Liquidity, Debt Denomination, and Currency Dominance

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Abstract

We provide a novel theory for US dollar dominance in global debt contracts that links corporate financing decisions to money market liquidity. Illiquid money markets entail search frictions as issuers trade their revenue streams for the assets required to extinguish their debt. Equilibria with a single dominant currency emerge naturally from endogenous positive feedback cycles, seeded by the initial supply of short-term government debt. The debt denomination choices of liquidity demanders and liquidity suppliers are complementary, further reinforcing global currency dominance. We rationalize features of post-WWII dollar dominance and relate our theory to several historical experiences, such as the prominence of the Dutch florin in the 17th and 18th centuries, British pound sterling in the pre-WWI era, and the ongoing debate about the potential rise of the Chinese renminbi.

Keywords: International Currencies, Dollar Dominance, Liquidity, Corporate Debt.

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1 Introduction

There is a great deal of dollar-denominated debt outstanding in the world, outsized relative
to the wealth or GDP share of the United States in the world (see Bruno and Shin 2015;
Cetorelli and Goldberg 2012; McCauley, McGuire and Sushko 2015; Maggiori, Neiman and
Schreger 2020). Indeed, the US dollar is the dominant currency in international finance and
trade, much as the British pound sterling was prior to the dollar (Lindert 1969; Eichengreen
2005), and as the Dutch florin was prior to the sterling (Quinn and Roberds 2014). This
paper offers a theory of currency dominance in the denomination of global financial contracts.
Our motivation is similar to that of Gopinath and Stein (2021), in that we seek to explain
why among many alternatives for debt denomination, in equilibrium, one currency emerges
dendogenously as dominant.

The theory in a nutshell is as follows. An issuer’s denomination of a debt contract reflects
a choice over which asset to hand over to extinguish the debt at the time of settlement. The
issuer, for example an oil-producing firm, could issue debt that is denominated in any
arbitrary unit, such as barrels of oil. In this case, upon maturity the firm would be obliged
to deliver barrels of oil. But if barrels of oil are hard to come by—that is, if the oil market
is illiquid—this may be a risky decision. Perhaps an oil producer will issue such debt, but an
automaker will certainly not. Hence liquidity, which we model via endogenous search frictions
(Duffie, Gărleanu and Pedersen 2005), constitutes the key economic force in our model.

The attraction of issuing dollar-denominated debt is precisely that the dollar money market
is large and liquid. An issuer, whether an oil producer or an automaker, reckons that there
is a large stock of safe dollar-denominated short-term claims that it can get its hands on to
extinguish its own liabilities. That is, there is a large set of investors who own a substantial
quantity of dollar-denominated, short-term money market instruments such as Treasury bills,
repos, or high-grade bank and firm debt—so that the issuer can readily trade its revenue
streams with these investors to obtain the assets that it needs to settle its obligations.

This liquidity-based theory explains “dominance.” As more firms issue dollar debt, some
of this issuance adds to the stock of safe dollar-denominated money market instruments,
expanding the supply of available assets that can be used by other issuers to extinguish
their debt. Dollar debt begets dollar debt, bootstrapping itself, leading to dominance. Our
explanation is different from that of Gopinath and Stein (2021) wherein dollar denomination
in trade begets dollar denomination in debt, leading further to dollar denomination in trade,
thus bootstrapping dollar dominance. In our explanation, trade invoicing is not a central force in the bootstrapping, and indeed can be a byproduct of the dollar-dominant equilibrium that arises through the liquidity mechanism.

Which initial conditions have then led the world to settle on a dollar-dominant equilibrium? In our model, the initial supply of safe short-term government liabilities acts as the kernel which kickstarts this endogenous positive feedback cycle. Our answer is therefore that the United States issues a large quantity of safe dollar-denominated Treasury bills, with more safe float than the government bonds of alternative currencies, which are the seeds to get the currency dominance process ongoing.

The dollar is the reserve currency of the world currently, but history has seen other dominant currencies. Our liquidity-based theory explains why the Dutch florin and the British pound sterling were the world’s dominant currencies in their respective periods, and also why the financial system shifted to those centers as opposed to others. For example, the demise of the Dutch florin was followed by the rise of the British pound sterling rather than a competitor such as the French franc. In addition, the model speaks to why certain places that were economically central, such as the city-states of the Italian Renaissance, failed to develop a dominant currency.

Lastly, our theory sheds light on the factors that may shift the world equilibrium away from dollar dominance to, for example, a Chinese renminbi-dominant equilibrium. In all these cases, the economic forces that we highlight revolve around the quantity of safe and liquid assets, as well as the endogenous feedback cycles and bootstrap effects that form the core of our theory.

Related Literature  [To be added.]

2 A First Global Currency: The Dutch Florin

Before laying out the model, we begin by discussing the period of the dominance of the Dutch florin currency in the 17th century. The discussion highlights that the frictions we model are readily apparent in this history.

The 16th century was the beginning of an era of globalization when newly discovered resources in the Americas were linked to markets in Asia and Europe. Transactions and debts around the world were primarily settled in “trade coins,” which were high-denomination specie
coins. However, hundreds of domestic and foreign varieties existed, and using them entailed large transaction costs such as transportation, insurance, and verifying their metallic content.\(^1\) The difficulty of enforcing quality created incentives to debase the currency and reduce the circulating supply of high-quality coins. These costs compounded the difficulty of coordinating on the coins that were valid for settling a debt. While negotiable credit instruments such as the bill of exchange reduced the need to transfer coin, settlement still ultimately depended on an uncertain supply of trade coins.

The Bank of Amsterdam was chartered by the City of Amsterdam in 1609 to provide a standardized currency that could be used for settlement. It did so in two ways: first, by allowing for the settlement of payments on the bank’s internal ledgers through account transfers, and second, by providing high-quality coin for deposit account redemption. The former was conducted in a currency known as “bank florin,” (hereafter “florin”) while the latter was in the “current guilder.” Bank accounts were freely provided to anyone, and florins were credited to accounts for deposits of recognized coins. These coins backed the florins that could be withdrawn as current guilders in a narrow bank model. Since the Bank charged a fee for withdrawals, it was usually less costly to trade florin for current guilder in a secondary “open market.”\(^2\) In that market, the *agio* was the market exchange rate between the bank florin and the current guilder.

The City of Amsterdam created an initial pool of florin by requiring that all large bills of exchange drawn and/or payable in Amsterdam had to be settled at the Bank in florin.\(^3\) As a result, all merchants kept an account at the Bank, and the Bank maintained two to three thousand accounts at any given time (Van Dillen, 1934, p. 107). In 1683, the Bank also introduced a *receipts* technology that operated like a modern day repurchase agreement. The Bank of Amsterdam advanced florin for short-term deposits of specie and metal bars. Depositors were issued a receipt, negotiable and renewable with an initial maturity of six months, for the right to withdraw the specific metal they deposited.\(^4\) This technology broadened the set of

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\(^1\)An ordinance in the Dutch Republic from 1606 officially recognized 25 gold and 14 silver trade coins from 35 domestic mints, but many more varieties circulated, and the Republic officially published exchange rates for almost 1000 coins (Roberds and Velde, 2016, p. 344).

\(^2\)The withdrawal fee of 1.5% covered the costs that the Bank of Amsterdam incurred to mint current guilders for deposits of inferior coins (judged by their metallic content).

\(^3\)The first ordinance in February 1609 applied to bills over 600 guilders; in 1642 year this was revised to include bills over 300 guilders.

\(^4\)There was a large secondary market in receipts. Receipts could be redenominated in smaller face values, and they were renewable by paying the withdrawal fees. Withdrawal fees with receipts (0.125% for silver and 0.25% for gold) were much lower than that for current guilders (1.5%) because the Bank did not need to mint guilders to meet withdrawal demands. Around this time it appears the Bank of Amsterdam eliminated the
assets that could be converted into florin beyond the original set of trade coins, and it was beneficial for both the Bank of Amsterdam and for private parties. The former gained from the metal deposits, which became part of the Bank’s assets if the receipt expired, and the latter was able to obtain florin for settlement without needing to convert them into eligible trade coins for deposit at market value.\footnote{Given the wide variety of specie circulating, the demand and supply for specific coins varied significantly, and market prices were usually in flux. The receipts technology made it possible to transact on the Bank’s mandated value for the specie while retaining the ability to withdraw and sell at a future date when prices rose. It also supported a large trade in precious metals since the freely-traded receipts were equivalent to advances on pledges of the underlying metals.}

During this period, the \textit{agio} reflected the florin’s liquidity premium, and for most of the 17th and 18th centuries, it was steadily around 4.5–5\% (Van Dillen, 1934, p. 91, 102). Rotterdam, a neighboring mercantile city, also created its own exchange bank modeled after the Bank of Amsterdam. While the two institutions maintained separate balance sheets, Rotterdam adopted Amsterdam’s \textit{agio} because merchants preferred florin (Van der Borght, 1896, p. 209). Rotterdam provided a system where all deposits and withdrawals of guilders were made allowing for the Amsterdam \textit{agio} and thus used Amsterdam’s florin as the unit of account (Carey, 1818, p. 369). Rotterdam also conceded to provide current accounts, which were the primary means for merchants to access florin by way of guilders and much more heavily used than its own bank money (Van der Borght, 1896, p. 210). In addition, the Bank of Rotterdam, despite requiring large bills of exchange to be settled in its own bank florin, also settled bills payable in florin in Amsterdam. In these ways, Rotterdam provided access to florins to the extent possible given its separate balance sheet.

The confidence in the florin as reflected in the \textit{agio}, in conjunction with the high quality of minted guilders, stabilized the exchange rates in Amsterdam relative to other cities.\footnote{In Russia, only the exchange rate relative to Amsterdam was quoted until 1763 (Van Dillen, 1934, p. 105).} As a result, the Bank’s ledger accounts denominated in florin could form a central clearing center for debt settlement even when the counterparties were not in Amsterdam (Van Dillen, 1934, p. 105). For example, the trade between England and Russia was conducted through payments in Amsterdam, and more generally, the “[Bank of Amsterdam became] the clearinghouse of world trade,” (De Vries and Van der Woude, 1997, p. 87, 131).

The quantity of florins at the Bank of Amsterdam doubled from approximately eight million to sixteen million from the mid 17th to the beginning of the 18th century (Quinn and Roberds, 2014). After a century of dominance, the Bank of Amsterdam eventually became a right to withdraw from its accounts, which has led some authors to argue that the florin was an early fiat currency (Quinn and Roberds, 2014).
victim of its own success. Intermediation in bank florins was profitable for the Bank, and it
routinely turned over its wealth to the City of Amsterdam, leaving it with little capital buffer.
It also made advances to the Dutch East India Company (VOC), which eventually led to runs
on bank florin after the VOC came close to failure following the fourth Anglo-Dutch War in
1784. The French invasion in 1795 led to a drop in the agio to -14%, after which it never fully
recovered, and eventually the Bank was formally dissolved in 1819.

From this history, we highlight a few aspects that are central to our analysis. The Bank
ingenerated a large balance sheet of a convenient medium, the florin, that was used for set-
tlement of payments and denomination of short-term debt (bills of exchange). The private
sector placed a premium on this service, the agio, and the quantity of florin swelled due to
usage of both Amsterdam and non-Amsterdam merchants. The arrangement held together in
part because of the size of the market and the safety of the backing asset. The loss of safety
eventually led to the demise of the florin arrangement.

3 A Model of Liquidity and Debt Denomination

We now lay out our model, connecting our theoretical framework to the historical discussion of
Section 2. We consider a three-period ($t = t_0, t_1, t_2$) environment with two countries, indexed
by $j \in \{A, B\}$. In each country, there is a government that issues risk-free debt denominated
in units of the local currency that is traded to meet liquidity needs by agents in the country. In
terms of the Bank of Amsterdam history, we can think of the quantity of risk-free government
debt as the quantity of coin-backed florin. There are also firms that issue debt (e.g., bills of
exchange) and make a choice of denominating the debt in their home currency or in the foreign
currency. These firms also have liquidity needs in a manner similar to Holmström and Tirole
(1998). Trading occurs in a secondary market with endogenous trading frictions, modeled as
in Duffie et al. (2005). Finally, there is a continuum $I_j$ of homogeneous risk-neutral investors
who buy the debt of firms and governments.

3.1 Within-Country Environment

We start by developing the model within a given country, before turning to the full case where
firms may choose to issue debt in the foreign currency and hence characterizing the general
equilibrium.
There is a mass $F_j$ of firms in country $j$. These firms invest at date $t_0$ and generate profits of $\pi = 1$ at either $t_1$ or $t_2$. At $t_0$, we assume that the firm issues bonds with face value of one maturing at $t_2$. The probability of receiving profits early is $\phi$. The preference of a given firm $i$ is to maximize:

$$u_{i,j}^F = c_0 + \beta c_1 + \beta^2 c_2$$  \hspace{1cm} (1)$$

The liquidity need in the model arises if a firm’s revenues are early at $t_1$ while its debt is due at $t_2$. In this case, the firm’s debt and its revenue streams are mismatched in time. In the Amsterdam setting, a merchant whose shipment arrives early will have goods at $t_1$. If her debt is denominated in florin, she faces a choice: hold onto the goods until $t_2$ and purchase florin to extinguish the debt at that point (we assume there is no price risk in goods for simplicity) or purchase a florin-denominated bond at $t_1$ and use the proceeds to repay his florin debt at $t_2$. If the firm purchases the florin bond at $t_1$, it potentially receives an interest rate that exceeds zero, thus doing better than holding onto the goods until $t_2$.

Suppose the firm sells a bond in units of florin at date $t_0$ at an endogenous price $P_{0,j}$. Suppose that at $t_1$, the early firm enters the money market and purchases a one-period florin bond at price $P_{1,j} \leq 1$. Then the expected utility for the firm is

$$u_{i,j}^F = P_{0,j} + \beta \phi \alpha_{F,j} (1 - P_{1,j}).$$ \hspace{1cm} (2)$$

Here $\alpha_{F,j}$ is the endogenous probability of a firm meeting a florin bond seller at time $t_1$ during its search in the market for bonds. We describe the search market shortly. The first term in this objective reflects that firms benefit from selling their bonds at a high price at $t_0$. The second term reflects their liquidity demand: if a firm buys a florin bond at $P_{1,j} \leq 1$, it effectively earns interest on its early revenues of $1 - P_{1,j} > 0$. The firm is early with probability $\phi$ and obtains the needed liquidity with probability $\alpha_{F,j}$.

Let us next consider the market for florin bonds. There is a mass $I_j$ of investors. These investors are risk neutral with preferences

$$u_{i,j}^F = c_0 + \beta_I c_1 + \beta^2_I c_2.$$ \hspace{1cm} (3)$$

We assume that $\beta_I > \beta$ so that firms desire to borrow from investors. We also take the limit as $\beta_I \to \beta$ so that we do not have to separately carry around two discount factors in the algebra of the model.
Bonds are indivisible and each investor can only invest in one bond. At \( t_0 \), the government issues a quantity \( G_j \) of sovereign bonds. The firms issue a mass \( F_j \) of private bonds. Investors purchase all of these bonds at \( t_0 \). We assume that both government and private bonds are safe (i.e., there is no default risk, as we elaborate on later), and that they have the same liquidity properties. We consider breaking this symmetry later in the analysis. For now, as the bonds are identical they have the same endogenous prices \( P_{0,j} \) and \( P_{1,j} \). The total mass of bonds is \( G_j + F_j \). Define,

\[
m_{I,j} = G_j + F_j \leq I_j,
\]

where the last inequality is a restriction on parameters. That is, we assume there are enough investors to purchase all of the bonds at \( t_0 \).

### 3.2 Trading in Money Markets With Search Frictions

The bond market at \( t_1 \) is illiquid, modeled as undirected search. The mass of liquidity-demanding firms (buyers) is the total number of early firms, which is,

\[
m_{F,j} = \phi F_j.
\]

We posit a matching function such that the number of meetings between buyers (firms) and sellers (date \( t_0 \) investors) is

\[
n_j = \lambda_j m_{F,j}^\theta m_{I,j}^\theta, \quad \theta > \frac{1}{2}.
\]

Here \( \lambda_j > 0 \) captures the overall degree of liquidity of the money market. In the continuous-time asset trading model of Duffie et al. (2005, henceforth DGP), \( \lambda_j \) corresponds to the Poisson probability that a given agent (say buyer) will meet another agent (say seller). In their model, \( \theta = 1 \), so that the total number of matches is proportional to the masses of both buyers and sellers.\(^7\) We will take the general case where \( \theta \) may differ from one, although most of our results go through for the case where \( \theta = 1 \).

The key property of this matching function is increasing returns to scale. That is, take the case where \( \theta > \frac{1}{2} \). If the masses of both buyers and sellers double, the number of matches more than doubles. Thus the search model embeds a thick-market liquidity externality as in Diamond (1982). This liquidity externality is at the heart of many of our results. Given the

\(^7\)Duffie and Sun (2012) provide a mathematical foundation for this matching function based on independent random matching in a large population of atomistic buyers and sellers.
assumed matching function, the two-sided meeting probabilities are:

\[ \alpha_{F,j} = \frac{n_j}{m_{F,j}} = \lambda_j m_{F,j}^{\theta-1} m_{I,j}, \quad \alpha_{I,j} = \frac{n_j}{m_{I,j}} = \lambda_j m_{I,j}^\theta m_{I,j}^{\theta-1}. \quad (7) \]

\[ P(\text{Buyer finds a seller}) \]

\[ P(\text{Seller finds a buyer}) \]

3.3 Asset Market Equilibrium

Consider the asset market at date \( t_1 \) first. If a match occurs, the total surplus is \( 1 - \beta \). That is, the firm can save its profits in the form of goods at a zero interest rate, or trade with an investor that sells the firm its bond, which it values using discount rate \( \beta < 1 \). We assume that the surplus is split equally between buyer and seller, so the price of the bonds at \( t_1 \) is

\[ P_{1,j} = \beta + \frac{1 - \beta}{2}. \quad (8) \]

We assume that the date \( t_0 \) bond market is Walrasian. Each investor can bid for exactly one bond at date \( t_0 \). If an investor purchases a bond at \( t_0 \), the investor either resells the bond at date \( t_1 \) at a high price \( P_{1,j} \) if matched, or the investor holds the bond to maturity. Thus the investor’s valuation of the bond at \( t_0 \) is:

\[ P_{0,j} = \frac{\alpha_{I,j} \beta P_{1,j}}{P(\text{Matched}) \times \text{PV of Sale Price}} + \frac{(1 - \alpha_{I,j}) \beta^2}{P(\text{Not Matched}) \times \text{PV of } 1}. \quad (9) \]

We can rewrite this expression to find:

\[ P_{0,j} = \beta^2 + \frac{\lambda_j \beta (1 - \beta)}{2} m_{F,j}^\theta m_{I,j}^{\theta-1}. \quad (10) \]

We note that the wedge \( P_{0,j} - \beta^2 \) is a convenience yield on bonds issued at \( t_0 \). That is, consider the pricing of a completely illiquid bond, which in our model is one for which \( \lambda_j = 0 \). This bond will be priced at \( \beta^2 \). The government and private firm bonds in our model trade at \( P_{0,j} > \beta^2 \) because they may be retraded at date \( t_1 \). We can see that the convenience yield increases in the match probability and the surplus gained from the match.

Finally, consider the firm’s utility from bond issuance. Given equilibrium bond prices, we can rewrite (2) as:

\[ u_{i,j}^{F} - \beta^2 = \frac{\lambda_j \beta (1 - \beta)}{2} (m_{F,j} m_{I,j})^{\theta-1} [m_{F,j} + \phi m_{I,j}]. \quad (11) \]
The two additive terms in this expression reflect the two ways in which firms benefit from money market liquidity: the first term reflects the benefit of capturing convenience yields on the firms’ initial issuance, while the second term reflects the benefit from a high probability of being able to find a match in the date $t_1$ money markets, which increases monotonically with the firm’s probability $\phi$ of a liquidity mismatch.

### 3.4 International Equilibrium Conditions

We next describe the international equilibrium. The two countries, $j = A, B$, have fundamentals $\{G_j, \lambda_j, F_j\}$. Without loss, let us take country $A$ as the (weakly) higher-liquidity market: $\lambda_A \geq \lambda_B$, $G_A \geq G_B$.

Firms earn revenues in domestic currency and choose the denomination of bonds, either domestic or foreign. We assume that at date $t_1$, the foreign exchange rate $E$ either appreciates or depreciates with equal probability. Thus, a firm in country $B$ can convert its revenue to currency $A$ at a stochastic FX rate $E \in \{1 + \gamma, 1 - \gamma\}$.

Without loss, we focus on the equilibrium in which all firms in $A$ choose to issue bonds in $A$, and some firms in $B$ choose to issue bonds in their non-native currency, which is $A$. Suppose that a firm in $B$ chooses to issue debt in $A$. At $t_1$, the exchange rate realizes, with a depreciation of currency $B$ to $1 - \gamma$ being a bad state for the firm: the firm has revenues in units of currency $A$ of $1 - \gamma$ and debt obligation of one. We assume that in this bad state, the firm-$i$ can pay a disutility cost of $\kappa_i \gamma > 0$ to make up for the lost revenue. The disutility cost is just a modeling device that ensures that firms reckon some cost due to currency mismatch, and to ensure that the firm does not default so that the bond is riskless (and hence private bonds are perfect substitutes for government-issued bonds). We assume that there is heterogeneity in this cost across firms.

The expected utility for firm $i$ in $B$ issuing a bond in currency $A$ is,

$$ u_{i,j}^{F,A} \beta^2 = \frac{\lambda_A \beta (1 - \beta)}{2} (m_{F,A} m_{I,A})^{\theta - 1} \left[m_{F,A} + \phi m_{I,A}\right] - \beta \frac{\kappa_i \gamma}{2} \quad \text{FX Penalty} \quad (12) $$

If the firm issues in home currency ($B$), the expected utility is given in (11). The firm therefore issues in foreign currency ($A$) if (12) is greater than (11).
The marginal firm-i therefore satisfies:

$$\lambda_A (m_{F,A} m_{I,A})^{\theta - 1} [m_{F,A} + \phi m_{I,A}] - \frac{K_i \gamma}{1 - \beta} = \lambda_B (m_{F,B} m_{I,B})^{\theta - 1} [m_{F,B} + \phi m_{I,B}],$$

which sets equal the expected utility from issuing in foreign currency and home currency. Let us define

$$K_i = \frac{K_i \gamma}{1 - \beta}$$

as a variable that indexes the expected cost of switching currencies across firms. We have given this an interpretation in terms of financial distress costs, but this is not the only possible view. One could also tie this cost to the fixed costs for a firm of finding a bank and underwriters of its bonds in the foreign currency, providing information so that investors can assess the firms’ risks, and so on. The marginal firm has $K_i = \hat{K}$ where,

$$\lambda_A (m_{F,A} m_{I,A})^{\theta - 1} [m_{F,A} + \phi m_{I,A}] - \hat{K} = \lambda_B (m_{F,B} m_{I,B})^{\theta - 1} [m_{F,B} + \phi m_{I,B}],$$

Hence, in equilibrium all $B$-firms for which $K_i < \hat{K}$ switch to issuing in currency $A$, while firms with $K_i \geq \hat{K}$ issue in currency $B$.

To complete our characterization of the equilibrium, we solve for the masses of firms in $A$ and $B$. We assume that $K_i$ is distributed on $[K, \hat{K}]$ with cumulative density function $H(K_i)$. Then, the masses of liquidity demanders in the two currencies are,

$$m_{F,A} = \phi \left[ F_A + H(\hat{K}) F_B \right], \quad m_{F,B} = \phi \left( 1 - H(\hat{K}) \right) F_B,$$

while the masses of liquidity suppliers are,

$$m_{I,A} = G_A + F_A + H(\hat{K}) F_B, \quad m_{I,B} = G_B + \left( 1 - H(\hat{K}) \right) F_B.$$ 

These equations along with (15) fully characterize the equilibrium threshold $\hat{K}$ and the masses of firms in $A$ and $B$. Given these masses, we can also solve for the convenience yields in $A$ and $B$ from equation (10).

### 3.5 Discussion of the Model

We further explain some of the modeling choices that we have made in this section.
1. Financial liquidity demand. Our model embeds a financial demand for liquidity rather than a demand for liquidity stemming from trade in goods. That is, in our model firms desire an asset that is liquid and can be used to settle a financial obligation. The ideal settlement asset is one that is denominated in the same unit of account as the financial obligation. Thus, in our model, firms at date $t_1$ demand florin-denominated bonds in order to settle their florin-denominated financial obligations at date $t_2$. Another approach to modeling liquidity and the unit of account is provided by Gopinath and Stein (2021), where agents demand liquidity in order to purchase a good; agents thus prefer to purchase an asset in the same unit of account as the denomination of the good. In the world, both present and historically, the gross volume of financial positions is enormous and dwarfs the volume of flows in goods. Our model links liquidity demand to settling these larger volumes of financial obligations.

2. Saving vs. borrowing. In our modeling, a firm’s liquidity demand is driven by an early realization of revenues relative to a late obligation to make a debt payment. This induces a demand for liquidity as a savings and settlement instrument. In our modeling, if there are more investors owning florin-denominated bonds, then the bond market is more liquid and this transaction involves fewer frictions. Consider an alternative modeling where the firm issues one-period debt at $t_0$ that is due at $t_1$. In this case, the liquidity issue emerges for a firm that has a late realization of revenues ($t_2$) relative to an early need to repay its debt ($t_1$). Suppose that there are larger quantities of florins as well as investors who hold florins. Then, it will be easier for the firm to find an investor with which it can trade its $t_2$ revenues (i.e., borrow) for the investors’ florin assets, which are needed to repay the firm’s loans. In both cases, the economics of the modeling run through the quantity of available liquidity of the asset that is of the same denomination as the financial obligation.

3. Is search and liquidity a concern in money markets? At a theoretical level, our model builds on a long tradition of using search to model money markets (see Kiyotaki and Wright, 1993; Lagos and Wright, 2005). Even in high-volume money markets such as the repo market, search models have been shown to capture well price and quantity patterns (see Vayanos and Weill, 2008). Our model links corporate financing decisions to money market illiquidity concerns. The firm’s utility in (11) is increasing in $\lambda_j$. Thus in our model, firms make decisions based on the liquidity of the money market. To give
one example of the empirical counterpart to such a consideration, in September 2019 the dollar money market turned illiquid and it was difficult for many actors to get their hands on dollar reserves (see Copeland et al., 2021). If such events happen repeatedly, it is plausible that firms will pull back from issuing into the dollar money market. Of course, in this event, the Federal Reserve provided liquidity (expanded the supply of reserves, i.e. safe dollar-denominated assets) into the market to allay these concerns. Our analysis turns on the relative liquidity of the money markets in different currencies rather than the liquidity of any one market. At the macro level, during a period of global financial volatility, the dollar money market remains more liquid than the markets of many emerging and even advanced economies. In our model, these considerations drive financing decisions.

4. **Investor demand for liquid bonds:** In our model, the investors in both countries are symmetric, risk-neutral, and discount the future at the same discount rate. Thus our analysis does not introduce asymmetry in investor preferences, as do, for example, Gourinchas et al. (2010) and Jiang et al. (2020). While the dominant currency paradigm is likely also due to asymmetry in investor preferences, we set this aside in our analysis.

4 Currency Dominance and Denomination Incentives

Having specified the model environment and derived its equilibrium conditions in Section 3, we now turn to analyzing the properties of the resulting equilibria and examining the underlying economic forces. We outline how multiple equilibria naturally emerge as a consequence of increasing returns to scale, and how asymmetries in country fundamentals favor those equilibria that feature currency dominance. We also provide an extension of the model that introduces further heterogeneity between liquidity demanders and liquidity suppliers in the cross-section of firms, and we underscore the complementarities between the debt denomination choices of these two types of issuers.

4.1 **Dominant Equilibrium in the Symmetric Case**

Let us start by analyzing the simplest, fully symmetric case where fundamental \((\lambda_j, G_j, F_j)\) are the same for both \(j = A, B\), and where we also set the foreign-currency issuance cost \(K_i\) to zero by making \(\kappa_i = 0\) for all firms \(i\). There are three equilibria in this case:
1. No firm switches, so that the masses are symmetric across $A$ and $B$. As a result the utility from issuing in the home currency equals that of issuing in the foreign currency. The convenience yields on bonds in both $A$ and $B$ are equal:

$$P_{0,j} - \beta^2 = \frac{\lambda_j \beta (1 - \beta)}{2} m_{F,j} m_{I,j}^{\theta - 1}.$$  

(18)

2. All firms switch to $A$. Starting from the no-firms-switch case, if a small mass of firms were to shift from $B$ to $A$, then the masses $m_{F,A}$ and $m_{I,A}$ would rise while the corresponding masses in $B$ would fall. Then because of increasing returns to scale in matching, the liquidity benefit from issuing in $A$ rises relative to that of $B$. We can see this by examining the liquidity benefit of switching to $A$:

$$\frac{\lambda_A \beta (1 - \beta)}{2} \frac{1}{(m_{F,A} m_{I,A})^{1-\theta}} [m_{F,A} + \phi m_{I,A}].$$  

(19)

Both masses increasing raises the term in brackets one-for-one. For $\theta > \frac{1}{2}$, or increasing returns in matching, the term $(m_{F,A} m_{I,A})^{1-\theta}$ increases less than one-for-one. Thus the liquidity benefit of switching to $A$ increases with the masses $m_{F,A}$ and $m_{I,A}$. The algebraic proof is in the appendix.

Equation (19) highlights the two forces that drive firm decisions. Consider the second term in brackets. A firm that needs liquidity at date $t_1$, which occurs with probability $\phi$, benefits from having a larger pool of liquidity, which is linear in $m_{I,A}$. Next consider the first term in the bracket. At date $t_0$, firms sell their bonds at a convenience yield because these bonds are used for liquidity purposes at date $t_1$. This yield benefit is increasing in $m_{F,A}$.

As the liquidity benefit of moving to $A$ rises, the liquidity benefit of remaining in $B$ falls. The result is that the equilibrium resolves with all firms switching to $A$. In this equilibrium, the convenience yield on bonds in $B$ is zero, while it is positive in $A$.

3. All firms switch to $B$. This is the symmetric case as that of (2).

The fully symmetric case illustrates the economics at work in the model. The dominant equilibria of all firms switching to either $A$ or $B$ are the only stable ones. The equilibrium in (1) is unstable: a movement in masses to either $A$ or $B$ shifts the benefits for all other firms in the same direction leading to the all-firms-switch equilibria.
Figure 1: **Characterizing equilibria in the general case.** We plot the utility of a firm in \( B \) switching to issuing in foreign currency \( (U_A) \), and of a firm in \( B \) issuing in home currency \( (U_B) \), as a function of the equilibrium threshold \( \hat{K} \). The graph is for the case of symmetric fundamentals \( (\lambda_j, G_j, F_j) \) and positive currency-switching costs \( K_i \) distributed over \([K, \bar{K}]\) with a lognormal CDF \( H(K) \). There are three equilibria.

### 4.2 General Case and Denomination Incentives

Let us next introduce a positive cost of switching: that is, we allow for a general distribution of \( K_i \in [K, \bar{K}] \), with \( K > 0 \). Figure 1 plots the two curves \( U_A \) and \( U_B \) as a function of the threshold cost \( \hat{K} \), which capture respectively the expected utility for a firm in \( B \) of issuing in foreign currency or home currency. The figure continues to keep the country fundamentals symmetric \( (\lambda_j, G_j, F_j) \), while assuming a lognormal distribution \( H(K) \). In this general case, the model features three equilibria—focusing now, for ease of exposition, on equilibria in which no \( A \)-firms issue in foreign currency.

A first equilibrium point (labeled \( a \)) is at \( \hat{K} = 0 \). In this equilibrium, no firms issue in foreign currency: this equilibrium is now stable because of the presence of fixed costs \( K_i > 0 \), which make \( U_B \) higher than \( U_A \) in the neighborhood of \( \hat{K} = 0 \). The other two equilibrium points (labeled \( b \) and \( c \)) lie at the intersections of the two curves \( U_A \) and \( U_B \), one featuring low entry \( b \) and the other featuring high entry \( c \). The low-entry equilibrium \( b \) is unstable, while the high-entry equilibrium \( c \) is stable.
We can now consider comparative statics with respect to country fundamentals, hence introducing further asymmetry between the two countries $A$ and $B$, and also with respect to the degree of returns to scale in matching. The following proposition, which is proved in the appendix, characterizes these comparative-statics results.

**Proposition 1** In the general case with positive $K_i \in [\bar{K}, \tilde{K}]$, the following holds:

1. An increase in country $A$’s government bond supply $G_A$ increases foreign-currency issuance by $B$-firms ($\frac{\partial \hat{K}}{\partial G_A} > 0$) in the stable high-entry equilibrium (point $c$). A sufficiently high increase in $G_A$ dissolves the no-entry and low-entry equilibria (points $b$ and $c$), resolving equilibrium multiplicity in favor of the high-entry equilibrium. The same holds for increases in the overall matching intensity $\lambda_A$.

2. Decreasing the degree of returns to scale in matching $\theta$ shifts the positive-entry equilibrium points (b and c) further towards the interior of $[\bar{K}, \tilde{K}]$. In particular, entry is reduced ($\frac{\partial \hat{K}}{\partial \theta} > 0$) in the stable high-entry equilibrium (point $c$).

Figures 2a and 2b provide a graphical exposition of these comparative-statics results, which is helpful in building economic intuition. Consider first an increase in government bond supply $G_A$. As shown in Figure 2a, this acts as an outward shift of the curve $U_A$: as government bond supply grows, the mass of investors $m_{I,A}$ that are sellers in the money markets increases, which in turn benefits foreign currency issuers as it expands the pool liquidity available to them at date $t_1$. The stable equilibrium point $c$ therefore shifts further to the right, which means entry is increasing.

Crucially, increasing $G_A$ sufficiently causes a qualitative shift in the configuration of equilibria: this happens once the $U_A$ curve crosses above $U_B$ at $\hat{K} = 0$. Once this threshold is crossed, the no-entry and low-entry equilibria (a and b) both disappear, leaving the high-entry equilibrium as the sole remaining one. This illustrates a key economic point, which we discuss further in Section 4.3: multipolar equilibria (with denomination dispersed among multiple competitor currencies) can only survive in a world of roughly symmetrical fundamentals, while sharp asymmetries among countries bring about dominance.

Figure 2b shows the consequences of decreasing $\theta$, the degree of returns to scale in matching: this reduces the curvature of the expected utility functions $U_A$ and $U_B$, which moves equilibria towards the interior of the state space. Lower returns to scale dampen the endogenous positive feedback effects that support currency dominance, decreasing $\hat{K}$ in the
Some simple comparative statics. We consider introducing asymmetry in country fundamentals by increasing government bond supply $G_A$ (Panel A) and decreasing the degree of returns to scale in matching $\theta$ (Panel B).
high-entry equilibrium. Equilibrium multiplicity is lost altogether in the limiting case $\theta = \frac{1}{2}$, in which returns to scale are instead constant.

Lastly, we note that even under asymmetry in fundamentals—for instance with $G_A > G_B$—alternative equilibria in which $A$-firms rather than $B$-firms switch currency can also exist. These equilibria are welfare-dominated from the perspective of firm utility, and they disappear once the asymmetry between the two countries grows to a sufficient extent.

### 4.3 From City-States to a Dominant Currency

Prior to the dominance of the Dutch florin in the 17th and 18th centuries, the European financial landscape was markedly different. Of particular salience is the experience of Italian city-states during the era of the Italian Renaissance. In the 15th and 16th centuries, city-states such as the Republics of Genoa, Venice, Florence were highly prominent in both trade and finance. However, finance was conducted in a constellation of local currencies, such as the Genoese and Venetian lira and the Florentine florin, and so none achieved the centrality that the Dutch florin would attain a few centuries later.

Our model rationalizes this difference between the Italian Renaissance and the later Dutch experience, and attributes it to the economic mechanisms centered on increasing returns to scale in liquidity provision that we discuss in Section 4.2. The multipolar equilibrium of the multiple Italian currencies corresponds to equilibrium point $a$ of Figure 1, which features multiple currencies of roughly equal importance. This multipolar equilibrium is stable as long as these currencies have separate and approximately symmetric underlying liquidity pools (as determined by $G_j$).

We consider this to be an accurate representation of the historical context in which the constellation of Italian currencies circulated in the form of physical coins in fluctuating supply. Indeed, Italy during the Renaissance faced the same settlement issues from a large variety of trade coins that Amsterdam faced later on. While these city-states had large banks (including the Bank of San Giorgio dating from 1407 in Genoa and the Medici Bank from 1397 in Florence), none of them invested in creating a large and steady supply of safe debt in a common currency ($G_j$) as Amsterdam did. The Genoese lira and the Florentine florin therefore remained unremarkable like the other trade coins of the era.

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8Unlike Amsterdam, the Italian banks were slow to adopt ledgers and payments by account transfers. For instance, it was not until 1675 that the Bank of San Giorgio in Genoa issued depositors transferable vouchers reflecting deposit accounts (Willis, 1943, p. 12).
In contrast, the Dutch florin was a safe claim issued by the Bank of Amsterdam and backed by the City of Amsterdam with an initial supply sufficient to cover all large bills of exchange payments. In the context of our model, the financial innovations by the Bank of Amsterdam allowed it to increase florin-denominated $G$ sufficiently to trigger a shift from the multipolar equilibrium to unipolar dominance. It did so by pooling disparate assets (such as the various kinds of specie and trade coins that were used prior to the florin in trade) to back a single, unified money market. Moreover, the fact that the Dutch cities did not all compete with each others’ currencies, but rather followed Amsterdam’s lead with its florin, provided larger agglomeration spillovers that the Italian city-states lacked.

### 4.4 Complementarities Between Liquidity Provision and Demand

We now consider the interactions among the debt denomination choices of different types of issuers. To do this, we separate the liquidity demand and liquidity provision roles in the cross-section of firms in country $B$. Specifically, we now let the overall mass of firms $F_B$ be composed of two different groups of firms:

- A first mass $F_B^+$ consists of pure liquidity suppliers: these are issuers for whom $\phi = 0$, which therefore never experience an early realization profits and hence have no motive for demanding liquidity. Given that $\phi = 0$ for these firms, they will not contribute to the liquidity-demander masses $m_{F,j}$ in either country.

- A second mass $F_B^-$ consists of pure liquidity demanders. These are firms whose bonds have no possibility of re-sale in the money market of date $t_1$, so that effectively $\lambda_j$ (which is now heterogenous for different assets) is zero for these firms’ issues. These firms therefore will not contribute to the liquidity-supplier masses $m_{I,j}$.

The cost $K_i$ follows the same distribution $H(K)$ in these two subgroups of firms, and $F_B = F_B^+ + F_B^-$. These two groups of firms will now have two different endogenous equilibrium thresholds $(\hat{K}^+, \hat{K}^-)$: liquidity suppliers issue in foreign currency if and only if $K_i < \hat{K}^+$, while liquidity demanders issue in foreign currency if and only if $K_i < \hat{K}^-$. We consider the equilibrium determination of $(\hat{K}^+, \hat{K}^-)$ in the DGP case, in which $\theta = 1$.

The equilibrium conditions pinning down the two thresholds are

\begin{align*}
\lambda_A m_{F,A} - \hat{K}^+ &= \lambda_B m_{F,B}, \quad (20) \\
\lambda_A \phi m_{I,A} - \hat{K}^- &= \lambda_B \phi m_{I,B}. \quad (21)
\end{align*}
To complete the characterization of the equilibrium, the liquidity-demand masses in the two countries are

\[ m_{F,A} = \phi \left[ F_A + H(\hat{K}^-)F_B^- \right], \quad m_{F,B} = \phi \left( 1 - H(\hat{K}^-) \right) F_B^-; \]  

while the liquidity-supply masses are

\[ m_{I,A} = F_A + G_A + H(\hat{K}^+)F_B^+, \quad m_{I,B} = G_B + \left( 1 - H(\hat{K}^+) \right) F_B^+. \]  

An advantage of studying this extended model in the \( \theta = 1 \) case is that the solution is separable, in that it is characterized by an explicit two-equation system for the equilibrium values of \((\hat{K}^+, \hat{K}^-)\):

\[ \hat{K}^+ = \phi \left[ \lambda_A F_A - \lambda_B F_B^- + (\lambda_A + \lambda_B)H(\hat{K}^-)F_B^- \right], \]  

\[ \hat{K}^- = \phi \left[ \lambda_A (F_A + G_A) - \lambda_B (G_B + F_B^+) + (\lambda_A + \lambda_B)H(\hat{K}^+)F_B^+ \right]. \]

Equations (24) and (25) express the best responses of liquidity suppliers and liquidity demanders, respectively, to the entry decisions of the other type of firm. Crucially, these coupled entry decisions are complementary, in that entry by one class of firms increases the entry incentives of the other class, and vice-versa, as formalized in the following proposition.

**Proposition 2** The equilibrium entry decisions of liquidity suppliers \((F_B^+)\) and liquidity demanders \((F_B^-)\) are complementary, as their respective best responses satisfy:

\[ \frac{\partial \hat{K}^+}{\partial \hat{K}^-} > 0, \quad \frac{\partial \hat{K}^-}{\partial \hat{K}^+} > 0. \]  

Figure 3 provides a parametric plot of the best response functions (24) and (25) in the two-dimensional cost space of this extended model, continuing to use a lognormal distribution \(H(K)\) with symmetric country fundamentals. In the symmetric-fundamentals case, the system features two equilibria, one in which neither kind of firm enters, and one in which both kinds have strong entry.

When we introduce asymmetry by increasing \(G_A\) (or \(\lambda_A\) or \(F_A\)), a rightward shift of the \(\hat{K}^-\) curve will resolve equilibrium multiplicity in favor again of the high-entry equilibrium, in which currency dominance is now further reinforced by these strategic complementarities.

The growth of the London bond market in pounds sterling in the 19th century reflects
Figure 3: **Illustrating complementarity in the choices of liquidity demanders and liquidity suppliers.** This figure plots the best-response functions for the coupled entry decisions of liquidity suppliers ($\hat{K}^+$) and liquidity demanders ($\hat{K}^-$) in the extended model of Section 4.4. These are shown in the cost space ($\hat{K}^+, \hat{K}^-$) for the case of symmetric country fundamentals.

\[
\begin{align*}
\hat{K}^+ &= \phi \left[ \lambda_A F_A - \lambda_B F_B^- + (\lambda_A + \lambda_B) H(\hat{K}^-) F_B^- \right] \\
\hat{K}^- &= \phi \left[ \lambda_A (F_A + G_A) - \lambda_B (G_B + F_B^+) + (\lambda_A + \lambda_B) H(\hat{K}^+) F_B^+ \right]
\end{align*}
\]
these complementarities. Figure 4 plots the amounts of bonds issued by foreign governments and all corporates. We think of the foreign governments as suppliers of safe bonds in the pound market, so that their entry reflects the incentives of liquidity suppliers to harvest the pound convenience yield. We think of the corporates as liquidity demanders who choose to issue in pounds to access the easy settlement benefits of the pound money market. The complementarity in the entry decisions is reflected in the positive correlation in issuances of these two types of bonds. Finally, note that the growth in corporate bond issuance prior to WWI reflects both pound issuance by domestic firms in Great Britain as well as foreign firms. This is because the liquidity benefits of agglomeration raise issuance utility for all firms in the dominant equilibrium, which encourages all forms of issuance.

Figure 4: **Volumes of government and private debt denominated in pound sterling.** This figure plots the time series of the total outstanding amounts of pound sterling denominated debt traded in London, scaled by UK GDP. The series for foreign government bonds consists of sovereign debt collected by Meyer et al. (2022). The series for corporate debt comes from the publications of the Investor Monthly Manual (1869–1929) digitized by the International Center for Finance at Yale University. The series for total bonds sums the two series of foreign sovereign and corporate debt.
5 Sovereign Incentives

In this section, we analyze the model from the governments’ perspective. We begin by presenting a historical overview of the rise of the British pound sterling as a dominant currency in the 19th century. This historical experience highlights the role of government incentives and public policies in establishing and cementing currency dominance. We formally specify the sovereigns’ objectives and link these to the historical British experience. Using our theory to carry out a comparative historical analysis, we also discuss why other European countries failed to achieve dominant status in place of Britain.

5.1 Rise of the British Pound Sterling

Following the decline of the Bank of Amsterdam during the Napoleonic Wars, the British pound sterling took on the role of the dominant currency, which it held until the post-WWI period. The history of the pound sterling and the London money market during this period includes several dimensions of the model that we discuss in this section.

Like most currencies during this era, the pound sterling referred to specific metallic coins, and obligations denominated in sterling were contracted to be repaid in those coins. However, coins were inconvenient for the reasons already discussed, and private banks found it profitable to issue paper notes denominated in sterling (i.e., claims on sterling coin).

The Bank of England was a key institution in the London money market, founded in 1694 as a note-issuing private corporation that was granted several privileges in return for raising and administering the Crown’s debt.\(^9\) During the early part of its history, the Bank competed with other private banks to increase its note circulation and raise its profits.\(^10\) In this respect, the Bank was like any other private firm that was incentivized to issue safe debt in order to benefit from the yield premium in equation (10). It was very successful in establishing a sound reputation for its notes, and by the late 18th century, Bank notes became synonymous with the pound sterling (Thornton, 2017).

In 1833 and subsequently 1844, the \textit{de facto} equivalence between the pound and Bank notes

\(^9\)The privileges restricted banking competition and gave the Bank of England a monopoly over note issuance. From 1697 until 1844, only the Bank of England could raise equity; all other banks were restricted to partnerships of six or fewer (after 1844, this was altered to a radius of 25 miles around London). In 1708, the Bank was granted an exemption to laws restricting bank note issuances to private partnerships (Broz and Grossman, 2004).

\(^10\)The Banking Act of 1826 required the Treasury to monitor the amount of small-denomination notes issued by the Bank following the 1825 crisis in which the Bank was seen to have abused its monopoly (Scammell, 1968, p. 132).
bills are those that originated in and were payable in Great Britain. The series comes from Thomas et al. (2006) and sources therein.

became *de jure* with passage of the Bank Notes Act and the Bank Charter Act respectively. The former made Bank notes legal tender while the latter consolidated the entire note issuance onto the Bank of England’s balance sheet where it was fully backed in gold reserves above the allowed fiduciary issue.\(^\text{11}\) The full note circulation of the Bank of England therefore officially contributed to the supply of \(G_A\) following the 1840s. Figure 5 shows that the private debt issuance in pounds sterling, as measured by short-term domestic bills of exchange, doubled as a fraction of UK GDP in the subsequent two decades.\(^\text{12}\)

A second important innovation was the legal codification of the contractual terms for bills of exchange, which coordinated the market on the terms of borrowing and the procedures for

\(^{11}\)The limits of the Bank’s note supply was therefore primarily governed by the gold reserves at the bank and secondarily by the government-determined fiduciary issue. Private bank notes already in circulation were allowed to remain, but no new notes could be issued, and banks lost their right when they merged. The Bank Charter Act could be suspended during financial crises when there was large demand for Bank notes.

\(^{12}\)This figure does not fully reflect the private bills market, of which a large and growing component were foreign bills. There are not reliable estimates of the volume of foreign bills, but contemporaries remarked that foreign bill volumes dwarfed “inland” bills as the century progressed (King, 1972, p. 177).
default. Bills of exchange were the primary London money market instrument, and each time one was traded (“discounted”), the seller guaranteed (“endorsed”) the bill. These endorsements were legally equivalent to being the original borrower, and so each endorser was equally liable. The generality of these conditions were constantly tried at court and established a strong legal precedent.\(^{13}\) These laws reduced the information sensitivity of bills and collectively raised the safety and liquidity of all bills of exchange with multiple endorsers, regardless of the idiosyncratic characteristics of the ultimate borrower. Thus, these innovations made private debt money-like in the sense of Dang et al. (2017).\(^{14}\)

A third notable institution was the Bank of England’s role as a credible and reliable lender of last resort to the financial sector. During the banking crises of 1847, 1857, and 1866, the Bank obtained permission from the Treasury to suspend the Bank Charter Act in order to meet all demand for Bank notes.\(^{15}\) In fact, the Bank’s behavior during the crisis of 1866 was the basis for Bagehot’s rules for central banking (Bagehot, 1873). As a lender of last resort, the Bank provided liquidity at its discount window by converting private bills of exchange into pounds sterling, thereby \emph{de facto} became a backstop to the private bills market. This backstop officially only applied to high-quality bills—those first guaranteed (“accepted”) by large merchant banks that held accounts at the Bank of England—but like all liquidity backstops, its existence reduced the occurrence of market freezes and increased the willingness of private firms to lend in all states.\(^{16}\) These forces together led issuers to prioritize denominating issues in sterling, thereby increasing the quantity of safe pound-denominated debt in the London money market.

The Bank of England acting as a lender of last resort was a major transition from its earlier history in the 18th century when discounting and note issuance was a profit-maximizing endeavor. At that point, the Bank’s discount window followed the market and became simi-

\(^{13}\)A Parliamentary report from 1837 describes the legal protections against default: “a holder of a bill of exchange can bring actions at one and the same time, against every party whose name is attached to it, and in the event of the failure of them all, can prove upon the estate of each for the full value of the bill” (Joplin, 1837, p. 17).

\(^{14}\)An additional factor is that the Act of 1833 exempted short-term bills of exchange from the Usury Laws, which also expanded the market’s general willingness to hold them (Scammell, 1968).

\(^{15}\)Since the Bank Charter Act limited the supply of Bank notes to the Bank’s gold reserve, suspending it (and therefore the gold standard) was the only way to ensure they could meet demand. Even when the gold reserve was high, the presence of a limit reduced liquidity in the market. It is worth noting that obtaining permission to suspend the Bank Charter Act was sufficient, and Great Britain did not actually suspend the gold standard during this period.

\(^{16}\)The high quality bills eligible at the Bank of England became a class of their own, and the financial press throughout this period reported the rates on “Bank” bills separately from “trade” bills (Xu, 2022).
larly unavailable during downturns and crises.\textsuperscript{17} As the London money market deepened and the pound sterling gained dominance in the 19th century, the Bank increasingly took on a more formal role within the government. This was despite the fact that it remained privately owned by stockholders until 1944 and run by Governors and Courts of Directors that primarily stemmed from the merchant and banking classes (Cassis, 1994, p. 85). The Bank’s transitioning role in the money market given its dual identities reflects how the benefits of agglomeration accrued to both the government and to the private sector, all embodied in a single institution.

One final development during this period that contributed to maintaining the dominant equilibrium is the growth of international banking, which facilitated access to the pound sterling in locations around the world. British overseas banking institutions generally followed the business model of issuing deposits and shares domestically while lending via bills of exchange payable in London in their branches abroad. As in Amsterdam, the short term commercial bill became the dominant credit instrument internationally, with payments settled in London even for transactions that did not involve Great Britain.\textsuperscript{18} The network of British banks increased the likelihood that foreign firms could hold pound obligations (or equivalently receive part of their profits in pounds), which in the context of the model we view as equivalent to reducing the cost of foreign currency issuance $K_i$, whether through a reduction of underlying FX exposures or via a reduction in the fixed cost of debt underwriting. Reducing this cost increases the mass of firms for which issuing in the foreign currency is profitable, as shown in equation (15).\textsuperscript{19}

\begin{flushleft}
\textsuperscript{17}Scammell writes, “All in all the discounting of bills by the Bank in the early 19th century must be seen primarily as a prosperous business of the Bank and only very secondarily as a manifestation of credit policy,” (Scammell, 1968, p. 144). For example, during the 1797 crisis, Parliament assumed the role of being a liquidity provider by issuing exchequer (treasury) bills to the market (Thornton, 2017, p. 98). The subsequent crisis in 1825 provides a microcosm into the transition that took place. Early in the year, the Bank of England closed its discount window because it anticipated a financial market downturn. This action in itself ”created an atmosphere of misgiving and potential crisis,” (Scammell, 1968, p. 131). However, when the crisis peaked in November with numerous failures in London, the Bank reversed its earlier decision and made discounts and advances on government securities and private bills. Thereafter starting in 1830, it allowed bill brokers to access the discount window for the first time, after recognizing that these institutions were important conduits of liquidity.

\textsuperscript{18}For example, “the bill on London enabled the banks […] to finance a large share of international trade regardless of whether that trade touched Britain’s shores,” (Orbell, 2017, p. 8), and “wines from France, coffee from Brazil, sugar from the West Indies, and silk from Hong Kong were paid alike with bills on London,” (Jenks, 1927, p. 69).

\textsuperscript{19}Incidentally, both the French and the Germans followed the British model, often with explicit reference to expanding their currencies abroad. For instance, Edward Hurley, in his arguments for the creation for the US Federal Reserve System wrote, “The logical ambition of the German commercial policy is naturally to enthrone the Mark in the estimation of the world until it need pay no deference to the pound sterling.”
\end{flushleft}
5.2 Fundamentals and Government Incentives

The historical experience of the pound sterling provides a background for our formal analysis of sovereign incentives. We explain why the British pound sterling became dominant, as opposed to the French franc or the German goldmark. Our analysis also sheds light on the shift of the Bank of England from a private note-issuer to a central bank.

We first specify the sovereigns’ objective functions. The government of country $j$ maximizes:

$$ W_j = \int u_{i,j}^{F}(K_i) \, dH(K_i) + G_j(P_{0,j} - \beta^2), $$

(27)

The first term in this objective function corresponds to the purely utilitarian welfare criterion that aggregates the preferences of domestic firms. In addition to this standard utilitarian objective, we allow the government to have a profit motive, which is reflected in the second term of equation (27): this term corresponds to the seignorage revenues earned from the convenience yield on sovereign debt issued at $t_0$, which scales linearly with the size of $G_j$ government issuance.

It is easiest to analyze the objective (27) in the DGP case ($\theta = 1$); the appendix provides a treatment for the general case:

**Proposition 3** For $\theta = 1$, up to an affine scaling the objective for the leading country ($A$) reduces to

$$ W_A = \phi \lambda_A \left\{ G_A \left[ F_A + H(\hat{K})F_B \right] + 2F_A \left[ F_A + H(\hat{K})F_B + \frac{G_A}{2} \right] \right\}, $$

(28)

while the objective for the follower country ($B$), again up to an affine scaling, becomes

$$ W_B = \phi \lambda_B (1 - H(\hat{K}))F_B \left[ G_B + (1 - H(\hat{K}))F_B \right] + U_{B\rightarrow A}, $$

(29)

where $U_{B\rightarrow A}$ is the utility of the $B$-firms that issue in foreign currency, given by

$$ U_{B\rightarrow A} = H(\hat{K})F_B \left\{ \phi \lambda_A \left[ F_A + H(\hat{K})F_B + \frac{G_A}{2} \right] - \frac{\mathbb{E}[K_i | K_i \leq \hat{K}]}{2} \right\}. $$

(30)

The expressions for the two countries’ government objectives derived in Proposition 3 reveal several aspects of the structure of sovereign incentives in this environment. Consider, for example, the government’s incentives to invest in technologies that improve private sector
liquidity provision: in the context of the model, these can be thought of as increasing overall market liquidity $\lambda_j$, so that government incentives correspond to $\frac{\partial W_j}{\partial \lambda_j}$. These incentives to invest in financial innovation are increasing in measures of dominance ($\hat{K}$), size ($G_j, F_j$), and in the degree of the private sector’s demand for liquidity ($\phi$). Importantly, given this asymmetry, the incentive is higher for the leader country ($A$) than the follower country. Our model identifies a complementarity between financial innovation and dominance: the incentive $\frac{\partial W_j}{\partial \lambda_j}$ is increasing with entry into $A$’s markets ($\hat{K}$), and investments in financial innovation further spur entry, leading to an endogenous rise in $\hat{K}$, as formalized in the following proposition.

**Proposition 4** Issuance in the dominant currency and the leader’s incentives to invest in financial innovation are complementary, given that

$$\frac{\partial^2 W_A}{\partial \lambda_A \partial \hat{K}} > 0, \quad \frac{\partial \hat{K}}{\partial \lambda_A} > 0.$$  

(31)

The institutional development of the London market illustrates this confluence of factors. Great Britain was the victor and largest economy after the Napoleonic Wars with a government debt in pound sterlings of 200% of GDP, coupled with a credible tax base that made this debt safe. This initial point established the pound as a dominant currency with substantial entry from foreign sovereigns.\(^{20}\) The institutional developments in the legal structure of bills of exchange and the role of the Bank of England also reflect investments in overall market liquidity $\lambda_A$. These investments continued throughout the 19th century as dominance engendered entry, liquidity, and increased incentives to innovate.

These complementary innovation forces are also at play in the rise of Amsterdam. For instance, the receipts technology (i.e., repurchase facility) that created florin claims out of raw specie was only introduced in 1683, almost seven decades after the Bank’s establishment. The fact that florin balances doubled after its introduction is indicative of the force identified in our model that increases in $\lambda_j$ generate entry (Quinn and Roberds, 2014).

In contrast, France experienced several disruptions to its supply of safe government debt in the late 18th century, and its loss at Waterloo reduced its ability to float a large volume subsequently. Unlike Great Britain, it paid off its wartime debt with much higher taxes instead of new long-term issuances (Bordo and White, 1991). While the franc itself returned to the gold standard and maintained a stable value, the outstanding amounts of other forms

\(^{20}\)The vast majority of the sovereign debt issued in London after the Napoleonic Wars were by Latin American and other European nations rather than the British colonies (Meyer et al., 2022).
of franc-denominated claims were much smaller than that of the pound’s. One illustration of pound dominance is that French firms were the largest foreign contributors to the corporate bond issuance in London, accounting for 25% on average from the mid-19th century to WWI.

Other potential competitors in the 19th century were the US and Germany. In 1870, the US overtook Great Britain as the largest economy in the world while Germany became unified. However, neither country was “large” enough financially to dislodge Great Britain’s advantage. In the US, the financial sector was fragmented and lacked a national institution resembling a central bank until 1913. While Germany copied many aspects of the London money market including creating the Reichsbank, its economy was smaller than Great Britain’s, and it entered well after British dominance had been established.

### 5.3 Dynamics of Sovereign Incentives With Issuer Heterogeneity

We now turn to considering the sovereign objectives in the context of the extended model of Section 4.4, in which we allow for heterogeneity between liquidity demanders and liquidity suppliers. The question that we examine is how the government’s incentives to retain particular types of issuers evolve during transition dynamics—in particular, as a follower jumpstarts its international currency status and tends towards currency dominance, as Britain did in the early 19th century. We focus here on how the value attached to retaining liquidity suppliers in domestic currency evolves as this follower-in-transition gradually deepens the liquidity of its markets. As before, we describe the results for the DGP case ($\theta = 1$) in the main text, and we present the analysis of the general case in the appendix.

With heterogeneity between liquidity demanders and liquidity suppliers, the objective (27) of the follower government ($B$) becomes

$$W_B = \phi \lambda_B G_B \left[1 - H(\hat{K}^-)\right] F^-_B + F^+_B U^+_B + F^-_B U^-_B,$$

where $U^+_B$ and $U^-_B$ are the preferences of domestic liquidity suppliers and domestic liquidity demanders, which take the following forms:

$$U^+_B = \int_{K^-}^{K^+} [\lambda_A m_{F,A} - K_i] dH(K_i) + \int_{K^+}^{K} [\lambda_B m_{F,B}] dH(K_i),$$

and

$$U^-_B = \int_{K^-}^{K} [\phi \lambda_A m_{I,A} - K_i] dH(K_i) + \int_{K^-}^{K} [\phi \lambda_B m_{I,B}] dH(K_i).$$

(32, 33, 34)
Here the two integrals in each expression aggregate over the preferences of foreign currency issuers and home currency issuers, respectively.

To establish the valuation that the government attaches to liquidity suppliers, we consider a small perturbation to $\hat{K}^+$, the threshold cost below which liquidity suppliers choose to issue in foreign currency. We are interested in how this valuation changes as a country’s currency evolves and gains international status. We collect all country fundamentals in the vector $\mathcal{F}_{\text{Pre}} = (F_B^+, F_B^-, G_B, F_A, G_A, \lambda_B, \lambda_A)$ where the word $\text{Pre}$ refers to fundamentals at an early stage of development. The relevant valuation is therefore given by

$$V_{\text{Pre}}^+ = -\frac{\partial W_B(\mathcal{F}_{\text{Pre}})}{\partial \hat{K}^+}.$$  \hspace{1cm} (35)

Denote the fundamentals at a later stage of development as $\mathcal{F}_{\text{Post}}$, with the properties that $(F_B^+, F_B^-, G_B, \lambda_B)$ are all higher in the post-transition vector as compared to the pre-transition vector $\mathcal{F}_{\text{Pre}}$. The government’s valuation of liquidity suppliers later in development is then

$$V_{\text{Post}}^+ = -\frac{\partial W_B(\mathcal{F}_{\text{Post}})}{\partial \hat{K}^+}.$$  \hspace{1cm} (36)

The following result then holds:

**Proposition 5** Under regularity conditions, the government in the follower-in-transition country $B$ attaches a higher value to retaining liquidity suppliers in domestic currency markets later in the transition towards dominant status, as compared to earlier in the transition:

$$V_{\text{Post}}^+ > V_{\text{Pre}}^+.$$  \hspace{1cm} (37)

The intuition for this result comes back to the gains from agglomeration that result from increasing returns to scale in matching. When more liquidity supply is already concentrated in domestic markets (as happens endogenously via the shift in fundamentals), the marginal benefit of inducing further liquidity suppliers to remain in domestic currency rises. Proposition 5 thus uncovers a dynamic aspect to the sovereign’s problem. Once again, we encounter a complementarity: a country that starts out a follower endogenously gains stronger incentives to invest in domestic liquidity creation as it makes headway towards dominance. This dynamic endogenous positive feedback will tend to accelerate transition dynamics.

These results also shed light on the evolution of central banking: in particular, they underscore that government-led innovation in private debt markets will tend to accelerate in
countries that are in a transition towards dominance. This helps explain the shift of the Bank of England to a true central bank, discounting private bank bills and acting as a lender of last resort. In contrast, France’s transition in this direction was more limited, and its incentives did not evolve along these same lines.

6 Understanding Today’s Dollar-Denominated World

The conceptual mechanisms that we have highlighted throughout this paper explain many of the features of US dollar dominance that we currently observe in world financial markets. To begin with, we view the large, liquid, and safe stock of US Treasury bills—partially first established to finance the war effort in World War I and subsequently expanded throughout the 20th century—as the kernel that seeded the process of dollar dominance.

Building on this initial stock of government-issued money market instruments, innovation in the US financial system allowed privately-issued short-term debt instruments to add to the pool of dollar-denominated money market liquidity. The growth of the US banking system and of the commercial paper market (Greenwood and Scharfstein 2013) are early examples of these liquidity-producing financial technologies. In more recent decades, securitization (Mian and Sufi 2009, Keys et al. 2010) allowed for further private-sector production of safe liquid assets, while the expansion of repo markets (Gorton and Metrick 2012, Krishnamurthy et al. 2014) broadened liquidity in the overnight segment of dollar money markets.

Correspondingly, the currency denomination choices of today’s worldwide debt issuers feature the complementarities that we have illustrated through our theory. On the one hand, very safe global issuers—for instance, the German state-backed development bank KfW—are attracted to the US dollar because of the convenience yields attached to dollar-denominated assets, and they act as net liquidity suppliers to dollar money markets. On the other hand, lower-rated entities all around the world also issue debt in US dollars, drawn in by the ensuing liquidity benefits.

Other elements of the global financial architecture reinforce the current dollar-dominant equilibrium. Central bank swap line arrangements (Bahaj and Reis 2021) are an important example. Swap lines provide emergency liquidity supply by one central bank to others: overwhelmingly, the central bank on the supplying end of these arrangements has been the US Federal Reserve, which provided US dollar liquidity in overseas markets during stress periods such as the global financial crisis of 2008-09 and the COVID crisis of 2020. Fed swap lines ef-
fectively promise a state-contingent expansion of dollar-denominated money market liquidity in times of need, hence increasing the expected liquidity benefits from issuing dollar debt.

Our analysis explains that these financial and central banking developments in the US are a natural outcome of the incentives of the dominant country. Financial developments are complementary to dominance.

An often-asked question in academic and policy discussions is whether the Chinese Renminbi (RMB) might be posed to displace the US dollar as the world’s dominant international currency in the near future (Horn et al. 2021, Clayton et al. 2022). Our theory answers that this equilibrium switch might require the Chinese financial system to develop the features that we have highlighted here, many of which it is currently lacking.

7 Conclusion

We have provided a model which explains why the US dollar acts as the dominant currency in worldwide debt denomination. In our theory, money market liquidity is the fundamental force shaping debt denomination decisions and currency dominance. Our model features endogenous positive feedback cycles, search frictions in money markets, and increasing returns to scale in matching—forces which generate unipolar equilibria with a single dominant currency. Our analysis examines interactions in the debt denomination choices of heterogeneous global issuers, and it similarly encompasses normative aspects relating to the incentives faced by the sovereigns. The model rationalizes features of the current dollar-dominant international financial architecture. Further, it sheds light various historical experiences, including the dominance of the Dutch florin in trade and finance in the 16th and 17th centuries, the centrality of the pound sterling in the pre-WWI era, the potential rise of the Chinese renminbi as an international currencies, and transitions among these regimes.
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