusion of bills circulating on the London money market and on all agents involved in their origination and distribution. Our data set contains information on all individual bills re-discounted by the Bank of England during the year 1906 (23,493 bills). We use descriptive statistics and network analysis to reconstruct the complete network of linkages between agents involved in the design of these bills. Doing so allows us to present a set of new descriptive findings on the industrial organisation behind the production of sterling bills on the eve of the First World War.

Unlike modern money market instruments, sterling bills were not collateralised by a financial or physical asset; instead, they carried a third agent’s guarantee. Bills of exchange always involved a *drawer* (a borrower located either in the United Kingdom or abroad), an *acceptor* (a London-based actor which guaranteed the bill’s payment in pounds sterling at maturity), and a *discounter* (the buyer of the bill). The data that we have assembled enable identification of how these various agents interacted on the money market.

[[ INSERT **Figure 1** about here ]]

Our analysis first reveals the truly global dimension of the London bill market at the start of the twentieth century. We show that drawers (borrowers) were numerous and scattered across

the world (Figure 1). Our data set records 3,554 different drawers, most of which were small private firms or merchants. Since the average investor could not hold detailed information about all these debtors, large information asymmetries must have existed between borrowers and lenders on the money market. Such information asymmetries constitute market frictions, which typically result in adverse selection and a total absence of lending (Stiglitz and Weiss, 1981). Data on the intermediaries involved in the origination and distribution of bills allow us to demonstrate how these market frictions were overcome thanks to the intervention of acceptors and discounters.

We first demonstrate the role of acceptors (bill guarantors) in producing information on money market borrowers and in reducing the risk inherent to bills. Because acceptors were the first ones exposed in the event that drawers (borrowers) defaulted, they had strong incentives to collect information about them. Our data reveal that the structure of the accepting industry was typical of the “relationship” banking business, where a financial intermediary’s main function is to gather – via multiple interactions – proprietary information about debtors (Allen, 1990; Sharpe, 1990; Rajan, 1992; Bhattacharya and Thakor, 1993). Through these information acquisition activities, acceptors greatly contributed to reducing information asymmetries between lenders and borrowers.

The acceptor’s signature was complemented by that of the *first discounter*, who was the bill’s wholesale seller. First discounters purchased bills from drawers or acceptors and resold them to final investors, thereby acting as distributors on the London market. When they resold (endorsed) a bill of exchange, discounters added their personal guarantee to it and thus enhanced its credit.<sup>3</sup> In this paper we describe how the discounters’ activities contributed to resolve information frictions. The discounter’s signature was especially important in the case of bills accepted by small trading or manufacturing firms, which represented a significant share of the market’s acceptors.

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<sup>3</sup> Regulations required discounters to endorse each bill they resold. That a bill was jointly guaranteed by all successive discounters was known as the *joint liability* rule (see Ghatak and Guinnane, 1999; Santarosa, 2015).

Our results therefore shed light on the complex structure of the London money market at the start of the twentieth century and on the various mechanisms through which the information problem inherent to the production of bills was solved. These mechanisms allowed borrowers from around the world to access London credit facilities and ensured that risky, private debts could be transformed into the highly liquid and safe monetary instruments that were traded throughout the global financial system. The bill market's industrial organisation was key to London's position as the world's leading financial centre before the First World War.

The rest of our paper proceeds as follows. Section 2 explains how the bill of exchange functions. In Section 3 we present our primary source, the Bank of England's *Discount Ledgers*, and describe the data. Section 4 details the structure of the accepting and discounting industries in London at the beginning of the twentieth century and showcases the role of acceptors and discounters in reducing information asymmetries on the bill market. Section 5 concludes.

## 2. The sterling bill of exchange

### *2.1. The bill of exchange: Definition and functioning*

From the late sixteenth until the early twentieth century, a negotiable bill of exchange was the standard financial instrument for obtaining short-term credit and exchanging currencies (de Roover, 1953; Accominotti and Ugolini, 2019). The bill of exchange was defined legally as a written order requiring that some specified person or entity pay a certain sum to the bearer at a given date in the future.<sup>4</sup> A bill always involved at least three agents: a “drawer”, an “acceptor”, and a “discounter”. The drawer was the person who addressed the bill; the acceptor, the individual or institution to whom the bill was addressed; and the discounter, the bill's beneficiary. By *accepting* the bill, the acceptor committed to pay the specified sum to the discounter at the specified date.

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<sup>4</sup> For the full legal definition of the bill of exchange in the United Kingdom, see Article 3 of the 1882 Bill of Exchange Act.



Because the bill of exchange was a negotiable instrument, a discounter's claim on the acceptor could always be transferred to another investor (or *re-discounter*) at any time before maturity.

[[ INSERT **Figure 2** about here ]]

Although its legal form remained practically unchanged for centuries, the bill of exchange proved to be a flexible instrument that could be employed to finance diverse types of operations. Figure 2 presents an illustrative example of a transaction commonly financed through sterling bills in the early twentieth century: an export of goods from “city A” to “city B”. The figure's panel A shows the operations involved when the bill is issued. An exporter in city A has agreed to sell goods to an importer in city B (path 1 in the figure) but needs credit in order to finance production and shipment before receiving payment. The exporter (here, the *drawer*) draws a bill on a London agent (the *acceptor*) and asks for an engagement to pay to the bearer of the bill, at a specified date in the future, a sum in pounds sterling corresponding to the proceeds of the sale (path 2).<sup>5</sup> The drawer then transfers the bill (3) to her local bank (the *remitter*), which arranges to send it to a *discounter* in London (4). The discounter might have been pre-selected – either directly by the drawer (if she has London correspondents other than the acceptor) or by the acceptor herself (if she is the drawer's only correspondent in London).

Upon arrival of the bill in London, the discounter presents it to the acceptor (5); she “accepts” the bill by countersigning it, thereby confirming her commitment to pay the bearer at maturity (6). Once the bill is accepted, the discounter credits the remitter's account (7). The remitter, in turn, credits the drawer's account (8) and so provides the financial means for producing and shipping the goods. The discounter can then either keep the bill until its maturity or resell (“endorse”) it to a final investor (the endorsee, or *re-discounter*) willing to lend capital until the pre-

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<sup>5</sup> In this example, the bill is “placed to the importer's account”, which means that the importer authorises her exporter to draw on the acceptor with whom she is in a business relationship. However, if the drawer were in a direct business relationship with the acceptor then it would be said that the bill was “placed to the drawer's account”.

specified date (9 and 10). The bill can be re-discounted an unlimited number of times before its maturity.

Panel B of Figure 2 summarises the operations taking place when the bill expires. Just before maturity, the importer – who has, by then, received delivery of the shipped goods – remits funds directly to the acceptor<sup>6</sup> (11); those funds enable the acceptor to meet the bill's payment. On the bill's actual maturity date, the bearer presents it to the acceptor for payment<sup>7</sup> (12 and 13). Thus the instrument disappears at maturity, or “self-liquidates” in the wording used by contemporaries.<sup>8</sup>

It should be clear from this example that a bill's acceptor did not advance her own capital; rather, she committed only to repaying the bearer in the expectation of receiving a monetary flow from the importer before maturity. In other words, the acceptor was just a *guarantor* of the bill who added her signature to it – usually in exchange for a fee (Hawtrey, 1930, p. 129). In contrast, the discounter and re-discounter immobilised their own funds in order to purchase the bill. These actors were (respectively) the first and ultimate lender. The usual procedure was for investors (re-discounters) in sterling bills to purchase them from a limited set of London institutions (discounters), who in turn had obtained those bills either from their correspondents abroad (remitters) or from acceptors. These first discounters constituted the “wholesale” segment of the London discount market.<sup>9</sup>

Recall that every seller of a bill of exchange also had to “endorse” it, thereby adding a secondary guarantee to the bill. In case the acceptor failed to pay the bill at maturity, the last endorser was liable for repaying the sum due to the bearer. By originating a bill, the drawer was

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<sup>6</sup> In technical language, the importer is said to “make provision”.

<sup>7</sup> The sum is thus “charged to the importer's account”. In contrast, if the drawer were in a direct customer relationship with the acceptor, then the bill would be “charged to the drawer's account”. Under the latter circumstances, the exporter (rather than the importer) would pay the acceptor (“make provision”) at or before maturity.

<sup>8</sup> On the concept of self-liquidation and its implications, see Jobst and Ugolini (2016, pp. 162–63).

<sup>9</sup> Specialised wholesale *discount brokers* (connecting first discounters to re-discounters) had already emerged in London by the end of the nineteenth century. For instance, Sayers (1968, pp. 51–52) writes that the discount house Gillett Brothers & Co. (a leading London re-discounter) used to purchase, in the 1890s, its entire portfolio of Indian-drawn bills through the intermediation of discount brokers Page & Gwyther.

thus able to borrow from an unknown lender (the re-discounter) thanks to the guarantee provided by an acceptor and to the intermediation – and secondary guarantee – of a wholesale discounter. Unlike most modern money market instruments, such as repurchase agreements and asset-backed securities, the bill of exchange was not collateralised by any financial asset or “physical” goods; it was secured instead via the guarantees provided by the successive intermediaries involved in its origination and distribution (Flandreau and Ugolini, 2013).<sup>10</sup> These intermediaries certified the quality of the bill’s underlying debt and its repayment upon its maturity.

## **2.2. A flexible instrument**

The specific type of transaction described in Figure 2 was common in the early twentieth century; yet bills of exchange could be mobilised in many other ways, and all these roads led to the London money market. A detailed exposition of the manifold uses of bills can be found in a handbook published by one of London’s foremost discount houses (Gillett Brothers, 1952).<sup>11</sup> Bills could be used to finance commercial transactions between two foreign countries, exports and imports of goods from and to the United Kingdom, and domestic trade. Especially in early times, the drawer was often the seller of some goods and the acceptor their buyer. By signing the bill, the acceptor promised to pay the value of the sold goods after their delivery – thus allowing the seller to raise capital and finance shipment. In that case, the bill’s acceptor was a UK importer (Gillett Brothers, 1952, pp. 47–48). Bills drawn directly on importers were called *trade bills* on the London discount market.

From the mid-nineteenth century onward, several trading and financial houses in the City began offering their respective signatures and allowed exporters to draw bills upon them rather than on their importers (Greengrass, 1931, p. 46). Bills accepted by reputable financial institutions were known as *bank bills*, which were usually considered superior to trade bills because of the

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<sup>10</sup> The holder of an unpaid bill could not seize the commodities that it financed; the only recourse was to seize the acceptor’s or previous endorser’s assets.

<sup>11</sup> On Gillett Brothers, see Sayers (1968).

acceptor's higher standing. In these cases, the acceptor was not engaged in the commercial transaction; instead it was a third party that agreed to accept bills in the importer's name – on the condition that the latter (privately) agree to provide the funds needed to meet the bills' payment at maturity (Hawtrey, 1930, pp. 123–24; Gillett Brothers, 1952, pp. 27–29, 37–39, 41–43).<sup>12</sup> Bills could also be drawn directly by the importer (rather than the exporter) on the financial house with whom she had the arrangement. In this case, the importer raised capital herself to finance the goods' shipment (Gillett Brothers, 1952, pp. 29–31, 39–40). Sometimes, the acceptor did not have a direct relationship with the drawer but only with her bank, which took care of selling the bill to a discounters and of providing the funds to the acceptor before maturity. In such cases, often the drawer's bank also endorsed the bill before it was accepted (Gillett Brothers, 1952, pp. 53–55).

Bills could also be used to finance activities other than trade. For instance, the drawer might be an industrial firm that needed short-term credit to finance production and sought to raise capital on the London discount market with the guarantee of an acceptor. Should the firm's production remain unachieved at the bill's maturity, then the acceptor could authorise the drawer to draw another bill so that the debt could be rolled over (Gillett Brothers, 1952, pp. 45–47). Finally, in many cases the drawer was a financial firm just willing to fund its own stock or bond investments or to refinance its banking operations. By originating a bill, a financial firm could refurbish its liquidity while using the acceptor's guarantee as collateral.<sup>13</sup> Bills originated for purposes other than trade were referred to as *finance bills*. Although such bills were often decried for not being based on “genuine” transactions, their standing on the London discount market was good because they were most often accepted (guaranteed) by reputable financial institutions (Gillett Brothers, 1952, p. 22).

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<sup>12</sup> In contemporary parlance, the importer engaged to “make provision” and to “cover” the acceptor before maturity. This particular case corresponds to the example described in Figure 2.

<sup>13</sup> Also in this case, the acceptor was not necessarily in a direct customer relationship with the drawer; thus, for example, the former might only have had an arrangement with the drawer's correspondent.

### ***2.3. Bills as carriers of information***

The information recorded on a bill of exchange allowed bearers to reconstruct many, but not all, of the underlying interlinkages that led to its origination and distribution. Simply looking at a bill was not enough to reliably determine the exact nature of the transaction that stood behind it. That said, each bill did record the name of its drawer as well as the names of all intermediaries who had guaranteed and/or purchased it.

[[ INSERT **Figure 3** about here ]]

Figure 3 transcribes a typical bill of exchange found in the archives of the leading acceptance house Kleinworts & Co. This £3,000 bill was drawn on 10 August 1910 by the Moscow-based Société L. Bauer & Co. (the drawer) and was made payable after three months by Kleinworts & Co. (the acceptor). After drawing the bill, the drawer immediately sold it to the Banque de Commerce de l'Azow-Don/Azow-Don Commerzbank (the remitter), probably the drawer's bank in Moscow. The very same day (10 August), the remitter sold/endorsed the bill to the Union Discount Company of London (the discounter), which thus became entitled to cash it in at maturity. Azow-Don Commerzbank shipped the bill to London, where Kleinworts accepted it (by affixing its signature) on 15 August before transmitting it to the Union Discount Company. The discounter kept the bill until maturity and did not resell it to another investor. Three months later, Kleinworts therefore repaid the Union Discount Company £3,000 through a London clearing bank (the London County & Westminster Bank), which was responsible for pure payment services. The discounter then returned the self-liquidated instrument to the acceptor, in whose archives it remains preserved.

The information recorded on that bill does not indicate the exact nature of the transaction it financed. The drawer (Bauer & Cie) might have been an exporter of Russian goods. Yet because the bill makes no mention of any shipment of goods,<sup>14</sup> we cannot be sure that it was used to

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<sup>14</sup> Although a bill might mention the underlying transaction's nature (e.g., by providing details on the sold goods and their shipment), doing so was optional as well as irrelevant from the judicial standpoint.

finance trade. Inspecting the bill itself leaves us in the dark also with regard to the exact nature of the relationships between the various parties involved. For example, the remitter (Azow-Don Commerzbank) might have selected the discounter (the Union Discount Company) directly; alternatively, the acceptor (Kleinworts) might have arranged for the bill to be discounted. In that event, Kleinworts would have instructed the Moscow bank to endorse the bill to the Union Discount Company (the discounter) before shipping it to London.<sup>15</sup>

One must bear in mind that, even if all details of the transactions were not known, a bill's purchaser could always identify the most important actors involved in its production. In particular, a bill recorded the names of all intermediaries whose signatures amounted to collateral for it. Those agents included the drawer (or borrower; here, Bauer & Cie); the acceptor (or guarantor; here, Kleinworts & Co.), and the discounter (or lender; here, the Union Discount Company).

The largest acceptors of bills in London were the merchant banks or acceptance houses that specialised in offering acceptance services for their customers at home and abroad (Greengrass, 1931; Chapman, 1984). Acceptors also included UK deposit banks, branches of foreign banks, and "Anglo-foreign banks" – multinational banks based in London but whose business was concentrated in certain foreign geographical areas, where these banks specialised and maintained a large network of correspondents (Jones, 1993).<sup>16</sup> In addition, a large number of UK trading or manufacturing firms also accepted bills drawn on them by their trading partners (Sayers, 1968).

Among the largest discounters were the so-called discount houses of the City. These highly specialised institutions purchased large amounts of bills, which they then kept in their own

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<sup>15</sup> The Union Discount Company was a "discount house" that was not actually involved in the business of correspondent banking. Thus, it is unlikely that this company was the London correspondent of Azow-Don Commerzbank. Hence we suspect that Kleinworts both accepted the bill and found a discounter (the Union Discount Company) willing to purchase it in London.

<sup>16</sup> According to Cassis (1985, p. 110), "the Anglo-foreign banks were English banks in the sense that their capital and management were British ..., but the greater part of their business was done in a foreign country or in the colonies." Although Anglo-foreign banks did not constitute a separate legal entity, Baster (1935, p. 9) notes that they nevertheless "formed a very well-defined group of their own."

portfolios or re-discounted to other investors (Vigreux, 1932, pp. 169–70; Sayers, 1968, pp. 37–38). Discount houses usually funded their investments with short-term deposits or “call money” from other financial institutions (especially the large UK deposit banks) and were therefore highly leveraged.<sup>17</sup> However, discount houses were not the sole distributors of bills on the money market. Foreign and Anglo-foreign banks also played that role, while trading and manufacturing firms discounted bills as well. In contrast, UK deposit banks invested in (i.e., re-discounted) bills but seldom served as wholesale sellers on the discount market (Spalding, 1915, p. 200; Hawtrey, 1930, p. 130).

### 3. Data

#### 3.1. Data Source

In order to explore the structure of London’s money market in the early twentieth century and the various ways by which bills were originated, we rely on a unique archival source: the Bank of England’s *Discount Ledgers*. These ledgers provide complete information on the identity of the intermediaries (drawer, acceptor, discounter) involved in the origination and distribution of bills of exchange re-discounted by the Bank of England, whose monetary operations made it an influential actor in the London discount market. Large holders of bills approached the Bank – in times of monetary tension and before publication of their balance sheets – for re-discounting and to obtain cash. As a result, the Bank of England’s bill portfolio ended up containing a significant portion of the bills originated on the London discount market. The Bank gathered systematic information on all the bills it re-discounted, thereby monitoring its exposure to discounters and acceptors (Flandreau and Ugolini, 2013). For these reasons, the *Discount Ledgers* provide invaluable information on a plethora of bills that were originated on the London money market.

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<sup>17</sup> For a detailed description of the business of discount houses, see King (1936).

We collect information on all bills re-discounted by the Bank of England in the year 1906, the last non-crisis year for which a complete series of the *Discount Ledgers* is available.<sup>18</sup> We select a study period equal to exactly one year in order to circumvent any seasonality concerns. The *Discount Ledgers* contain the accounts of the Bank’s clients. During any re-discounting operation, the Bank registered the bill’s information in the discounter’s account (in a column labelled “with”) and also in the acceptor’s account (in a column labelled “upon”).<sup>19</sup> Thus each bill re-discounted by the Bank was recorded twice in the *Ledgers*. To avoid recording the bills twice in our database, we collect only the “upon” entries of the Bank’s *Ledgers*.<sup>20</sup> For each bill, we record the name and location of the three parties involved in its origination and distribution: the drawer, the acceptor, and the discounter.

We use these data to describe relations between agents on the London money market. From our data set for 1906, which contains 23,493 bills, we reconstruct the complete network of agents whose names appear on the bills. In this way we obtain a static network of 4,970 agents, or “nodes”. Among these we find that the drawer role is played by 3,554 nodes, the acceptor role by 1,439, and the discounter by 145 nodes (note that some nodes played more than one role).

We record all relations, or *links*, between pairs of agents in the network. We define three types of links: links between drawers and acceptors, links between acceptors and discounters, and links between drawers and discounters. In each case, we consider there to be a link between two agents when their names appear on the same bill. Thus a link exists between a given drawer and a given acceptor when the latter has accepted at least one bill drawn by the former, and there is a link between an acceptor and a discounter when the latter has discounted at least one bill accepted

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<sup>18</sup> Because they contain personal information, the *Discount Ledgers* are subjected to a 100-year embargo. Some of the ledgers containing information for 1908 also cover many subsequent years, which precluded access to them when our data collection began.

<sup>19</sup> See Flandreau and Ugolini (2013) for a description of the Bank’s accountability in the re-discounting of bills.

<sup>20</sup> We prefer to collect the “upon” entries because the “with” entries are sometimes less detailed. Bills were usually re-discounted not individually but rather in packs known as “parcels”. A specific category of the Bank of England’s *Discount Ledgers* includes the accounts of discount houses. In these ledgers, the parcels of bills discounted were not always “unpacked” in the “with” entries. Yet in the “upon” entries the parcels *were* unpacked – that is, under the headings of the acceptors of each bill contained in the parcel. For additional details, see Flandreau and Ugolini (2013).



by the former. Finally, a link also exists between a drawer and a discounter when the latter has discounted at least one bill drawn by the former.

### **3.2. Representativeness**

There are, of course, some limitations to our source and resulting data set. Especially, the *Ledgers* do not record all the bills originating on the London discount market – they record only those bills purchased (re-discounted) by the Bank of England. The discount market was of the over-the-counter type, and bills were not transacted through an organised platform; hence there was no central authority that recorded information on all London-originated bills. The Bank of England was certainly the biggest re-discounter in London, and its *Ledgers* constitute the only source providing information on such a large number of bills. Nevertheless, bills re-discounted by the Bank might not have been representative of the entire money market.

Two remarks are in order here. First, this archival source does not enable precise knowledge of whether the agents who sold bills to the Bank of England were those bills' first discounters or if they had themselves bought the bills from other discounters. However, the Bank of England re-discounted bills from only a limited set of discounters that it declared "eligible". Although these eligible discounters were not representative of the final investor in sterling bills (the re-discounter in Figure 2), they did include all intermediaries involved in the distribution of bills to final investors. Eligible discounters made up the wholesale segment of the London discount market (the discounters in Figure 2) and included institutions that purchased bills through acceptors or foreign correspondents and then resold them to the final investor (or to the Bank of England). This group of institutions included discount houses, Anglo-foreign and foreign banks, and merchant banks as well as non-financial, trading firms.

[[ INSERT **Table 1** about here ]]

A second limitation concerns the potential for any bias that reflects the standing of the acceptors of bills presented to the Bank – that is, as compared with bills sold on the open market.<sup>21</sup> There was no formal rule regarding the eligibility of acceptors, and the Bank of England re-discounted bills accepted by all sorts of intermediaries.<sup>22</sup> Fortunately, we can cross-check our data set with alternative sources that give estimates of the total amounts of bills accepted by London’s most prominent acceptors. Such aggregate amounts have been computed in the secondary literature based on the contemporary financial press (Chapman, 1984)<sup>23</sup> or on direct evidence from archival records of the acceptance houses (Jansson, 2018). Table 1 compares the ranking of the biggest acceptance houses in our database (as measured by market penetration)<sup>24</sup> with the ranking of British acceptance houses (in terms of the volume of bills they accepted in 1906) as reported by, respectively, Chapman (1984) and Jansson (2018). This evidence about the representativeness of acceptors in our data set is reassuring: our ranking almost perfectly matches those established by these two authors. Hence it is reasonable to suppose that our data set captures the London money market’s broad structure at that time.

## 4. Anatomy of the London money market

### 4.1. *Information asymmetries and the money market*

The first advantage of our data set is that it allows us to document where the debts underlying sterling bills were originated. Figure 1 (in Section 1) showed how the drawers of bills were dispersed geographically. Among all the drawers of bills re-discounted by the Bank of England in 1906, UK drawers represented only 13.56 per cent; 17.50 per cent of drawers were located in

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<sup>21</sup> One could argue that any quality bias is exacerbated in crisis times. Yet Flandreau and Ugolini (2013) show that, around the financial crisis of 1866, the quality of the signatures on bills re-discounted by the Bank of England did not significantly differ in quiet and troubled times.

<sup>22</sup> The Bank of England did not acquire bills through open-market operations but only through its standing facility (Ugolini, 2016).

<sup>23</sup> Chapman (1984) relies on Thomas Skinner’s contemporaneous annual directory, *The London Banks*.

<sup>24</sup> We define the *market penetration* of an acceptor as the percentage of discounters in our sample that purchased bills accepted by her.

continental Europe, 20.40 and 15.14 per cent were in (respectively) USA/Canada and Latin America, 19.78 per cent in India and the Far East, 5.46 per cent in Africa, 2.11 per cent in Oceania, and 6.05 per cent in the rest of the world.

Not all the borrowers who used sterling bills were located in the world's largest metropolises or trading centres; many originated from cities with much smaller populations. This phenomenon is evident from the geographical location of European drawers, which Figure 4 shows were scattered across the continent. Many drawers of bills were located in smaller localities – especially in Central Europe, Scandinavia, Spain, and Italy – from which we conclude that many foreign local firms had access to London credit facilities. Thus it appears that, at the beginning of the twentieth century, firms from all around the world could borrow on the London bill market.

[[ INSERT **Figure 4** about here ]]

How could such diverse and geographically widespread borrowers gain access to the London money market and borrow through sterling bills? As emphasised by Hawtrey (1930, p. 122):

*many borrowers are traders in a small way, whose affairs and whose names are unknown except to their bankers and the few traders with whom they have dealings. The credit of a small grocer in a country town may be in itself unimpeachable; he may be less likely to default on any of his debts than a financial house of world-wide reputation; but still his name on a promissory note will carry no weight except with people who know enough of him and his affairs to believe that they can trust his solvency and his honesty.*

The investor in bills of exchange could barely rely on hard indicators to assess the borrowing firms' solvency (let alone their honesty), and their geographical dispersion made it difficult for a distant investor to assess conditions in the various markets where they operated. It follows that there must have been severe information asymmetries between borrowing firms and final investors on the London money market. Such market frictions could well have resulted in credit rationing for borrowers and an absence of lending (Stiglitz and Weiss, 1981).

In order to understand how these frictions were overcome, it is essential to look at the role of intermediaries in the production of sterling bills. Before it reached the final investor, each

bill was first accepted/guaranteed by an acceptor and subsequently distributed by a discounter. We now examine the role of acceptors and discounters in overcoming market frictions and information problems on the money market.

#### ***4.2. The business of accepting***

As we have explained, London acceptors were the guarantors of sterling bills. In case the drawer (or her trading partner) failed to reimburse her debt, the bill remained the acceptor's liability: she was still obliged to repay its bearer at maturity. An acceptor was the first exposed when borrowers defaulted, so she was strongly incentivised to gather detailed information about them.

Among the largest acceptors in the City were the specialised acceptance houses, which accepted bills drawn by their numerous domestic and foreign clients. Archival records of the merchant bank Kleinwort & Co. illustrate the role of these houses in producing private information about borrowers seeking to access the London money market. Founded in 1855, Kleinwort & Co. gradually established itself as a major acceptance house over the second half of the nineteenth century; by 1906, it was the leading acceptor of sterling bills (see Table 1). The firm typically offered credit lines under specific conditions to its customers around the globe. Under these arrangements, Kleinwort & Co. committed to accept bills (up to a certain amount) on account of its customers. The conditions of the credit lines – in particular, their total amount and the commission charged for accepting bills – varied as a function of the borrowing firm's credit standing.<sup>25</sup> In order to obtain information on its clients abroad, the house relied on its large network of foreign correspondents to produce detailed reports on clients' positions that described these firms' origins and commercial activities while assessing their financial situation (especially their capital) and the owners' personal qualities. These reports, which were often written in a foreign language, were gathered into "client information books" and updated frequently.

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<sup>25</sup> See, for example, the *Client Account Ledgers* at London Metropolitan Archives, CLC/B/140/KS04/12/22.

The type of information gathered about borrowers could be acquired only through frequent contacts with those clients and was rarely quantifiable; thus it was “soft” information.<sup>26</sup> For example, the information book on German customers described Heine & Fleisch – a family business, located in Altona (Hamburg), that specialised in the trade of leather, skins, and furs – as a “reputable firm” whose “financial situation is favourable” and is “considered solvent for its orders”. This report added that, “on a personal note, the owners are described to us as competent and respectable merchants”. The case of Kleinworts therefore suggests that acceptance houses acted as relationship bankers toward their clients who wanted to borrow on the London money market. Through repeated interactions with these clients, acceptance houses gathered private information about bill market borrowers.<sup>27</sup>

#### ***4.3. The special relationship between drawers and acceptors***

We hypothesise that, through their information acquisition activities, acceptors made an indispensable contribution to resolving information asymmetries between borrowers and lenders on the money market. To provide quantitative evidence for this proposed mechanism, we rely on the theory of relationship banking. According to this literature, firms on which little public information is available usually borrow from only one or a small number of creditors (Diamond, 1984; Sharpe, 1990; Diamond, 1991; Rajan, 1992; Peterson and Rajan, 1994; Berger and Udell, 1995; Boot, 2000; Boot and Thakor, 2000). Private information about borrowers can be acquired only through repeated transactions, and there are fixed costs involved. Therefore, lending to such borrowers is more efficiently handled by one single intermediary (or a small number of them). In contrast, firms whose standing and creditworthiness are publicly known will more efficiently

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<sup>26</sup> Stein (2002, p. 1892) defines *soft information* as “information that cannot be directly verified by anyone other than the agent who produces it.” In contrast, *hard information* is “verifiable information, such as the income shown on the borrower’s last several tax returns.”

<sup>27</sup> Boot (2000, p. 10) defines *relationship banking* as “the provision of financial services by a financial intermediary that i) invests in obtaining customer-specific information, often proprietary in nature; and ii) evaluates the profitability of these investments through multiple interactions with the same customer over time and/or across products.” The fee charged by acceptance houses compensated them for these information acquisition activities. On the information role of acceptance houses, see Accominotti (2012, 2019) and Flandreau and Mesevage (2014).

borrow from a large set of creditors or directly from the capital market (Boot and Thakor, 2000). If the activity of accepting (guaranteeing) bills required private information about drawers (borrowers), then we should similarly expect the latter's bills to have been guaranteed by a small number of acceptors. Yet if the acceptor's guarantee had solved the information problem on the bill market, then drawers should have been able to sell their accepted bills to a larger number of discounters. Hence we check for whether the drawers of sterling bills were, on average, connected to more discounters than acceptors.

Our empirical strategy consists of comparing how acceptors and discounters (two different categories of *principals*) established relationships (or *links*) with drawers (or *agents*) on the bill market. We first focus on the 1,381 drawers whose names appear on at least two non-identical bills in our data set.<sup>28</sup> In Table 2, panel A reports the average number of acceptors and discounters per drawer. Although there are 1,439 different acceptors appearing in our data set and only 145 discounters, drawers of bills were on average connected to a smaller number of acceptors (2.83) than discounters (3.33). Whereas the ratio of the acceptor population to the discounter population is 9.92, the median acceptor-to-discounter ratio of drawers is only 1.16. As shown in panel B of the table (row “All>1/Observed”), about half (50.25 per cent) of the 1,381 drawers whose names appear on more than one bill had a strictly higher number of discounters than acceptors. In contrast, only 28.67 per cent of the drawers had more discounters than acceptors. This result holds irrespective of the number of transactions in which drawers were involved. Both small drawers (whose names appear on a limited number of bills) and large ones (that were involved in a much higher number of transactions) had, on average, fewer acceptors than discounters (see panel B, rows “Observed”).

[[ INSERT **Table 2** about here ]]

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<sup>28</sup> Drawers for which only one transaction is recorded were, by construction, linked to just one acceptor and one discounter – which prevents us from drawing any conclusions about the structure of their personal linkages. Among the total of 3,554 drawers, 1,381 appear more than once in our data set.

We can also compare this distribution with a simulated one when the links between drawers and acceptors/discounters are formed randomly. Toward that end, we perform two simulation exercises in which we generate 100 random networks with the same demography (i.e., the same population of drawers, acceptors, and discounters) as the observed one but with simulated links (see the Appendix for details). In our first simulation, we assume that links between nodes were generated in a purely random way – so that every acceptor/discounter had the same probability of forming a link with a given drawer. In simulation 2, we again randomly recombine links between drawers and acceptors/discounters but assume that each acceptor/discounter maintained the same total number of links (with drawers) in the simulated network as in the observed one. Thus simulation 2 better accounts for the individual characteristics of the acceptors/discounters and for the greater likelihood that some have of establishing relationships with drawers. Panel B (rows “Simulation 1” and “Simulation 2”) in Table 2 classifies drawers in the simulated networks according to whether they had more acceptors or discounters; the Appendix provides full details on simulated and observed distributions of the drawers’ acceptor-to-discounter ratio.

If links between nodes had been formed in a random manner, then only a small minority of drawers would have had more discounters than acceptors (0.79 or 4.26 per cent, versus 50.25 per cent in the observed network). Some 40 per cent of the drawers in Table 2 appear on only two different bills. If these small, two-transaction drawers had chosen their acceptors/discounters randomly, then an overwhelming majority of them would have had a different acceptor and a different discounter for each bill – and therefore as many acceptors as discounters overall. In the actual network, however, only 26.70 per cent of the two-transaction drawers had as many acceptors as discounters whereas 47.67 per cent of them had two discounters but only one acceptor. When instead focusing on the largest drawers (those that had more than ten transactions), we see that, in the observed network, 50.00 per cent of them had more discounters than acceptors. By contrast, if these big drawers had formed their relationships with acceptors and

discounters randomly, only a small minority of them (3.24 or 5.71 per cent) would have had more discounters than acceptors whereas a majority (55.85 or 82.62 per cent) would have established links with a strictly higher number of acceptors than discounters. Thus the evidence indicates that drawers tended to maintain a few relationships with acceptors but had access to a larger pool of discounters. Most drawers of bills could deal only with the limited number of acceptors that held information on them.<sup>29</sup>

In the Appendix, we also assess the extent to which acceptors had drawers in common – that is, to what extent they “shared” drawers. Had acceptors held proprietary information about their drawers, it seems unlikely that drawers would be shared among acceptors. Our findings support this hypothesis. Acceptors tended to share very few drawers (and often, none) with other acceptors. In fact, 40 per cent of the acceptors in our data set did not share any of their drawers, and no acceptor shared drawers with more than 13 per cent of the other acceptors. Yet if the links between drawers and acceptors had formed randomly, then acceptors would be much more likely to share drawers (see Appendix).

The acceptors’ tendency not to share their drawers is characteristic of markets in which intermediaries hold proprietary information about their customers. Acceptors specialised in guaranteeing the debts of a few borrowers on which they had acquired information and with whom they had special relationships. The evidence therefore suggests that acceptors played an important role in producing information about borrowers on the London money market and in overcoming market frictions.

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<sup>29</sup> At the same time, we also observe a significant minority of drawers in our data set who were connected with more acceptors than discounters. The implication is that an acceptor’s signature was not invariably sufficient to overcome information frictions – in other words, several drawers still depended on one discounter (or on just a few discounters) for access to the bill market *despite* having obtained an acceptor’s guarantee. In such cases, the discounter’s signature appears to have played a vital role. See Section 4.5 for more on the role of discounters.



#### ***4.4. Market structure of the accepting and discounting industries***

We next explore how information problems shaped the market structure of the accepting and discounting industries in London. As we have described, the acceptor's guarantee was crucial in the investors' willingness to purchase bills on the money market. Of course, the value of this guarantee depended heavily on the acceptor's reputation. Reputational effects could have resulted in a high concentration of the accepting industry, since a few large acceptors might have been able to capture the reputational rents associated with guaranteeing commercial debts. Indeed, Chapman (1984) argues that, during the second half of the nineteenth century, the accepting business became increasingly concentrated around a few specialised merchant banks and acceptance houses. At the same time, the acceptors' information acquisition activities might have suffered from diseconomies of scale. Small, decentralised institutions are widely considered to be more efficient (than are large, hierarchical ones) at acquiring and processing soft information about borrowers (Stein, 2002). The reason is that the information derived by a bank officer is often difficult for upper management to verify. For example, the qualitative information that Kleinworts obtained about the owners of Heine & Fleisch could hardly be verified by anyone other than the agent who had produced it.<sup>30</sup> These diseconomies of scale in the acquisition of soft information could have constrained acceptors' capacity to grow.

[[ INSERT **Figure 5** and **Figure 6** about here ]]

Figures 5 and 6 present indicators of market concentration in the accepting and discounting industries.<sup>31</sup> Figure 5 plots two common measures of concentration: the *Herfindahl*–

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<sup>30</sup> Stein (2002) presents a formal model that explains why small banks with a decentralised structure might be better equipped (than are hierarchical banking firms) to deal with soft information.

<sup>31</sup> The construction of these indicators is based on the number of drawers per acceptor and per discounter.

*Hirschman index* (HHI)<sup>32</sup> and *highest market penetration*.<sup>33</sup> Figure 6 displays the *market share*<sup>34</sup> of the top discounters and acceptors in our data set. According to this evidence, the accepting industry did not exhibit a high degree of market concentration. There is actually much greater concentration in discounting than in accepting: the HHI index is almost 4 times higher for discounters than for acceptors, and the greatest market penetration is twice for discounters what it is for acceptors. Similarly, the top 15 discounters in our data set captured more than 70 per cent of the market share in discounting whereas the top 15 acceptors accounted for only a 35 per cent market share in their activity. These results suggest that the very nature of accepting activities, which required maintaining personal relationships with customers abroad, resulted in diseconomies of scale and therefore limited market concentration in the industry.

[[ INSERT **Figure 7** about here ]]

In Figure 7 we report the frequency distribution of acceptors and discounters with regard to the number of drawers with whom they were connected. Both industries were characterised by a “dual” market structure in that many small actors co-existed with a small number of much larger ones. Most (64.42 per cent) of the acceptors in our data set were connected to one drawer only. These small acceptors were usually trading or manufacturing firms and not financial institutions. At the other end of the spectrum, a small minority (0.83 per cent) of acceptors were connected with more than a hundred drawers. These included the main commercial banks and London acceptance houses such as Kleinwort & Co. (the largest acceptor in our data set), which accepted bills drawn by 325 different drawers.

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<sup>32</sup> The Herfindahl–Hirschman index is defined as the sum of the squares of the market shares of all market participants. The index ranges from 0 (in the case of a perfectly competitive market) to 10,000 (in the case of a perfectly monopolistic market).

<sup>33</sup> A firm’s market penetration is defined as the share of potential customers it reaches. Market “penetration” differs from market “share” in this sense: shares cannot be appropriated by more than one firm, but any number of firms can reach the same customer(s) at the same time. The highest market penetration is the penetration of the firm that reaches the largest number of potential customers. This metric can range from 0 per cent (when each firm reaches only an infinitesimal share of customers) to 100 per cent (when at least one firm manages to reach all potential customers).

<sup>34</sup> We compute the market share by treating each drawer–acceptor and drawer–discounter relationship as the unit portion of the existing market and then computing their sum. Thus we view the accepting (resp. discounting) market as consisting of 6,075 (resp. 6,758) portions.

The discounting industry also exhibited a dual market structure. Among the discounters in our data set, 35 per cent of them were connected with only one drawer and 35 per cent were connected to more than ten drawers. Yet discounters, unlike acceptors, seem not to have faced diseconomies of scale; those that managed to grow did so to a much greater extent than did acceptors. As a result, a small number of large discounters dominated the market while a large number of small ones undertook much more limited discounting activities. These differences in market structure explain the higher level of concentration observed in the discounting than in the accepting industry. The largest discounters included the City's leading commercial and merchant banks as well as specialised discount houses such as the Union Discount Company (the largest discounter in our data set), which purchased bills drawn by 705 different drawers.

#### ***4.5. The business of discounting***

A consequence of the market structure just described – and of the limited market power of the large acceptance houses – was that a significant share of the bills produced in London were accepted by small, non-financial firms of modest reputation and on which little public information was available. How could bills drawn on such small acceptors end up on the money market and be brought to the final investors' portfolio?

We argue that discounters played an important role in reducing the risk inherent to these bills. After being accepted, sterling bills were purchased by a discounter who then distributed them to a final investor (a re-discounter). In this process, discounters endorsed the bills and added their personal, secondary guarantee to them – that is, in addition to that of the acceptor. Thus discounters served two distinct functions on the money market: they not only distributed bills but also rendered them more creditworthy.<sup>35</sup> In case the acceptor was not itself a well-known house

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<sup>35</sup> All the discounters in our data set served these two financial functions. Bills recorded in the Bank of England's *Discount Ledgers* had all been endorsed (and thus guaranteed) by the discounter before being resold to the Bank (the re-discounter).

with a solid reputation, the discounter's guarantee provided an alternative mechanism through which borrowers could sell their bills and obtain credit in London.

To investigate this mechanism, we analyse how discounters selected their bills. The Bank of England categorised discounters into three different types: “bankers” (all commercial banks, including mostly Anglo-foreign banks), “brokers” (discount houses), and “[other] discounters” (a mixed bag, which included a variety of UK merchant banks and trading houses).<sup>36</sup> Figure 8 shows that these three types of discounters purchased similar proportions of bills drawn on small and large acceptors.<sup>37</sup> This means that the various discounters, whether small or large, all took part in distributing the bills accepted by the relatively less well-known, non-financial firms.

[[ INSERT **Figure 8** about here ]]

That said, the different discounter types did not all obtain their bills through the same channels. First, smaller UK trading firms and houses (included in the Bank of England's “other discounter” category) mostly discounted bills drawn or accepted by their own trading partners. They agreed to endorse those bills because they were in a business relationship with the drawers or acceptors and knew there was a sound commercial transaction behind them.<sup>38</sup>

The largest discounters were (on the one hand) discount houses and (on the other hand) Anglo-foreign banks, two types that differed in how they obtained their bills. Discount houses specialised in bill trading. They were in close contact with various acceptors and remitters of bills

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<sup>36</sup> Of the 145 discounters in our database, 19 were “bankers” (including 3 purely domestic banks, 1 foreign bank, and 15 Anglo-foreign banks), 19 were “brokers” (i.e. discount houses), and 107 were “[other] discounters”.

<sup>37</sup> There were so many acceptors that it is not possible to identify the activities in which each was involved; also, there was no geographical variation across acceptors because all of them were based in London. Hence we can classify acceptors only in terms of their size, defined as the number of discounters who had purchased their bills. We do know that most small acceptors were merchant or industrial firms, whereas most large acceptors were established financial institutions such as commercial banks and acceptance houses.

<sup>38</sup> Trading houses were often both the drawer and discounter of the same bill. In one extreme example from our data set, we see how a drawer (Foy, Morgan & Co., a timber trading company) had drawn bills on 38 different acceptors and then had itself discounted the bills. Since the acceptors were all small industrial or trading firms, we suspect that they were Foy Morgan's own clients. The drawer probably had outstanding claims on these clients and decided to securitise those claims by drawing bills on them, which could then be re-discounted to another investor (or to the Bank of England). In such cases, it was the signature of the discounter – rather than that of the acceptor – which could persuade an investor (or the Bank of England) to purchase the bills.

– London acceptance houses, banks located in foreign countries, Anglo-foreign banks, and various UK importers and exporters that accepted bills drawn on them by their trading partners – and purchased bills through these agents on a daily basis (Greengrass, 1931, pp. 62–65; Vigreux, 1932, pp. 177–78; Truutil, 1936, p. 126; Sayers, 1968, p. 37).<sup>39</sup>

In contrast, foreign and Anglo-foreign banks did not focus exclusively on bill discounting, and their business was geographically specialised. They maintained a large network of correspondents or branches in those areas of the world where their activities were concentrated (Jones, 1993). The correspondents shipped these banks a constant stream of bills drawn by their local customers on reputable UK financial institutions and acceptance houses as well as on smaller acceptors, especially trading and manufacturing firms.<sup>40</sup> Foreign and Anglo-foreign banks discounted these bills upon their arrival in London and then either kept the bills in their respective portfolios or distributed them to other investors (Greengrass, 1931, p. 64).

[[ INSERT **Figure 9** about here ]]

The distinction between discount houses and Anglo-foreign banks is clearly apparent in our data. Figure 9 focuses on all discounters in our data set which had at least ten drawers and plots the geographical concentration of their bill portfolios (as measured by the HHI)<sup>41</sup> against the total number of drawers with whom they were connected. The figure distinguishes between the three categories of discounters: it includes 12 “commercial banks” (including 11 Anglo-foreign banks and 1 foreign bank; grey triangles), 19 “discount houses” (black diamonds), and 21 “other discounters” (merchant banks and trading houses; white circles). Our measure of geographical concentration reflects the different business models adopted by these various discounters.

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<sup>39</sup> Discount houses sometimes purchased bills by relying on *running brokers*, who were bona fide brokers acting as intermediaries between the acceptors or remitters of bills and the discounters. Unlike discount houses (often called “bill brokers”), running brokers (often called “discount brokers”) did not themselves endorse any bills, and their names did not appear on them. However, running brokers charged a commission for their services. See Greengrass (1931, p. 64). Also see ft. 9 above.

<sup>40</sup> In most cases, foreign correspondents endorsed the bills before sending them to London.

<sup>41</sup> The index is constructed based on the geographical distribution of each discounter’s drawers. We classify drawers into nine different regions depending on the city in which they were located.

Discount houses purchased bills drawn on or remitted to London agents with whom they had a relationship (either directly or through a broker). These bills could be drawn from all around the world, so the bill portfolio of a discount house was highly diversified geographically. But since Anglo-foreign banks purchased bills through their foreign correspondents, their portfolios were geographically concentrated.

[[ INSERT **Figure 10** about here ]]

Figure 10 shows the geographical composition of bills discounted by six large discounters: three discount houses (Union Discount Co, Ryder Mills & Co., National Discount Co.) and three Anglo-foreign banks (Canadian Bank of Commerce, Chartered Bank of India Australia & China, Bank of Tarapaca & Argentina). We also compare the geographical composition of these discounters' portfolios with that of the market portfolio (i.e., the aggregate portfolio for all discounters in our data set). The discount houses' portfolios did not exhibit any specific geographical bias, and their portfolios matched the distribution of all drawers in the data set. In contrast, nearly all the bills endorsed by Anglo-foreign banks originated in the regions where those banks specialised: 89 per cent of the bills discounted by the Canadian Bank of Commerce were drawn from Canada or the United States, and 85 per cent of those discounted by the Bank of Tarapaca & Argentina and by the Chartered Bank of India, Australia & China originated from (respectively) Latin America and Asia/Oceania.

Through their wholesale activities, then, discounters helped reducing informational asymmetries by screening a large share of the bills on the London money market; because a discounter always endorsed the bills it distributed, their creditworthiness was enhanced by that screening. Although discounters were generally not in direct contact with drawers, they could supply information on the other intermediaries involved in a bill's origination. On the one hand, discount houses endorsed bills drawn from around the world because they knew the acceptors or remitters (either directly or indirectly through the brokers they used and trusted). On the other hand, Anglo-foreign banks discounted bills originating from specific regions because they were

sent to them by their foreign correspondents, who had previously screened the drawers. In both cases, discounters contributed to reducing the credit risks of bills. Hence discounters' signatures allowed for a large number of bills – despite being drawn on small, unknown acceptors – to be sold on the money market.

## **5. Conclusions**

This paper has presented new insights into the structure and industrial organisation of the London money market during the heyday of the first globalisation. We construct an original database that tracks the complete origination and distribution chains for all bills of exchange re-discounted by the Bank of England in 1906. We first show how borrowers from practically anywhere in the world could borrow on the London bill market. Then we describe the various mechanisms through which information asymmetries between these borrowers and lenders were reduced on the money market. We argue that the information problem inherent to the production of bills was solved by a cumulative process in which London intermediaries successively added their guarantees to the instruments. The acceptor's signature played the key role, but it was supported by the secondary guarantee (endorsement) added by the bills' sellers (discounters). That second guarantee was especially important for the many bills drawn on small and relatively unknown acceptors. All successive intermediaries involved in the origination and distribution of bills contributed to produce information on the debts underlying them. This "screening cascade" allowed unknown borrowers from even the most obscure parts of the globe to access money market investors in the world's financial capital.

Our analysis therefore reveals the crucial role of information collection – and of case-by-case screening by intermediaries – in transforming risky private debts into liquid and almost riskless money market instruments. The complex industrial organisation of the London discount market and its intermediaries' human capital and expertise were instrumental in positioning London as the world's money market and financial centre during the first globalisation. The

liquidity and safety of the London money market remained unquestioned until the position of bill-trading intermediaries, on which its functioning depended, was threatened by the First World War's financial repercussions.



# APPENDIX

## Network simulations

This appendix provides details on the network simulations presented in Section 4. The purpose of these simulations is to assess whether the network structure that emerges from our data set differs from what would have been observed if links between nodes had been formed randomly. Thus we compare the structure of the actual network of agents involved in the production of sterling bills in 1906 with two simulated benchmarks.

### Simulation 1

In the first benchmark, Simulation 1, we generate 100 random networks with the same demography as the actual one (1,361 multi-transaction drawers, 943 multi-transaction acceptors, and 119 multi-transaction discounters) by randomly recombining the links between drawers on the one hand and acceptors/discounters on the other hand. In this scenario, each acceptor (resp. discounter) has the same likelihood as any other acceptor (resp. discounter) to form a link with a drawer. In other words, each acceptor/discounter appears on roughly the same number of bills.<sup>42</sup> Simulation 1 allows us to visualise the distribution of drawers' acceptor-to-discounter ratios had links between nodes been generated in a purely random fashion.

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<sup>42</sup> In order to produce this scenario, we divide the total number of transactions involving the 1,361 multi-transaction drawers (6,715 transactions) by the number of acceptors (943) and the number of discounters (119). We then create two columns: one listing all acceptors and one listing all discounters. In the acceptors' (respectively, discounters') column, each acceptor (respectively, discounter) appears as many times as in the observed network (rounded up to the nearest integer value). Thus, since the observed drawer-to-acceptor ratio is 7.12, each acceptor appears 8 times in the acceptors' column. Since the observed drawer-to-discounter ratio is 56.43, each discounter appears 57 times in the discounters' column. We then produce simulations through a process of column building by randomly associating drawers in the original drawers' column with acceptors (respectively, discounters) in the newly-constructed acceptors' (respectively, discounters') column. Each recombination of the 6,715 rows constitutes one simulated network. We repeat this procedure 100 times in order to produce 100 different simulated networks.

## Simulation 2

In our second benchmark, Simulation 2, we also account for acceptors/discounters differing in their respective abilities to form links with drawers. Thus, in the language of network analysis, we account for various nodes having different “relational capacities”. For that purpose we generate 100 random networks with the same demography as the observed one, but in which each node also has the same total number of links as in the actual data. This means that each acceptor/discounter has the same likelihood of forming a link with a drawer in the simulated network as in the observed network.<sup>43</sup> Simulation 2 allows us to check for whether drawers’ acceptor-to-discounter ratios were affected by the relational capacity of acceptors/discounters.

### Acceptor-to-discounter ratio

Figure A.1 plots the frequency distribution of drawers’ acceptor-to-discounter ratio in the actual data (white bars) together with the frequency distribution of the same variable in random networks generated according to our two simulations. For each of the 100 networks generated through simulation 1 (resp., simulation 2), a grey tilde (resp., a grey line) indicates the number of drawers with a given acceptor-to-discounter ratio.

[[ INSERT **Figure A.1** about here ]]

In the actual network, most drawers have an acceptor-to-discounter ratio that is strictly less than 1 (i.e., there are fewer acceptors than discounters). But if links between nodes had been generated randomly, then (a) an overwhelming majority of drawers would have displayed an acceptor-to-discounter ratio of exactly 1 – that is, an equal number of acceptors and discounters – and (b) a higher proportion of drawers would have exhibited a ratio strictly greater than 1 (more acceptors than discounters) than strictly less than 1 (more discounters than acceptors). This

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<sup>43</sup> This scenario is also produced through a process of column building. Each actor’s likelihood to appear is unchanged with respect to the observed data. In order to produce a simulated network, we now simply recombine the original acceptors’ and discounters’ columns while keeping the original drawers’ column fixed. Hence, each acceptor and discounter has as many transactions in the simulated network as in the observed one, while the pattern of these transactions is redefined randomly. We then repeat this procedure 100 times in order to produce 100 simulated networks.

outcome reflects that the network includes more acceptors than discounters. It is also worth noting that more outliers appear in the observed network than in the simulated ones, which suggests that the determinants of link formation behaviour varied greatly for different actors.

### **Shared drawers**

Finally, we investigate the extent to which acceptors (discounters) had drawers in common. Figure A.2 reports the frequency distribution of acceptors (panel A) and discounters (panel B) according to the percentage ( $x$ ) of fellow acceptors/discounters with whom they shared at least one drawer. In each case, we report the observed distribution (white bars) in the actual network as well as the distributions in the simulated networks obtained through simulation 1 (grey tildes) and simulation 2 (grey lines).

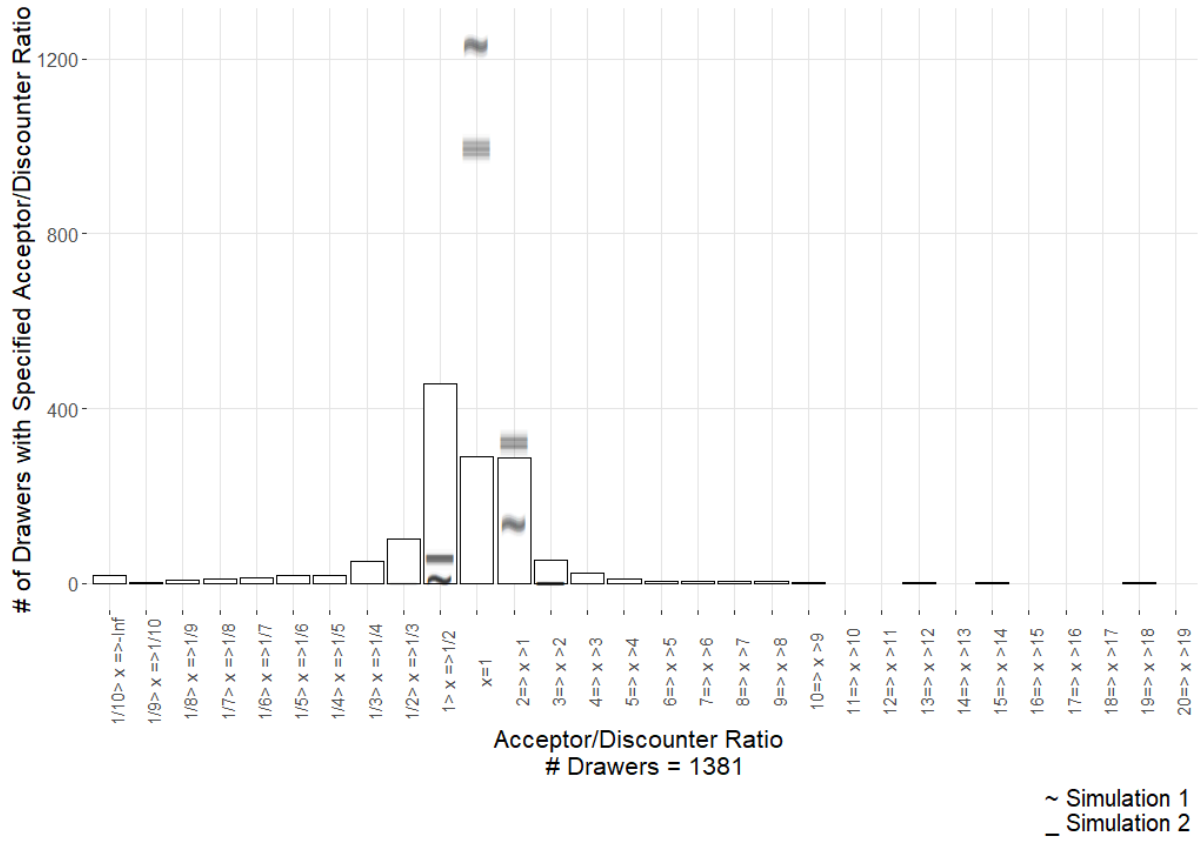
[[ INSERT **Figure A.2** about here ]]

In the observed distributions we can see that acceptors were less likely than discounters to share drawers with their peers: 40 per cent of the acceptors in our data set did not share any of their drawers with other acceptors, although more than 75 per cent of the discounters shared at least one drawer with other discounters. No acceptor shared a drawer with more than 13 per cent of the other acceptors, but a sizable group of discounters shared drawers with more than 40 per cent of their fellow discounters.

If links between drawers and acceptors had been formed randomly, then acceptors would (on average) have shared more drawers among them than they actually did (Figure A.2, panel A). This means that the tendency of acceptors not to share drawers, which we observe in the data, is due not to our network's structural characteristics but rather to structural factors in the formation of links between drawers and acceptors. The low amount of sharing observed among acceptors in the actual data strongly suggests that they held private information on bill market borrowers (drawers).

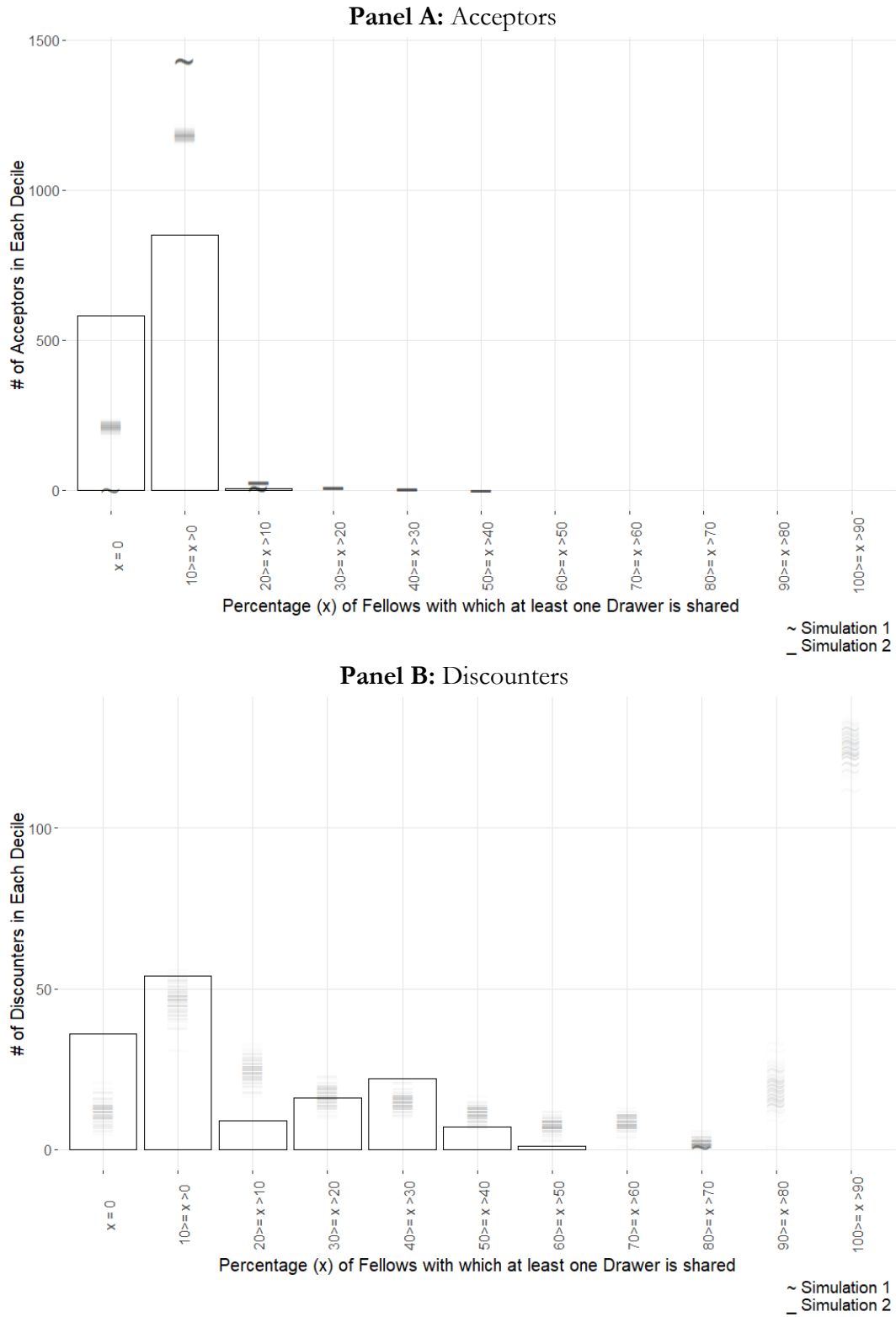
In panel B of the figure we see that discounters were divided into two groups. The small discounters in our data set shared, on average, fewer drawers than predicted by the simulations; however, large discounters shared as many drawers as predicted for the case of randomly formed links between drawers and discounters. These results indicate that, unlike the acceptors, large discounters did *not* hold proprietary information on the drawers.

**Figure A.1.** Acceptor/discounter ratios: Observed versus simulated



*Notes:* The figure plots the frequency distribution of the 1,381 multi-transaction drawers according to their acceptor-to-discounter ratio (denoted by “x” on the horizontal axis) in the observed network (white bars) as well as in simulation 1 (grey tildes) and simulation 2 (grey lines). Drawers for whom  $x < 1$  are linked to more discounters than acceptors. Drawers for whom  $x = 1$  are linked to as many discounters as acceptors. Drawers for whom  $x > 1$  are linked to more acceptors than discounters. Each tilde (line) indicates the number of drawers in the corresponding decile for each of the 100 simulations (we do not report a tilde or line when there is no drawer in the corresponding decile).

**Figure A.2.** Shared drawers: Observed versus simulated



*Notes:* This figure plots the frequency distribution of acceptors (panel A) and discounters (panel B) according to the percentage (“x”) of fellow acceptors/discounters with whom they share at least one drawer in the observed network (white bars) as well as in simulation 1 (grey tildes) and simulation 2 (grey lines). Acceptors/discounters for which  $x = 0$  do not share any drawer with any of their peers, whereas acceptors/discounters for which  $x = 100$  share at least one drawer (not necessarily the same) with all other fellow acceptors/discounters. Each tilde (line) indicates the number of drawers in the corresponding decile for each of the 100 simulations (we do not report a tilde or line when there is no drawer in the corresponding decile).

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**Table 1.** Three rankings of London acceptance houses in 1906

	Our database	Chapman (1984)	Jansson (2018)
Kleinworts	1	1	1
Schröders	2	2	2
Barings	3	3	4
Brandts	4	5	3
Rothschilds	5	4	5
Hambros	6	6	6
Gibbs	7	7	7

*Notes:* This table compares the ranking – in terms of their number of discounters in 1906 – of seven of our data set's acceptance houses with their ranking by Chapman (1984, p. 209) and Jansson (2018, p. 269). Those authors' rankings are based on the aggregate amount of accepted bills appearing on the respective houses' balance sheets.

*Sources:* See text.

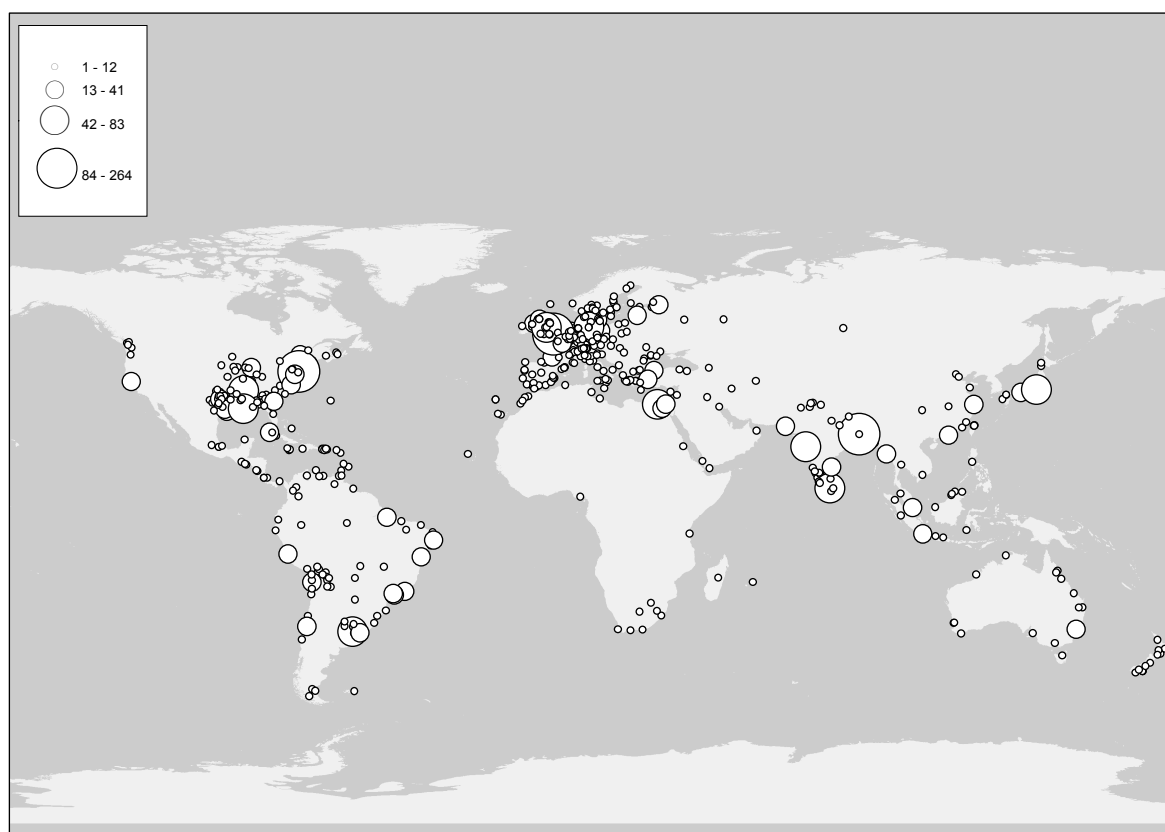
**Table 2.** Acceptors and discounters per drawer

<i>Panel A: Number of Acceptors/Discounters per Drawer</i>				
	Mean	SE	Max	Min
<i>Acceptors</i>				
No. of acceptors per drawer	2.83	(0.08)	38	1
% of all acceptors	0.20	(0.01)	2.64	0.07
<i>Discounters</i>				
No. of discounters per drawer	3.33	(0.08)	36	1
% of all discounters	2.29	(0.05)	24.83	0.69
<i>Panel B: Repartition of Drawers</i>				
No. of transactions involved	Total drawers	Discounters > Acceptors	Discounters = Acceptors	Discounters < Acceptors
<i>All &gt; 1</i>				
Observed	1,381	50.25%	21.07%	28.67%
Simulation 1	1,381	0.79%	89.28%	9.93%
Simulation 2	1,381	4.26%	72.21%	23.53%
<i>2</i>				
Observed	558	47.67%	26.70%	25.62%
Simulation 1	558	0.10%	99.06%	0.85%
Simulation 2	558	1.16%	94.65%	4.18%
<i>3</i>				
Observed	239	44.35%	30.54%	25.10%
Simulation 1	239	0.34%	97.20%	2.46%
Simulation 2	239	3.42%	85.26%	11.32%
<i>4</i>				
Observed	158	58.86%	13.92%	27.21%
Simulation 1	158	0.55%	94.44%	5.01%
Simulation 2	158	5.70%	73.00%	21.30%
<i>5–9</i>				
Observed	286	55.59%	12.23%	32.16%
Simulation 1	286	1.47%	84.39%	14.14%
Simulation 2	286	9.50%	46.71%	43.79%
<i>10+</i>				
Observed	140	50.00%	8.57%	41.42%
Simulation 1	140	3.24%	40.91%	55.85%
Simulation 2	140	5.71%	11.67%	82.62%

*Notes:* This table focuses on multi-transaction drawers, or those whose names appear on at least two non-identical bills in our data set. Panel A reports the mean, the standard error, and the maximum and minimum number of multi-transaction drawers per acceptor and discounter. Panel B (Observed) displays the share of multi-transaction drawers with more discounters than acceptors, with as many discounters as acceptors, and with fewer discounters than acceptors. The repartition is shown for all drawers in our data set who have more than one different bill (*All > 1*) as well as for drawers with different numbers of bills. Panel B (Simulation 1 and Simulation 2) also reports the same repartition in two simulated networks generated on the assumption that links between drawers and acceptors/discounters were formed randomly (for details, see text and the Appendix).

*Source:* Bank of England's *Discount Ledgers*.

**Figure 1.** Geographical location of borrowers (drawers) on the London bill market

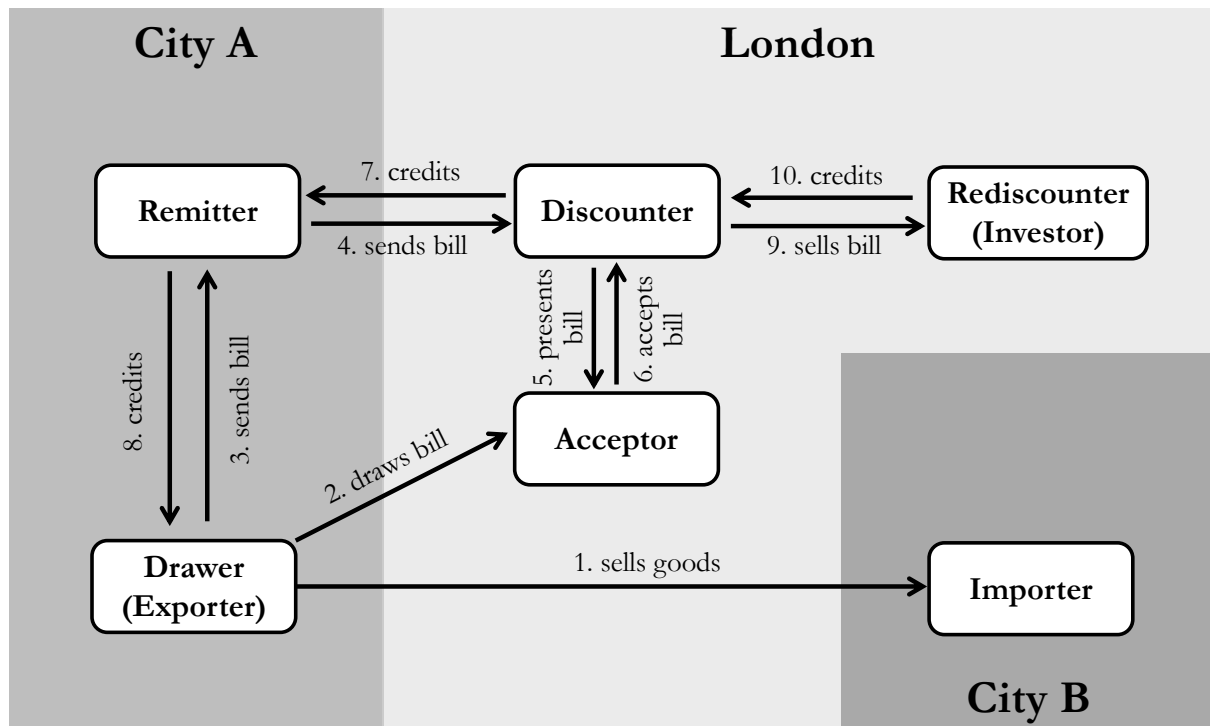


*Note:* This map shows the geographical location (at the city level) of all drawers of sterling bills in our data set.

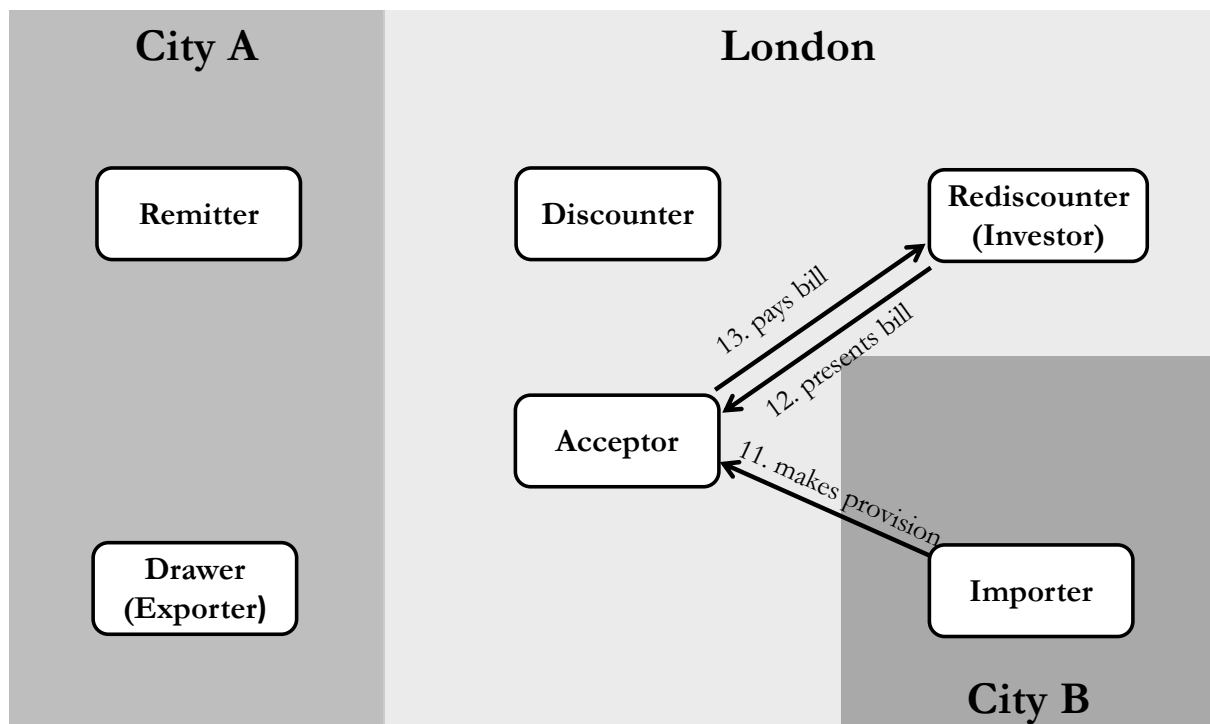
*Source:* Bank of England's *Discount Ledgers* (see text.)

**Figure 2.** Example of a commercial transaction financed by a sterling bill of exchange

**Panel A:** Operations at issue



**Panel B:** Operations at maturity



*Source:* Authors' schematic representation of transactions described by contemporaries (e.g., Gillett Brothers, 1952)

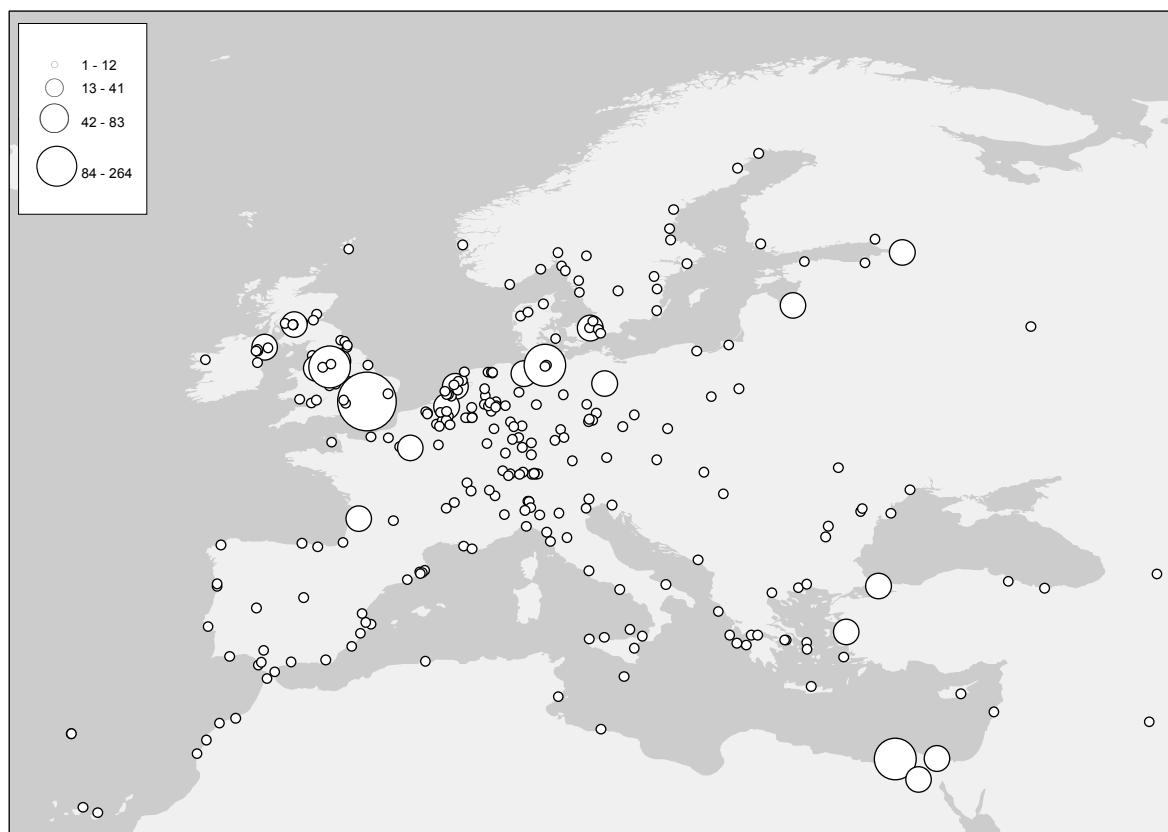
**Figure 3.** Bill of exchange, 1910

<b>ACCEPTED 15 AUGUST 1910</b> Payable at the London County & Westminster Bank <i>Kleinwort Sons &amp; Co.</i>	Moscow, 10 August 1910 <u>For £3,000</u>
	Three months after date pay against this Bill of Exchange to our order the Sum of <u>Three Thousand Pounds Sterling</u> Value in account and place it to account and charge it to account as advised by  Messrs Kleinwort Sons & Co. <u>London E.C.</u> ac Fenchurch Street
<i>Société L. Bauer &amp; Co.</i> <i>Le Directeur-Gérant: C. Bauer</i>	
Pay to the order of: Banque de Commerce de l'Azow-Don 10 August 1910 <i>Société L. Bauer &amp; Co.</i>	
For us at the order of: The Union Discount Company of London Ltd., London 10 August 1910 <i>Azow-Don Commerzbank</i>	

*Notes:* The figure's upper (resp. lower) portion transcribes the bill's front (resp. back) side. Text in italics corresponds to signatures.

*Source:* London Metropolitan Archives, CLC/B/140/KS04/13/02/006.

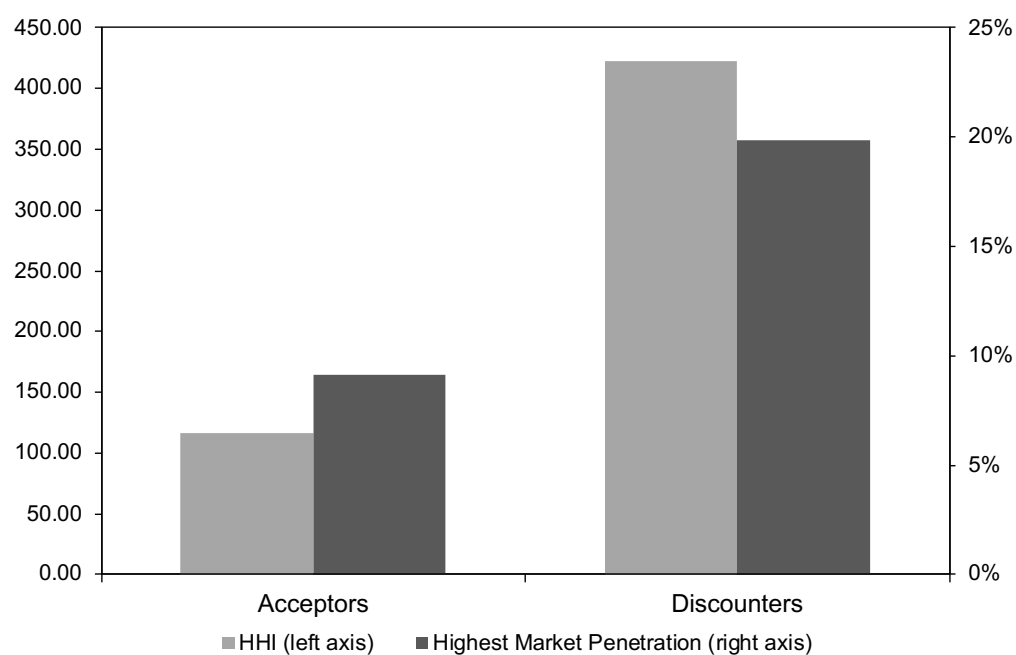
**Figure 4.** Geographical location of European borrowers (drawers) on the London bill market



*Note:* This map shows the geographical location (at the city level) of all European drawers of sterling bills in our data set.

*Source:* Bank of England's *Discount Ledgers* (see text).

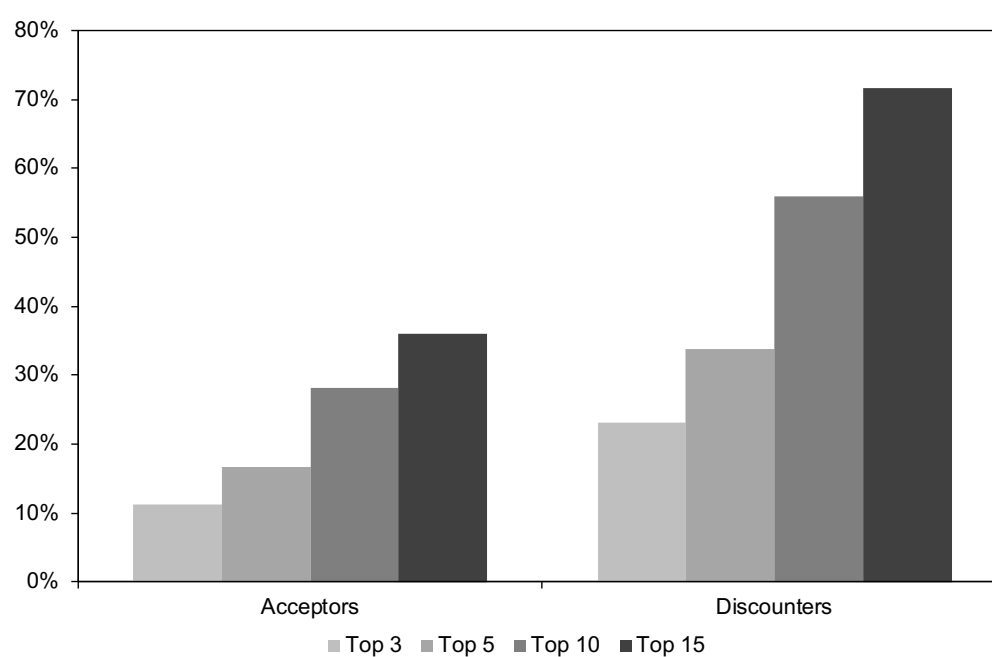
**Figure 5.** Market concentration in accepting and discounting



*Note:* This figure shows the HH index and the highest market penetration for acceptors and discounters on the London bills market; see text for details on these indicators.

*Source:* Bank of England's *Discount Ledgers* (see text).

**Figure 6.** Market shares of top acceptors/discounters

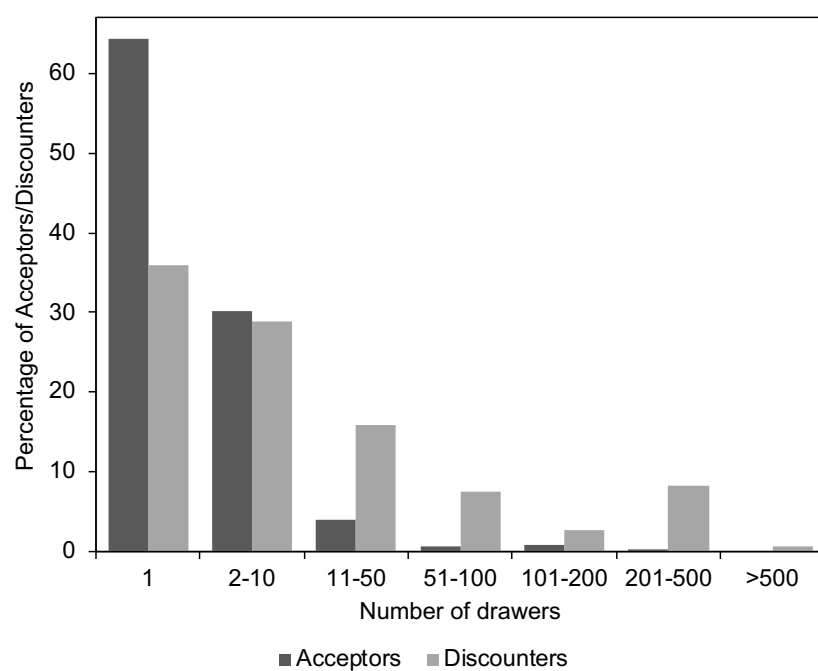


*Note:* This figure shows the market share of the top 3, top 5, top 10, and top 15 acceptors and discounters.

*Source:* Bank of England's *Discount Ledgers* (see text).



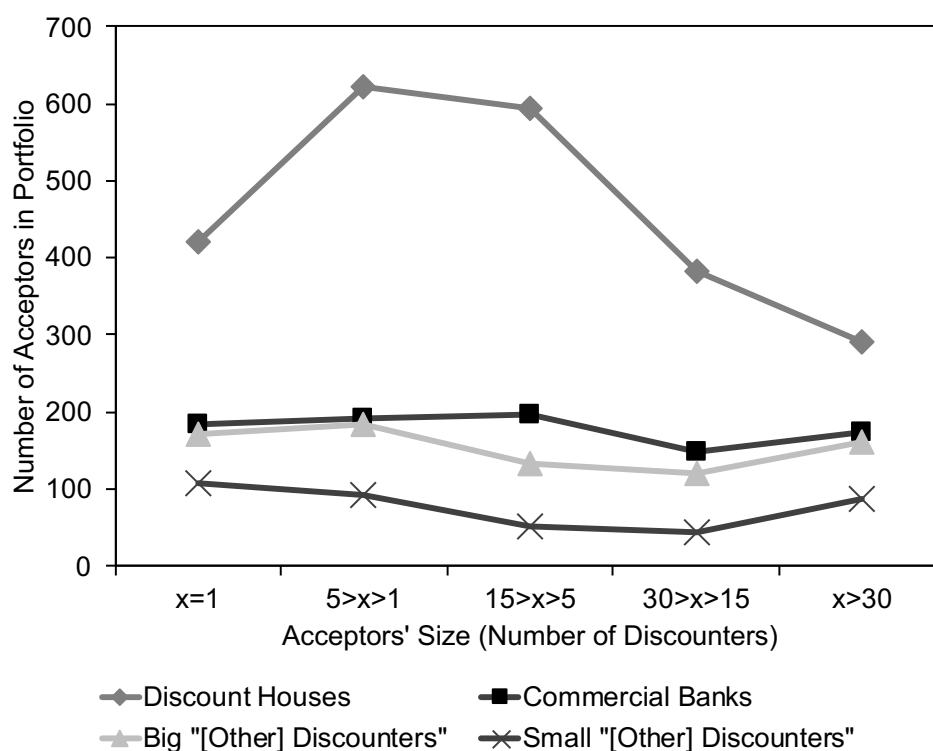
**Figure 7.** Dual structure of the accepting and discounting industries



*Note:* This figure shows the frequency distribution of acceptors and discounters in terms of the number of drawers to which they were linked.

*Source:* Bank of England's *Discount Ledgers* (see text)

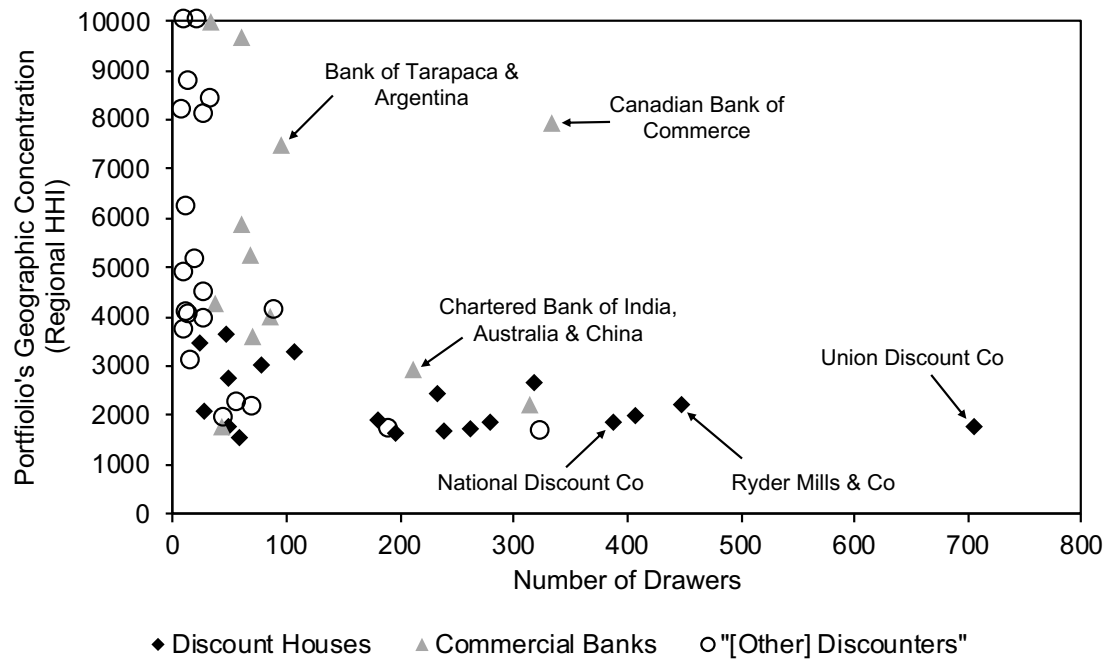
**Figure 8.** Discounters' portfolio of acceptors



*Notes:* This figure shows the total number of acceptors of various sizes connected to discounters of different categories: discount houses, commercial banks, and “[other] discounters”, where the latter are further divided into “small” and “big” types according to the total number of acceptors to whom they were linked. The 93 small “other” discounters in our data set are those linked to fewer than 18 acceptors; each of the 14 big “other” discounters is linked to at least 18 acceptors. Acceptors are likewise classified according to their size (denoted by “x” on the figure’s horizontal axis), defined as the number of discounters with which the acceptors were linked. The graph can be read as follows: in 1906, the 19 discount houses in our data set bought (in aggregate) bills accepted by 432 different very small acceptors (each of whom was linked to only one discounter) in addition to bills accepted by 293 different very big acceptors (linked to more than 30 discounters).

*Source:* Bank of England’s *Discount Ledgers* (see text).

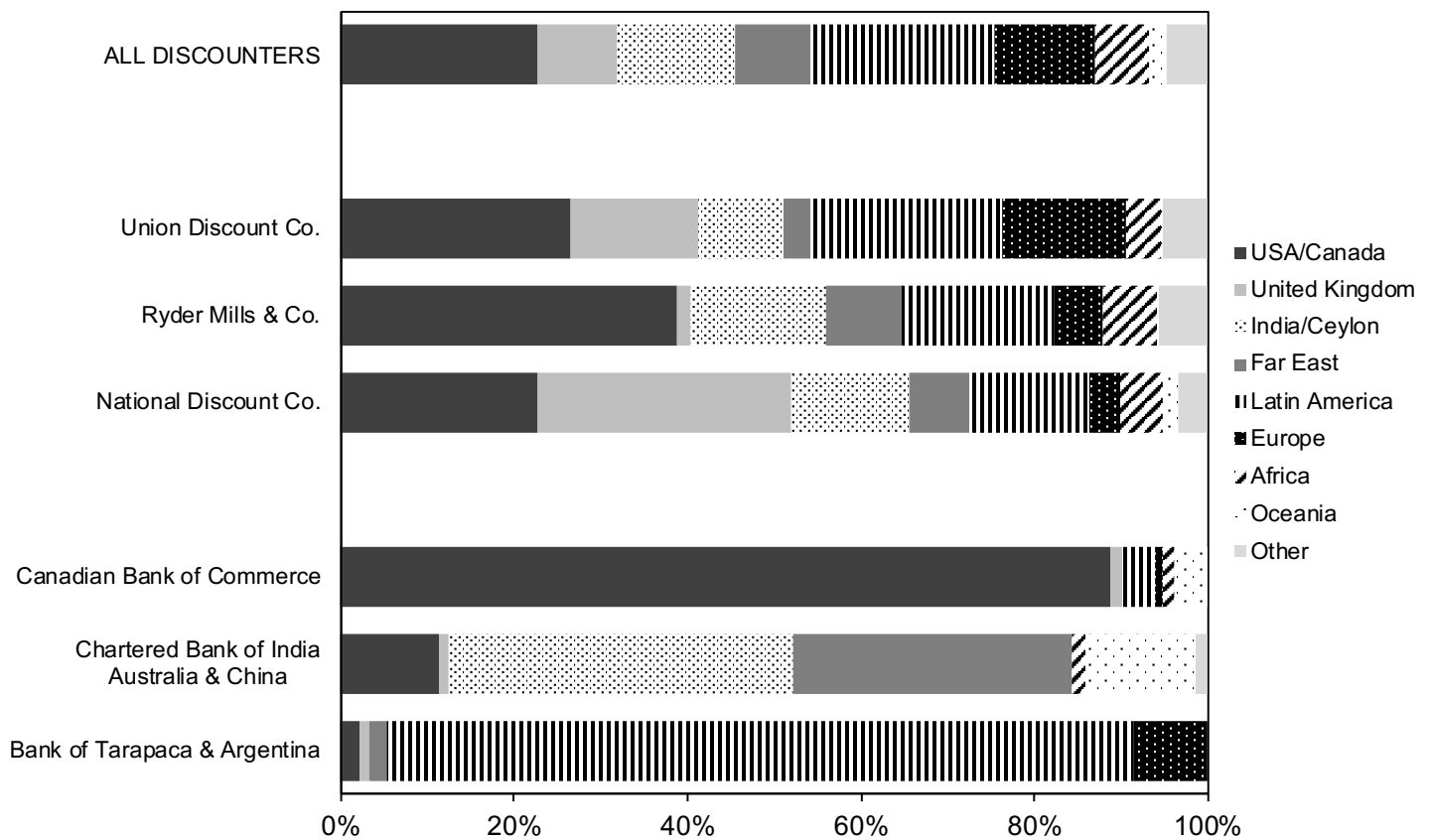
**Figure 9.** Discounters' portfolio of drawers



*Notes:* This figure plots the level of geographic concentration of each discounter's portfolio as a function of its size, defined as the number of drawers to whom the discounter is linked. The level of geographic concentration is assessed via the Herfindahl–Hirschman index, defined as the sum of the squares of the market shares of the nine regions in each portfolio; HHI values can range from 1,111 (perfect repartition among the nine regions) to 10,000 (perfect concentration in one region). The graph includes only those discounters (52 of the 145 in our data set) linked to at least ten drawers. Regions are defined in the text.

*Source:* Bank of England's *Discount Ledgers* (see text).

**Figure 10.** Discount houses versus commercial banks' portfolios of drawers



*Notes:* This figure illustrates the geographical location (via colour key) of the drawers of bills discounted by three discount houses and three Anglo-foreign commercial banks as well as the extent of their representation (via the x-axis percentages) in each institution's portfolio. Union Discount Co. was linked to 706 drawers, Ryder Mills & Co. to 448, National Discount Co. to 387, Canadian Bank of Commerce to 332, Chartered Bank of India Australia & China to 213, and Bank of Tarapaca & Argentina to 95 (also see Figure 9).

*Source:* Bank of England's *Discount Ledgers* (see text).