DISCUSSION PAPER SERIES

DP16606

# Hot Money Inflows and Bank Risk-Taking: Germany from the 1920s to the Great Depression

Natacha Postel-Vinay and Stéphanie Collet

ECONOMIC HISTORY

FINANCIAL ECONOMICS

INTERNATIONAL MACROECONOMICS AND FINANCE

ISSN 0265-8003

# Hot Money Inflows and Bank Risk-Taking: Germany from the 1920s to the Great Depression

*Natacha Postel-Vinay and Stéphanie Collet*

Discussion Paper DP16606
Published 04 October 2021
Submitted 29 September 2021

Centre for Economic Policy Research
33 Great Sutton Street, London EC1V 0DX, UK
Tel: +44 (0)20 7183 8801
www.cepr.org

# Hot Money Inflows and Bank Risk-Taking: Germany from the 1920s to the Great Depression


## Abstract

What is the impact of hot capital inflows on bank risk-taking? In an increasingly financially globalised world this question becomes especially relevant. However few authors have examined it in detail empirically, despite repeated crises in Latin America, East Asia and the Eurozone from the 1980s to the 2010s. In this paper, we collect individual bank data on one of history's most striking examples of a "supply push" in foreign funds: the great inflow of capital from the developed world to Germany in the second half of the 1920s. Bank by bank we examine its effects on decisions related to leverage, lending and liquidity. The specificities of the time period – the Dawes Plan of 1924 as well as the relative absence of a Too-Big-to-Fail environment, which we document through extensive historiographical analysis – allow us to mitigate endogeneity concerns. We develop a three-step approach in which we run panel regressions including only months of falling interest-rate spreads, and apply a two-stage least-squares model in which initial bank size is used as an instrument. In all our models our results tend to converge: while capital inflows did not seem to impact banks' liquidity decisions, their impact on leverage was non-negligeable. This paper's results thus call for extra prudential oversight whenever cross-border banking flows increase significantly.



JEL Classification: E51, F34, F65, G21, N24, N14

Keywords: money supply, credit, financial globalization, Foreign Debt, International Lending, Financial Development, financial crisis



Natacha Postel-Vinay - n.m.postel-vinay@lse.ac.uk
*London School of Economics and CEPR*

Stéphanie Collet - stephanie.collet@bundesbank.de
*Deutsche Bundesbank*



Acknowledgements
We thank Lasse Herbst for excellent research assistance, Marc Adam for help with archival sources, as well as Stephan Luck, Markus Brunnermeier and Kristian Blickle for kindly sharing data with us. We are grateful for comments and advice from Olivier Accominotti, Harold James, Jason Lennard, Marco Molteni, Kim Oosterlinck, Albrecht Ritschl, Catherine Schenck, Eric Schneider, Gianni Toniolo, other participants at the International Banking Networks Conference 2021 at Goethe University, the "From Reichsbank to Bundesbank" Conference 2021 at the Deutsche Bundesbank, and seminar participants at Münster University and the London School of Economics.

# Hot Money Inflows and Bank Risk-Taking: Germany from the 1920s to the Great Depression[1]

Stéphanie Collet Natacha Postel-Vinay

October 2021

Preliminary

**Abstract**

What is the impact of hot capital inflows on bank risk-taking? In an increasingly financially globalised world this question becomes especially relevant. However few authors have examined it in detail empirically, despite repeated crises in Latin America, East Asia and the Eurozone from the 1980s to the 2010s. In this paper, we collect individual bank data on one of history's most striking examples of a "supply push" in foreign funds: the great inflow of capital from the developed world to Germany in the second half of the 1920s. Bank by bank we examine its effects on decisions related to leverage, lending and liquidity. The specificities of the time period – the Dawes Plan of 1924 as well as the relative absence of a Too-Big-to-Fail environment, which we document through extensive historiographical analysis – allow us to mitigate endogeneity concerns. We develop a three-step approach in which we run panel regressions including only months of falling interest-rate spreads, and apply a two-stage least-squares model in which initial bank size is used as an instrument. In all our models our results tend to converge: while capital inflows did not seem to impact banks' liquidity decisions, their impact on leverage was non-negligeable. This paper's results thus call for extra prudential oversight whenever cross-border banking flows increase significantly.

**JEL Classification**: E51, F34, F65, G21, N24, N14

**Keywords**: Money Supply, Credit, Financial Globalization, Foreign Debt, International Lending, Financial Development, Financial Crisis

[1] Address for correspondence: Stéphanie Collet (Deutsche Bundesbank); Natacha Postel-Vinay (London School of Economics and CEPR). We thank Lasse Herbst for excellent research assistance, Marc Adam for help with archival sources, as well as Stephan Luck, Markus Brunnermeier and Kristian Blickle for kindly sharing data with us. We are grateful for comments and advice from Olivier Accominotti, Harold James, Jason Lennard, Marco Molteni, Kim Oosterlinck, Albrecht Ritschl, Catherine Schenck, Eric Schneider, Gianni Toniolo, other participants at the International Banking Networks Conference 2021 at Goethe University, the "From Reichsbank to Bundesbank" Conference 2021 at the Deutsche Bundesbank, and seminar participants at Münster University and the London School of Economics.

*"When the capital development of a country becomes a by-product of the activities of a casino, the job is likely to be ill-done."*

J. M. Keynes (1936)

# 1 Introduction

Do large, sudden capital inflows increase bank risk-taking? The question deserves to be asked, not least because of the great increase in the interconnectedness of the financial world since the end of Bretton Woods. Since the 1970s there have been numerous episodes of booming international investments followed by banking or currency crises, or both. From Latin America in the 1980s to East Asia and Sweden in the 1990s and finally the Eurozone in the 2010s, examples abound. Nevertheless, the debate on the causes of those crises is rarely framed around the question of the impact of inflows on bank risk-taking. Instead, it usually revolves around the relative causal significance of inflows and outflows on the one hand as opposed to domestic bank risk-taking on the other. The issue of interactions between the two is too often relegated to side discussions.[2] So-called "third-generation models" go one step in the right direction by making explicit the possible double occurrence of banking and currency crises (twin crises).[3] However, they usually focus on the dynamics of the crisis itself and say little on the origins of any bank risk-taking preceding it (Kaminsky and Reinhart 1999).[4] And while some authors have indeed emphasised interactions between inflows and bank risk-taking (see in particular Diaz-Alejandro 1985; Berg 1999; Corsetti, Pesenti and Roubini 1998; Calvo 1998), empirical evidence on those relationships is scant.

In this paper, we look back at one of the deepest twin crises in history – the German crisis of 1931 – and ask whether the large capital inflows that preceded it might have spurred bank risk-taking in the run-up to it. In the 1920s Germany was the recipient of an estimated

[2] In the Latin American and East-Asian contexts, compare for instance Calvo and Mendoza (1996), Eichengreen, Rose and Wyplosz (1995) and Radelet and Sachs (1998) with Berg (1999).

[3] For instance, Velasco (1987), Calvo (1998), Dornbusch, R., Goldfain, I. and Valdes, R. (1995), and Miller (1995).

[4] Third-generation models tend to emphasise balance-sheet effects linked to maturity and currency mismatches at the point the crisis occurs. As the currency depreciates, banks that have received large amounts of foreign capital face both increased credit risk due to the effect of currency depreciation on local prices and an increased currency mismatch which puts them in serious trouble (Eichengreen and Hausmann 1999).

total of RM 18.2 billion in inflows coming primarily from the US, Britain and other European countries (Harris 1935, p. 7).[5] These followed a period of hyperinflation which destroyed a great portion of existing German capital. Initially investors were attracted by strong demand and the resulting high level of interest rates on capital. Yet they were also greatly – and some might argue artificially – spurred by the Dawes Plan of 1924 which gave foreign exchange withdrawal priority to commercial investors in Germany over official investors (Ritschl 2002a, 2012). Over time the US-German long-term interest rate spread fell, indicating the presence of push factors in the supply of capital. At the same time, banks' leverage rose, and their liquidity fell, making them vulnerable to the crisis that would come in 1931.

Many authors in the German historiography have noted the increase in bank risk-taking in the second half of the 1920s and have linked it to the banking crisis that followed shortly after. Schnabel (2004) made this link explicit and convincingly showed that bank risk had increased at least as much as fiscal risk in the run-up to 1931. This provided further empirical grounding to an idea that had been developed at length in the literature by numerous authors (for instance Born 1967; Hardach 1976, 1984, 1995a, 1995b; Balderston 1991, 1993; James 1984, 1985, 1986). These accounts can be contrasted with those emphasising primarily fiscal issues and capital flight caused by flimsy international investors that either worried about the state of the German budget or became more interested in higher interest rates at home (Ferguson and Temin 2003; Accominotti and Eichengreen 2016).

What is missing from this debate is an explicit and systematic analysis of the interaction between the capital inflows that greatly expanded from 1926 onwards and the concurrent bank risk-taking. According to the theoretical literature, sudden, large capital inflows can act in the same way as a sudden increase in domestic liquid liabilities, as for example induced by loose monetary policy: the rise in loanable funds may push banks to quickly expand in unknown territories and engage in riskier lending (Dell-Ariccia and Marquez 2006; Acharya and Naqvi 2012; Dinger and te Kaat 2020). Within this framework the source of additional funds – whether foreign or domestic – makes no difference to risk-taking behaviour at the individual bank level. In fact, a foreign inflow might free up domestic funds for banks that are not direct recipients of foreign funds, which then leads the latter to behave

[5] This includes both long- and short-term capital capital flows, from 1924 to 1930. Short-term capital flows amounted to RM 13.1 milliard (ibid.).

in a similar way (Dinger and te Kaat 2020; see also Martinez-Miera and Repullo 2017). Nevertheless, the foreign origin or otherwise of the inflow matters from a historical point of view. There has been increasing awareness of the potential for international capital flows to reinforce domestic credit cycles in a destabilising way (Borio, James and Shin 2013; Ha, Kose, Otrok and Prasad 2020; Kaminsky, Medina and Wang 2020; Rey 2015; Tooze 2018). In one of the only crisis-specific empirical investigations of the topic, Dinger and te Kaat (2020) have compellingly shown how capital inflows in the run-up to the Eurozone crisis of the 2000s led to increased bank risk-taking at the time. In the German post-World War I context, the possibility of a positive relationship between inflows and risk-taking is mentioned in several narratives (see in particular Balderston 1993 and Straumann 2019). In Section 2 we present a rich account of the existing evidence on the topic drawn from the historiography. Nevertheless, it will quickly become apparent that this hypothesis has usually remained implicit and has not been the subject of systematic analysis.

To analyse these interactions in the pre-Depression German context in a more systematic way we therefore hand-collected, for the first time, the entire balance sheet data of the 130 or so "monthly-reporting banks" from 1925 to 1935. The balance sheet information has been used in previous studies (see especially Schnabel 2004 and more recently Blickle, Brunnermeier and Luck 2020) but the focus has almost always been on the crisis years and never before had this data been collected for such a long time period. Covering the years 1925-9 is essential if one wants to explore the evolution of bank risk-taking in the years preceding the crisis. The data contains 55 balance sheet items, 35 on the asset side and 20 on the liability side. We collected it at a bi-monthly frequency although the frequency varies a little over time as some reports were unavailable. Overall, the dataset contains 9,499 observations.

The richness and frequency of the data allow us to explore the links between the evolution of banks' increases in loanable funds on the one hand and aspects of risk-taking on the other. To the best of our knowledge, this it is the first study to do so at the individual bank level in the 1920s and thereafter.[6] We can explore for instance whether an increase in loanable funds was associated at the bank level with a rise in leverage or a fall in liquidity. We can also investigate its impact on short- and long-term lending as well as different types of collateralised investments. A potential issue with our analysis however might be that

[6] Dinger and te Kaat's (2020) analysis of the years preceding the Eurozone crisis is at the country level.

economic growth, risk preference or any other unobserved variable caused banks to take more risks and only as a result expand their assets and liabilities. In this case, a positive correlation between risk-taking and liability growth would reflect the simultaneous occurrence of both, not a causal effect going from the latter to the former. An additional concern could be the absence of a reliable way to determine the geographical provenance of banks' liabilities in the 1920s. In practice however, distinguishing between increases in domestic and foreign flows at the bank level may be of limited value since, as noted above, both can result from changes in foreign capital flows. Nevertheless, one would still like to be able to tell whether the increase in deposits was due mainly to domestic or international factors.

We propose a three-step approach to mitigate those issues. We first make use of additional data on banks' largest foreign liability holdings in 1930 to explore their relationship with deposit growth in the 1920s.[7] From this analysis we can extract the most relevant types of deposits in our monthly data whose growth should be analysed. Two types of deposits grew most at the "foreign-inflow" banks: three-month deposits and what we call "trade deposits" (more on this below). The other two types, seven-day deposits and interbank deposits, grew most at the other banks, and are thus of less interest to us.

Next, we run random effects panel regressions focusing on the relationship between risk-taking variables and the relevant changes in deposits. To mitigate the endogeneity issue, we analyse the model only in months in which the short-term interest rate spreads between the US and Germany fell, a strategy also followed by Dinger and te Kaat in the years preceding the crisis in the Eurozone (2020). This makes it more likely that we include months where supply shocks to international capital were more important than demand ones. Historical analysis suggests that the Dawes Plan of 1924 played an important role in generating this supply push.

Finally, to complement this analysis we look at the impact of foreign debt on risk-taking applying an instrumental variable (IV) approach. For this we use a time-invariant instrument, initial bank size, whose relevance is difficult to question and whose validity depends largely on the presence, or lack thereof, of a "Too-Big-To-Fail" (TBTF) environment. Our detailed account of the existing historiography on the topic suggests that, while there may have been some form of liquidity guarantee at the time, it is much harder to find evidence

[7] We thank Stephan Luck, Markus Brunnermeier and Kristian Blickle for kindly sharing their data with us.

of a bailout guarantee even in the context of "corporatist regulation." With this in mind, we then use our instrument in the pre-crisis cross-section where we examine the relationship between risk-taking and "foreign-inflow" banks.

This three-step approach allows us to highlight a number of important points. Although the Reichsbank was aware of possible risks attached to the sudden inflow of capital into German banks, it seems to have been powerless in its attempts to control it. It is clear from our data that those inflows induced banks to increase their leverage in ways that compromised their long-term health. Interestingly however, banks' liquidity does not seem to have suffered directly as a result of inflows. We suggest that these contrasting behaviours may have originated from different perceptions of the potential dangers associated with sudden capital inflows, although our explanations in this regard remain speculative and could be the subject of future research.

Our conclusions allow us to draw explicit and systematic linkages between the sudden inflows that took place after 1924 and the increases in bank risk-taking often emphasised in the literature. Although historical accounts have tended to focus on the sudden withdrawal and liquidity risks associated with large foreign inflows, for instance during the 1931 currency crisis, our results also suggest the existence of a longer-term and more profound impact on banks in the years preceding the crisis. The consequent deterioration in banks' leverage may have rendered them especially vulnerable on the eve of the crisis. In addition, our account also speaks to more general debates. It is in line with Borio, James and Shin (2014), who emphasise excess "[international] financial elasticity" amplifying financial booms and busts (see also Borio and Disyatat 2011). And it reinforces the idea that a "global financial cycle" can amplify bank risk-taking at the local level (Rey 2015; Tooze 2018).

The rest of the paper proceeds as follows. Section 2 presents historiographical evidence linking bank risk-taking to foreign inflows in the years preceding the German crisis. We then provide a detailed exposition of our three-step empirical approach (Section 3). Here we bring forward a rich account of the existing historiography on the evolution of German banking regulation in the early 20C and suggest that it is hard to find any evidence of a contemporary bailout guarantee. Finally, in Section 4 we present our results. Section 5 concludes, and is followed by an Appendix.

# 2 Probing the relationship between capital supply shocks and bank risk-taking in 1920s Germany: historiographical evidence

The literature on German banking developments in the post-World War I era is incredibly rich. Specifically, there is substantial descriptive and analytical material on increases in bank risk-taking over the period. At the same time, much attention has been paid to capital supply shocks in the aftermath of the Dawes Plan of 1924. In this section we bring to the fore the many connections that can be drawn between these two strands of literature and that are often left implicit in historiographical accounts. In so doing, we show that there is a strong case for investigating the link between post-1924 capital inflows and bank risk-taking empirically.

## 2. 1 Bank Risk-Taking

The evidence on increasing risk-taking among German banks in the second half of the 1920s is well-established. After the hyperinflation of 1923, banks underwent a dramatic expansion: their total assets quintupled between 1924 and 1930 (Schnabel 2004). During this expansion, banks prioritised less liquid but more remunerative assets, so that their liquidity did not keep pace with the expansion of their liabilities or relative to 1913 (Hardach 1984). The average estimated liquidity ratio among all banks fell from 7.3% in 1913 to 3.8% in 1929 (ibid.; see also James 1986). Their liquidity ratio worsened especially in 1925-6 as they invested more in less liquid assets such as stock market loans and advances (James 1986). And as has been noted by numerous authors, the expansion occurred on a very thin capital base. At the big Berlin banks capital ratios fell from 19% to 7% in 1929 (Hardach 1984; see also James 1986, p. 294 and Balderston 1991). Schnabel (2004) showed how depositors worried about those trends and in 1931 ran especially on banks with lower liquidity and capital. Banks were thus "extremely vulnerable" (Hardach 1984).

Many banks "overlent" in one of the most speculative markets at the time: the market for municipal debt which at first attracted very high nominal yields. Big cities such as Düsseldorf, Münster, Stuttgart, Cologne, Frankfurt and Berlin borrowed massively to invest in expensive projects such as exhibition halls, sports stadiums and swimming pools, a

phenomenon dubbed "city gigantomania" by some (James, 1986, p. 91). Investors at first tended to be foreign individuals buying long-term bonds underwritten by private US or British banks, though short-term foreign funds were increasingly channelled via German banks, such as the Dresdner and Danat banks which partly specialised in communal business (ibid., p. 99). The publicly-owned *Sparkassen* or savings banks, which comprised the Landesbanken and their parent institutions, the Girozentralen, also heavily invested in communal credit. Notorious examples include the Landesbank of the Provinz Westfalen and the Rheinische Landesbank, which lent copiously to the city of Cologne (ibid., p. 102; see also Fischer 1999).[8] By 1930 many of these cities' finances were in the red which led the overly committed banks to suffer as a result.

More generally many banks seem to have lacked asset diversification. From 1927 to 1929 the subcommittee of the Inquiry into German Conditions of Productions and Sale (the *Enquête-Ausschuβ*) warned that many concentrated too much of their lending in a small number of big customers (James 1986, p. 141). According to some accounts, banks indulged in lending to borrowers with whom they had historically close relationships, a strategy they considered as a "safe bet" in the post-inflation era. In such cases banks may have felt overly confident and failed to monitor unscrupulous customers (ibid., p. 143). Other accounts paint a more aggressive behaviour, with the "wild men" of Behrenstrasse investing in new "growth" areas such as municipal finance and mechanised, rationalised production (dubbed "rationalisation mania" by some), leading to excess capacity in those areas (Balderston 1993, p. 80; Harris 1935, p. 11). According to this interpretation, larger firms were able to seek credit directly from foreign lenders, whereas smaller firms were more dependent on bank credit. Banks expanded their market share therefore partly by catering to medium-size and smaller firms in the textile, machinery, iron and steel wares and foodstuff industries (Balderston 1991). "Technical hubris" may have been at play, for instance, when JP Bemberg AG continued to build a large new plant for artificial silk before discovering there was no market for its products (ibid., p. 148). Cases of overproduction led economist Joseph Schumpeter to suggest that up to a quarter of funds invested in Germany after 1924 had been put to inefficient uses (ibid.).

[8] Then mayor of Cologne Konrad Adenauer was intimately involved in these borrowing campaigns.

A significant example of lack of asset diversification is no doubt the Dresdner bank, one of the largest Berlin banks, which had invested heavily in Nordwolle, a large textile company which grew into trouble in the late 1920s. The case of the Danat bank is even more notorious. Also one of the banking giants of the time, its financial health became tied up with a small number local authorities (including, famously, the City of Berlin) and also firms such as Nordwolle.[9] The Danat is famous for exposing the extent of its troubles when it refused to renew a loan to the City of Berlin on June 5, 1931. Under the leadership of Jakob Goldschmidt, a former stock market trader, it had facilitated mergers and acquisitions by large firms, bought shares in them (Straumann 2019, p. 153) and lent to them. At the same time as the financial and fiscal well-being of the firms and local authorities it had invested in became increasingly questioned, its capital ratio came dwindling down (4.8% in 1929). Danatbank is sometimes portrayed as an outlier (see Ferguson and Temin 2003) although, as our results shall further suggest, it is probably best thought of as an extreme example of underlying trends. Due in part to an atmosphere of relative secrecy among banks, some of their weaknesses only came to light when the 1931 crisis unfolded (James 1986, Straumann 2019). According to Schnabel (2004), depositors became relatively well-informed around that time and withdrew more from banks that had adopted riskier investment strategies earlier on.

### 2. 2 Potential Causes: Structural and Regulatory Factors

The causes of these bank weaknesses have been widely debated. Part of them no doubt lay in the structure of the German post-war economy. James (1986) posited that capital investment had been excessive and led to over-production in "sunset" industries. Balderston (1993) also highlighted structural imbalances in the economy, though his emphasis lay more in "rationalised" industry.

Lack of regulation and strong competition may have also played a role (James 1984). Together they created incentives for growth. Some banks tried to overtake others to become larger, while small banks tried to expand as quickly as possible to avoid being overtaken (James 1984). The great Berlin banks fiercely competed with each other for market share in their new nationwide enlargements (Balderston 1991; Burhop 2011). Provincial banks large

[9] The mayor of Berlin Gustav Böss was heavily involved in corruption cases and responsible for many of the loans contracted with Danat.

and small often responded by expanding as well, and they themselves had to compete with numerous private and savings banks which were often also universal banks (Hardach 1984).

The Danat bank spurred some of this competition through its central involvement in the merger and rationalisation activity of the mid-1920s – for instance in the steel and automobile industries – and its channelling of foreign funds towards modernisation programs (ibid.). The banks also faced competition from foreign investors who were direct, avid lenders to German businesses in 1925-7. According to Balderston (1991), foreign banking competition certainly worsened the quality of banks' advances portfolios. Search for yield was thus partly induced by the erosion of rents (Schnabel 2004).

### 2. 3 Foreign Inflows

What remains unexplored is the extent to which foreign investment in banks reinforced those banks' risk-taking. In the finance literature, a capital inflow can act like any increase in loanable funds: it can induce recipient banks to take more risks as the pool of potential, unknown borrowers suddenly expands (see Dell-Ariccia and Marquez 2006, Acharya and Naqvi 2012, and Dinger and Te Kaat 2020). It is estimated that foreign deposits increased by a factor of 7.4 between 1925 and 1929 and that by the end of the period 18% of all deposits in the banking sector were of foreign origin (Schnabel 2004).[10]

Of course, capital inflows to Germany could at first be explained by sharp increases in the demand for funds following the hyperinflation (Straumann 2019, p. 9). Hyperinflation destroyed savings and corporate capital, which brought interest rates very high as the economy recovered following the stabilisation of the mark in 1924. Taxes were also hard to raise for political reasons, which increased the government and municipalities' demand for loans. Germany was a very attractive investment terrain: its industrial base was intact with leaders in coal, iron, steel, electrical engineering, chemicals and cars, while at the same time presenting very low levels of indebtedness due to the hyperinflation (ibid., p. 10, 31).

Monetary policy conducted by the Reichsbank also arguably spurred the demand for foreign capital. Up to 1924 the Reichsbank had almost freely discounted bills of exchange from

[10] James (1986) has argued that a portion of those foreign deposits were in fact owned by Germans who had fled from the mark earlier in the period. Unfortunately, we do not know their exact proportion.

banks in a way that it thought had promoted excessive money growth.[11] In that year Hjalmar Schacht, its president, decided to implement curbs on rediscounting by making it difficult for banks to do so unless their bills were related to trade and agriculture – this was the *Kreditstopp*.[12] In effect this meant that by focusing lending on trade some banks could continue to benefit from rediscounting, at least in good times.[13] One way of expanding trade lending was to acquire more funds from abroad via trade acceptances (Balderston, 1993, p. 140). As Balderston puts it, "the Kreditstopp opened the door to the internationalization of the German money supply" (ibid.).

Finally, some of the "foreign" capital was arguably of domestic origin. James (1984, 1998) has shown that many German businessmen had established parent companies in the Netherlands or Switzerland during the war to continue operations without disclosing their German roots. Over time it also became a way of avoiding the higher post-war taxes or hedging against currency risk. Some of the funds were deposited in foreign currency at German banks.

At the same time, there is some qualitative evidence that short-term capital inflows were not always justified by demand. Felix Somary, an astute contemporary observer, described "a system of short-term loans which have been granted to an extent that cannot be justified on financial grounds" (Straumann 2019, pp. 4-5).[14] His statement likely applied to both municipalities and banks. Balderston (1993, p. 80) blames excess capacity in the mechanised industries on an "excess supply of real capital" channelled by the financial system. Lewis (1938, p. 377), also a contemporary, described US banks as "urging loans upon foreign borrowers in excess of their requirements, and sometimes in opposition to the advice of responsible officials in the borrowing countries."

Although there is no systematic empirical evidence on the importance of supply factors in short-term capital flows to Germany, the existing statistical evidence on private

[11] This credit growth had been in part fuelled by inflation: inflation had meant increasing profits for firms and easy repayment of debt, thereby incentivising borrowing (James 1986, p. 134).
[12] The *Kreditstopp* was implemented to "shake the bad apples out of the tree" (James 1986, p. 134). Schacht thought there had been "massive misinvestment" during the inflation period.
[13] Whether this would be true in bad times as well is more doubtful due to the Reichsbank's conflict of goals between supporting the banking system and supporting the currency. This is discussed in more detail in Section 3.
[14] JP Morgan also famously criticised the lending frenzy: "From what I see of the German people they are second-rate people and would rather have their business done for them by someone else" (quoted in ibid., p. 10). However note that Charles Mitchell from the National City Bank derided Somary (Straumann 2019, p. 17).

long-term gross lending to central Europe also goes in this direction. Accominotti and Eichengreen (2016) have shown empirically that in the 1920s push factors, such as stock market conditions in the investing countries, were more important than pull factors related to the state of recipient economies such as growth, inflation, budget deficits and financial openness. They assign some of the volatility in foreign investment to the failure of lenders to assess debtors' creditworthiness (see also Borio, James and Shin, 2014).

The Dawes Plan arguably created an artificial boost to the supply of loans by assigning priority to commercial loans relative to loans linked to reparations payments which became secondary (Ritschl, 2002a, 2013).[15] The high interest-rate differential with other Western economies, initially linked to German demand for funds, in turn attracted large capital inflows which led to a gradual but durable fall in rates there, thereby pointing to a supply shock following the initial demand shock.[16] Foreign lending continued unabated even after early 1928, when US funds returned home seeking more favourable economic conditions and higher domestic rates but were replaced with French and Dutch funding (Ritschl 2002b; Straumann 2019, p. 12). The fact that investors responded more to factors outside the recipient countries is in line with Mauro, Sussman and Yafeh (2006)'s suggestion that investors in emerging markets have become increasingly concerned with global financial conditions rather than the economic state of individual countries.[17]

The effect of the Dawes Plan was enhanced by intense competition for foreign lending coming especially from the US. Latin America and Central Europe figured prominently as exciting destinations for loans, with Lewis (1938, p. 377) for example describing how "some 36 houses, most of them American, competed for a city of Budapest loan and 14 for a loan to the city of Belgrade." Thomas Lamont of J. P. Morgan & Co. described in 1927 a "horde of American bankers sitting on [European governments'] doorsteps and offering them money"

[15] This feature of the plan was presented as a solution to the transfer problem. The issue was that foreign investors were presumably reluctant to invest in Germany despite high interest rates because they feared the Reichsbank would not have enough foreign exchange reserves to meet both reparations and foreign withdrawals should they occur. Germany's persistently adverse balance of trade worsened the foreign exchange situation and made foreign borrowing even more necessary. By assigning priority over those reserves to foreign commercial investors, the plan alleviated such concerns (see also Ritschl 2012).

[16] On the impact of high rates leading to a supply shock also in the US stock market, see also Postel-Vinay (forthcoming).

[17] There is a sense in which the inflow was needed to equilibrate Germany's balance of payments. Germany's trade deficit meant a lack of foreign exchange which rendered reparations and other foreign payments next to impossible, especially with regards to the currency. However, the capital imports were more than double the trade deficit, and reparation transfers were only a sixth of capital imports (Balderston 1993, p. 129).

(ibid., p. 380).[18] Germany ended up the top recipient of foreign dollar loans over the period 1925-1929.[19]

Many banks had welcomed the capital inflow which induced them to pursue aggressive investment strategies. Some of the inflow was directly linked to foreign trade and thus thought to be self-liquidating. There is no doubt that, at least in an initial phase, small and medium-size companies imported raw materials which gave them ready access to the "advances on commodities" (Vorschüsse auf Waren) that German banks financed via lines of credit on foreign banks (also called trade acceptances – see Balderston, 1993, p. 141, and Harris 1935, p. 19).[20] These credits were initially contingent on the presentation of documents proving the trade transaction. But over time firms with ongoing foreign business became allowed to use such credits for domestic business, and the practice became widespread (Balderston, 1993, p. 141; see also Harris 1935). Eventually, as Table 1 shows, the most important form of foreign lending became simple deposits used by German banks to channel funds to borrowers for domestic business. The money was usually lent in foreign currency to Germans who transferred it into Reichsmarks (ibid.). James concurs: "On both the German and the western sides the illusion was that the short-term credits had been used for the purpose of financing international trade: in fact three-quarters of the standstill-protected loans had been used for fixed investments or for the maintenance of stocks" (James, 1986, p. 320).[21] Conolly (1936, pp. 362, 356) and Lary (1943, p. 113) estimated that about half the short-term inflow to banks was made up of deposits unrelated to trade.

There is widespread anecdotal evidence that the 1920s credit supply shock indeed led to complacent behaviour among German borrowers. A contemporary observer noted that "the German banks, their ledgers swelled with foreign balances, financed their various public and private undertakings freely with little thought for the morrow" (Harris 1935, p. 6; see also Conolly 1936, pp. 362-356). The rate at which Germans could take out foreign-currency loans

[18] She describes how "a Bavarian hamlet, discovered by American agents to be in need of about $125,000, was urged and finally persuaded to borrow 3 million dollars in the American market" (ibid., p. 377). The Agent General for Reparations, S. Parker Gilbert, famously warned against such excesses. In some cases, such as Peru, this led to "streets paved out in the desert" (p. 383).

[19] Following Germany were Canada, Italy, Australia, Chile, Argentina, Brazil, and Colombia (ibid., p. 393).

[20] On banks' liability side these appeared as "*Seitens der Kundschaft bei Dritten benutzte Kredite*," or "Liabilities for clients." In this paper we call them "trade deposits."

[21] Harris (1935) notes that credits from London were more likely to be related to trade than those coming from the US.

from banks tended to fall further than the Reichsbank rate which made them more attractive than domestic-currency borrowing. Schacht felt powerless about this issue despite central bank rates falling from 9% in January 1926 to 5% in 1927 (Balderston, 1993, p. 149). Straumann also pointed out that large commercial banks' capital ratios had dramatically dropped "as a large portion of this foreign capital inflow was channelled through the financial system." It is for this reason that Somary considered the German banking system to be the "weakest link where the collapse will and must occur" (Straumann 2019, pp. 32-33).

Table 1: Types of foreign liabilities at German banks, 1925-1933 (RM million)

| State at end of June | "Liabilities for clients" (1) | Foreign-owned deposits at German banks (2) |
|---|---|---|
| 1925 | 391 | 837 |
| 1926 | 300 | 1312 |
| 1927 | 521 | 2485 |
| 1928 | 1136 | 3768 |
| 1929 | 1769 | 4020 |
| 1930 | 2062 | 3880 |
| 1931 | 2068 | 1530 |
| 1932 | 1324 | 615 |
| 1933 | 1116 | 527 |

*Notes*: In column (1) "Liabilities for clients" (*Seitens der Kundschaft bei Dritten benutzte Kredite* on the monthly balance sheets) were technically credits arranged on clients' behalf with foreign banks for the financing of foreign trade, often referred to as trade acceptances. In this paper we call them "trade deposits." We saw that these became increasingly used for other purposes. The foreign deposits in column (2) were used for domestic business. The distinction is also apparent in Harris (1935), Conolly (1936) and Lary (1943). Source: *Untersuchung des Bankwesens* 1933, part I, p. 512 and Balderston (1993) Table 5.7, p. 144.

The abundance of foreign funds allowed banks to further dynamic growth strategies. They either overlent to well-known customers or lent to an ever-increasing pool of potential borrowers they had not had the opportunity to know well. For example, the Landesbank of the Rheinprovinz is thought to have "recklessly transformed short-term deposits into long-term loans to West German cities and municipalities…" (Straumann, 2019, p. 159).

James (1984) criticises the level of blindness among public authorities about bank weaknesses towards the end of the 1920s. He incriminates their "misplaced optimism" and,

later, their focus on banks' foreign deposits as a potential source of instability *in case of withdrawals*, not on banks' investment and growth strategies following these inflows. For instance, Reichsbank President Hjalmar Schacht had sounded the alarm about the size of foreign liabilities in 1927 but not so much about banks' leverage and liquidity.[22] Even on the question of foreign deposits' prevalence among banks, the Reichsbank was badly informed (Burhop 2011). Despite all the suggestive evidence, however, one has yet to analyse the issue of the interaction between those foreign deposits and banks' risk-taking behaviour.[23]

# 3 Empirical Approach and Data Collection

## 3. 1 Approach and Identification

Having suggested there is a good case for investigating the links between post-1924 capital inflows into Germany and bank risk-taking there, we can now lay out our analytical plans for probing those connections empirically. Someone interested in the impact of capital inflows on bank risk-taking might be tempted to simply examine, at the bank level, the correlation between deposit growth on the one hand and various risk-taking measures on the other. Yet such an approach would meet with two main challenges. The first is the possibility that some economic factor is causing certain banks to take risks and expand their deposits at the same time. For example, a bank with a greater risk preference profile might act more aggressively both in seeking funds elsewhere and in finding new, perhaps less reliable borrowers. Alternatively, the general economic environment might be inducing some banks to expand in both directions. This is especially likely when the demand for foreign funds rises rather than their supply independently from demand. Such confounding factors would make it more difficult to ascertain any causal impact of inflows on risk-taking. A second problem is that, although in theory the geographical (whether foreign or domestic) origin of an increase in loanable funds should make no difference to banks' increases in risk-taking, one would still

[22] Schacht was more vocal about the risks private US investors were taking in directly investing in German municipalities (James, 1986, p. 97). For example, in 1925 he publicly attacked certain US underwriters for loans to Berlin and Cologne and in 1929 Dillon Read for considering yet another loan to the City of Berlin of RM 120 million.

[23] James mentions that the weakest banks were not those with the higher share of foreign deposits, citing the example of the BHG in 1929 whose deposits were 66% foreign (James 1984).

like to check this assumption empirically, and to do so data on the geographical origin of the new deposits seems at first sight necessary.[24]

We deal with these issues in three steps. First, we make use of data on the largest holdings of foreign liabilities in 1930 to extract the most relevant types of deposit growth in the 1920s. The banks that had the largest such holdings in 1930 saw their three-month and "trade deposits" grow fastest, whereas the other banks saw greater growth in their seven-day and interbank deposits. This suggests that we should focus on the former (for more detail on data sources and definitions, see Sections 3 and 4).

The next natural step is to run a panel regression over the period 1925-1930 in which we explore the relationship between the relevant deposit types and changes in risk-taking. To mitigate endogeneity concerns, we follow Dinger and te Kaat (2020) in including only the months in which German borrowing costs fell, either relative to US rates or in foreign currency. Excluding other periods ensures that we focus on months where supply factors were more likely to have driven capital shocks rather than domestic demand.

We use three foreign funding supply indicators in this analysis. The first is the spread between the US and German private discount rates.[25] It reflects private domestic credit conditions in both countries and was heavily influenced by the availability of US dollars in Germany: an increased ease to borrow in dollars would put downward pressure on German rates due to increased competition for lending, and thus lead to a falling spread. As Balderston judiciously pointed out, "the market rate of discount in Germany… was being determined by that 'world rate of interest'" – the US dollar (Balderston 1993, p. 149).

Our second foreign funding supply indicator is the German foreign borrowing cost, taken from Balderston (1993). This is the German interest rate on short-term dollar loans added to the swap rate for reconverting those dollars into reichsmarks for domestic use. It is also expected to fall along with the increased availability of dollar funding. Finally, for peace of mind we also include the spread between US and German interest rates on long-term

[24] Parallels between a foreign capital inflow and a loosening of domestic monetary policy are explicitly drawn by Acharya and Naqvi (2012) and Dinger and te Kaat (2020), with implied similar consequences in terms of bank risk-taking. Note however that some differences might persist. For instance, given the known volatility of foreign inflows, banks might act more cautiously as recipients. But in the German case the Dawes Plan, which made foreign commercial investments more secure, might have dampened such high volatility expectations on the part of banks. It is thus unlikely that banks would have acted more cautiously.

[25] More specifically, the US commercial paper rate and the Berlin rate on three-monthly paper (see Ritschl 2002a and 2002b).

sovereign bonds although it is less likely to reflect short-term lending conditions. In Figure 1 we can see that the relevant periods are from October 1925 to February 1927, from February 1928 to March 1929 and from October 1929 to October 1930.

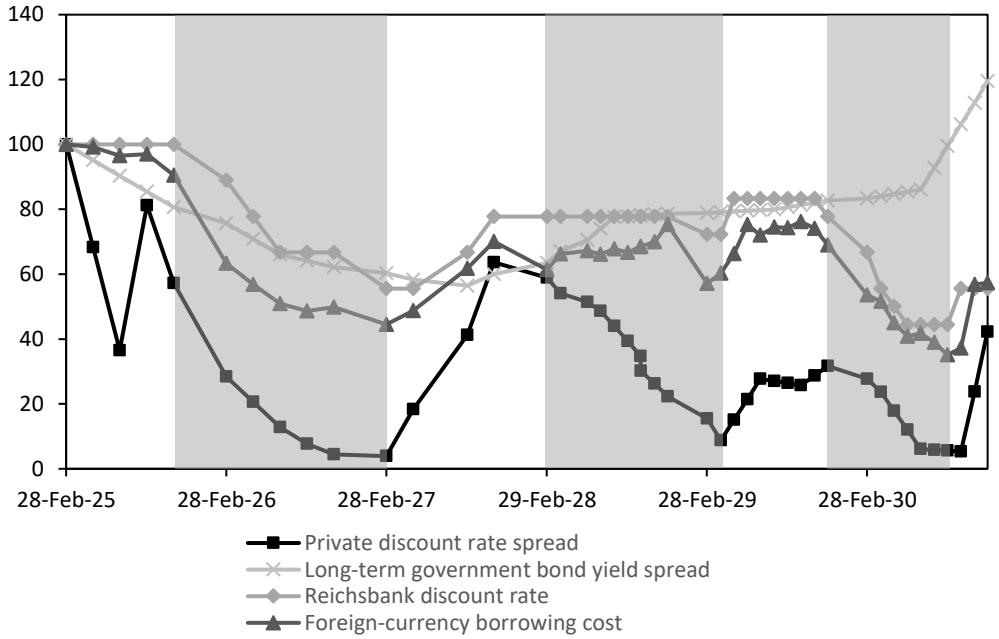


Figure 1: US-Germany private discount spread, foreign-currency borrowing cost, long-term government bond yield spread and Reichsbank discount rate indices (28 February 1925 = 100).

*Sources*: The Reichsbank discount rate is from Balderston (1993), Table 5.9, p. 148. The German long-term bond yield is from Jordà et al. (2017), and the US equivalent from Carter et al. (2006), Series Cj1192. The US and German private discount rates are from Ritschl (2002a): respectively these are the US commercial paper rate and the Berlin rate on three-monthly paper (see also Ritschl 2002b). The foreign-currency borrowing cost is Balderston's estimate of German borrowers' cost of borrowing in foreign currency at German banks. It is the sum of the foreign currency loan rate for dollars and the US-Berlin discount rate differential on prime bills (see Balderston 1993, p. 141 and Tables 5.6 and 5.8).

A potential remaining concern is that these months also tended to be ones where the Reichsbank rate was falling. This would make it more difficult, in these months, to attribute deposit growth mainly to foreign funding supply factors. However, as Figure 1 shows, the spread between the US and German private discount rates from 1925 to 1927 declined much more than the Reichsbank discount rate, which, on the other hand, remained far above the Federal Reserve discount rate throughout the period (its lowest level was 5% in January 1927, a level at which it stayed only briefly before quickly reaching 7% once again).[26] The cost of

[26] The Reichsbank's relative and very temporary loosening was a reaction to the supply of funds from abroad –

borrowing from German banks in foreign currency also declined significantly more than the Reichsbank discount rate, a point clearly emphasised by Balderston (1993, p. 149). The international liquidity shock thus seems to have been substantially greater than any shock to loanable funds produced by domestic monetary policy. Schacht even called this the period of the "two Reichsbanks; on the one hand, the institution which he represented, and on the other that which consisted in the foreign credits."[27]

And insofar as exogenous domestic monetary policy did matter for liability growth, it was more likely through its impact on international liabilities than domestic ones. The restrictive policy stance arguably attracted funds from abroad. Even domestic deposits were probably impacted by foreign inflows: as pointed out by Dinger and te Kaat (2020), the increase in international deposits at some banks might lead to more domestic funds being available at other banks.[28] To alleviate any persisting concerns about possible confounding effects coming from Reichsbank policy, however, we include the Reichsbank discount rate as a control in our regressions. And wherever it is sensible to do so, we also control for bank size (but more on this below).

Finally, our third and last step is to make use of the 1930 foreign liability data more directly and test the relationship between being a "foreign-inflow" bank and risk-taking. Analysing this relationship in the pre-crisis cross-section (February 1929) allows us to include a time-invariant instrument to control for endogeneity – initial bank size, measured by the natural log of total assets at various points in 1925 and 1926. Larger banks were then as now more likely to have greater visibility abroad, receive funds from there and thus display significant liability growth (Schnabel 2004, Dinger and te Kaat 2020). This puts this instrument's relevance under little doubt and is confirmed by our first stage results (see Section 4).

To satisfy the exclusion restriction, initial bank size should also be uncorrelated with the error term in our main regression. This means that there should be no relationship between

an attempt to make it less attractive for foreign investors to invest in the country, and to remain the main provider of short-term domestic funds via rediscounting (ibid., p. 150).

[27] Balderston (1993), p. 149. Schacht attempted to limit foreign lending by freeing up the parity within the gold points in August 1926 but to little effect (ibid.). See also Hardach (1970).

[28] Some of our deposits, such as those we call trade deposits, are much more likely to be of foreign origin than others, and we examine their impact separately.

initial bank size and risk-taking other than through capital inflows. In other words, larger banks can be seen to take more risks but only because they receive a larger amount of inflows. Is such an assumption plausible? In a twenty-first century context, it would certainly be difficult to maintain. In what follows, however, we draw on the rich historiography to make the case that, while there may have been some form of *liquidity* guarantee, the idea that large banks benefited from an implicit *bailout* guarantee is harder to substantiate.

### 3. 2 Too Big to Fail?

In the modern theoretical and empirical literature, larger banks are often assumed to take more risks for either of two possible reasons. The first one is that a "Too-Big-to-Fail" (TBTF) environment might be conducive to moral hazard and thus risk-taking. The second one is that larger banks are more likely to be universal banks and thus suffer from potential agency and corporate governance issues (Leaven, Ratnovski and Tong 2016). The idea that larger banks are more likely to engage in investment banking activities applies especially to the US postwar context, where commercial and investment banking activities remained separated until the 1980s and universal banking only became a possibility fairly recently. In 1920s Germany, however, joint-stock credit banks were nearly all universal banks (Fohlin 2002). Although the banks themselves varied in size, and so did the extent of their activities, universal banking had been a staple of German finance in the nineteenth century, leading authors such Gerschenkron (1962) to argue that it helped Germany catch up with more industrialised economies around that time. So universal banking is unlikely to have been a characteristic confined to the largest banks.

The common assumption that larger banks take more risks is usually based on the idea that they are "Too Big to Fail" (see, for instance, Farhi and Tirole 2012). While this is largely correct in most of the developed world today, such an assumption is likely at least partly anachronistic in the 1920s German context. In the German historiography, increases in risk-taking have usually been explained by the intensification of interbank competition around that time (see for example Born 1967, Lüke 1956, Balderston 1991). In her 2004 paper, Schnabel boldly departed from this literature and attempted to explain banks' risk-taking behaviour in the 1920s by suggesting that the largest banks faced moral hazard as a result of a TBTF environment. Yet she herself admitted the speculative character of her argument, and there is

good reason to think that convincing evidence of such an environment, at least in terms of a *bailout* guarantee, is lacking.[29]

There is a sense in which large banks may have benefited from an implicit *liquidity* guarantee from the Reichsbank. When the latter implemented the *Kreditstopp* in 1924 it preserved banks' ability to rediscount paper related to international trade. This meant that banks could, at least in theory and especially in relatively good times, expect a level of help proportionate to their share of foreign-financed trade bills to total assets (Balderston, 1993, p. 140). Smaller banks could benefit from the scheme if they were involved in the business. Yet it remains true that since larger banks were more likely to receive funds from abroad and finance trade bills, they would on average be likely to be eligible for more help as a proportion of their total assets.

Yet banks large and small must have been aware of the Reichsbank's potential dilemma between injecting liquidity and protecting the exchange rate in case of a currency crisis, especially in the context of the Gold Standard. In fact, the will to protect the currency was one of the reasons for implementing those credit restrictions in the first place (Schnabel, 2004). Some assets were exempt then, but would they be so indefinitely? The credibility of such an implicit guarantee must have hinged on the severity of any future currency crisis, which was arguably impossible to predict. Balderston (1993) for instance provides ample documentation on the many dilemmas Schacht dealt with throughout his career, and there is no reason to think that bankers were particularly ignorant about them.

A good example of such a dilemma faced by Schacht can be found in the period following the 1927 stock market crash. Shortly after the crash, which had been partly engineered by Schacht himself, economic activity was reduced and banks were contracting lending somewhat. At the same time, confidence in the German economy was weakening and the country experienced some foreign capital outflow. Schacht hesitated between a slight loosening of monetary policy to help the banking system and tightening in defence of the Gold Standard. In June 1927 he reversed his cheap money policy, and tightened it further in October (Balderston 1993, p. 155). The central bank's response to the crisis echoed earlier decisions

[29] Schnabel's support for the presence of a TBTF environment in the 1920s likely emanates from her explicit will to regard the 1931 crisis through the third-generation model lens. Those models tend to explain domestic bank risk-taking through TBTF environments (see Kaminsky and Reinhart 1999), although they are usually applied to later periods.

made when the 1907 panic reached German shores (Borchardt 1976, p. 30). It illustrated once again the severe constraints imposed by adherence to the global monetary framework.

While the presence of some form of liquidity guarantee, at least in good times, cannot be excluded, similar evidence for an implicit bailout guarantee is harder to come by.[30] Reference to so-called "corporatist regulation" is tempting in this context but it can also be misleading. Corporatist regulation emerged in the aftermath of the 1907 panic as a regulatory response to what was seen at the time as excessive reliance on central bank liquidity, especially on the part of the larger banks, and insufficient limits to competition between banks (Borchardt 1976).[31] The German banking system had been only very lightly regulated through most of the nineteenth century. Following the crisis, the Reichsbank saw a need for greater regulation, but was wary of losing control of such matters via greater parliamentary oversight. It was also concerned about the possibility of what it saw as unnecessarily stifling regulation that would threaten the economic development of country (for example, a separation of retail from investment banking). Its president at the time, Rudolf von Havenstein, thought that the best way to secure improvements in regulation while avoiding a government overhaul was for the central bank to seek cooperation from the largest banks in regulatory matters, occasionally brandishing the threat of deeper government involvement. Corporatist regulation was therefore a way for the Reichsbank to secure greater regulation while keeping control of regulatory issues (Feldman 1993, p. 31; Hardach 1995b; Krieghoff 2013, p. 71).

Regulation probably ended up lighter than it otherwise would have been had there been greater government oversight from the start. Krieghoff (2013, p. 76), for instance, insists that competition only increased after World War I and notes the Reichsbank's apparent powerlessness in its attempts to restrain it. A good example of this is the its authorising of the widening of the public banks (*Sparkassen*)'s range of operations, which it had hoped would check the growth of large credit banks (see also Born 1983). However, this measure ended up rather counterproductive as the other credit banks saw in the *Sparkassen* an additional rival force to reckon with, which enhanced competition. And while before the war the largest

[30] Of Schnabel's own admission there is little concrete evidence of this, and she merely refers to "close cooperation between the great banks and the Reichsbank in regulatory questions" as a possible basis for such a guarantee.

[31] The 1907 crisis started in the US and originated in a mixture of adverse circumstances, the most important ones being the San Francisco earthquake and a burst bubble in the market for copper (Odell and Weidenmier 2004). It affected Germany to a much lesser extent (Borchardt 1976).

banks had promised to enhance their capital and liquidity buffers, not much was achieved in this area in the 1920s, perhaps for lack of explicit threats of further government involvement. Finally, from 1924 the Reichsbank supported a coordinated effort to harmonize interest rates across bank types but only achieved its goal in early 1931 (ibid., p. 80).

There is therefore a sense in which the Reichsbank was in the end dissatisfied with the resulting lack of constraints on bankers' investment and growth decisions. But while historical accounts of the evolution of banking regulation point to serious flaws in Germany's interwar regulatory framework, they rarely suggest the presence of an implicit bailout guarantee for the larger credit banks.[32] On contrary, the emphasis is usually on the rather restrictive – albeit ineffective given the international context – credit policies at the Reichsbank. For instance, Hardach notes in his 1984 paper that: "[large] German banks borrowed heavily abroad to circumvent the restrictive credit policy of the Reichsbank." In addition, adherence to the Gold Standard imposed severe fiscal constraints that bankers could hardly have been unaware of. As Hardach emphasises in this regard, "even with historical hindsight it is difficult to design an optimal bank policy which would under the prevailing conditions have satisfied both the need to maintain financial stability under the gold standard, and the need to finance economic reconstruction." Here too, then, bank managers would have been aware of a potential dilemma between an expensive bank bailout and fiscal retrenchment should a currency crisis arise.

Schnabel insists that since the largest banks tended to have the greatest international exposure, providing them with emergency liquidity or bailing them out would have been particularly important as a way of avoiding the running down of the Reichsbank's foreign exchange reserves.[33] Here she openly admits the dilemmas mentioned above. She tones down the issue by emphasising a strong expectation of cooperation between central banks around the world which would render these dilemmas obsolete. However, evidence of such cooperation expectations among bank managers is sparse. In addition, central bank cooperation would have only helped with the first dilemma, not with the second (fiscal) one.[34]

[32] Contrary to the credit banks, the publicly-owned *Sparkassen* probably benefited from a more credible guarantee. They made reference to it in their aggressive attempts to acquire new customers (Krieghoff 2013, p. 76).

[33] She notes that foreign deposits at the great branch banks exceeded the Reichsbank's reserves by 70 percent.

[34] She explains the more cautious behaviour of the great Berlin nonbranch banks by their relatively smaller size relative to the branch banks, which presumably would have weakened the TBTF guarantee. However, she also

To summarise, the presence of an implicit liquidity guarantee for Germany's largest banks cannot be excluded. At the same time, the argument that they also benefited from an implicit bailout guarantee is more difficult to defend on the basis of existing evidence. The corollary is that, while bank size and liquidity may have been directly related in 1920s Germany, similarly *direct* linkages between size and leverage are much less likely to be found. Although it is true that the largest Berlin banks tended to take more risks, especially in terms of their leverage, the reasons are more likely to be tied to capital flows, which larger banks tended to attract, than to other contextual features of German finance. In other words, any link between bank size and leverage is more likely to be *indirect*, originating in the impact of capital inflows on banks' risk-taking.

### 3. 3 Data Sources

A significant contribution of our research is the construction of a new dataset. We hand-collected balance sheet data on all the credit, Staatsbanken, Landesbanken, and Girozentralen included in the *Deutscher Reichsanzeiger and Preußischer Staatsanzeiger* (DRPS) from 1925 to 1938. The DRPS released data to the public almost every month from 1928 onwards except in December and January, and on a bi-monthly basis prior to this. This source – its 1930 and 1931 sections in particular – has previously been used (notably by Schnabel 2004, 2009 and Blickle, Brunnermeier and Luck 2020) but to the best of our knowledge no one had collected this data on such a long time span before. The most important months for our analysis are the ones preceding the 1931 crisis, from 1925 to 1930.

The DRPS covers 137 banks. Credit banks totalled around 100 while the publicly-owned Staatsbanken, Landesbanken and Girozentralen made up the rest. Together these banks owned about half the assets of Germany's banking system. This means that we exclude from our analysis the private banks, other savings, mortgage and cooperative banks, and even some smaller credit banks. Although some private banks were also heavily involved in foreign borrowing, the credit banks included in the DRPS likely held most of the banking sector's foreign debt (Schnabel 2004).[35] Our data includes more than 50 balance sheet items.

insists that those banks, which were still large, had a higher proportion of foreign deposits. If one were to follow her reasoning, this would make them at least as important to bail out, which renders her reasoning slightly inconsistent.

[35] Data on private banks is thin.

To complement this information, we make use of data obtained from confidential filings to the Reichsbank in 1930.[36] Around that time the banks holding the largest amounts of foreign liabilities were asked to send reports to the German central bank. These reports disclose such amounts for the 22 credit banks involved. By doing so, they also reveal the identity of the banks most involved in foreign borrowing.

Finally, we include several variables related to the state of the German macroeconomy and foreign capital flows. These come from a variety of sources, although most of them are drawn from Ritschl (2002a). They include the German and US private discount rates (the latter is simply the US commercial paper rate), the German and US long-term government bond yields, the Reichsbank and Federal Reserve discount rates, a foreign-currency borrowing cost computed by Balderston (1993), German national income, tax revenue and expenditure, the central government deficit, employment, private consumption, private investment, CPI, manufacturing output, capital stock, and current account deficit. Most of these variables are quarterly and were interpolated when needed. Likewise, we also interpolated balance sheet data when it was missing in some months for certain banks. What we obtain is a large dataset of 9,499 observations from 1925 to 1938 on a bi- or monthly basis, and Appendix A provides a summary of the main statistics and sources for these data.

### 3. 4 Mergers and Takeovers

The German banking landscape kept evolving throughout the 1920s. Although most of the merging activity took place before 1926 (Hardach 1984), the process was not over. As a result, the number of banks in our sample changes somewhat from one data point to the next as some banks drop out of the sample and others appear.[37] This process affected a small minority of banks, and the question is what to do with them.

If a bank disappears at some point from one of the time periods being analysed in the panel (for example, a period of a few months during which deposit growth occurs), it is usually because it either fails or is being taken over by another bank. When this happens, the bank is dropped altogether from the time period analysed. It will however be kept in the sample in the time periods before, when it still existed throughout. This should matter little

[36] We thank Stephan Luck, Markus Brunnermeier and Kristian Blickle for kindly sharing their data with us.
[37] This number usually hovers between 130 and 140.

for our analysis as it should affect only a small number of banks in an even smaller number of time periods. What matters is that the bank in question be analysed at least in the period preceding the one in which it drops out.

If, on the other hand, a bank grows somewhat due to a fusion with another bank, in our dataset this is usually because it has taken over that other bank. Such cases will remain in the time period under analysis. This means that we can analyse the way which in which the takeover is affecting the deposit growth and risk profile of the merging bank. An example of this is the takeover of a rather small bank, Mitteldeutsche Creditanstalt, by one of the largest Berlin banks, Commerzbank, in 1929. The former's last occurrence is in March 1929 while Commerzbank remains in the sample and the effect of the takeover can be analysed. Another notable event is Deutsche Bank's takeover of Disconto-Gesellschaft, also in 1929, which in the process became Germany's largest bank.

Finally, what if two existing banks disappear to form a new bank? This is most likely to occur when there is no obvious takeover of a weaker or smaller bank by another, but the two banks decide together to join forces to increase capacity or avoid failure. In such (relatively rare) cases, we lose two observations in the time period of the merger. However, our analysis takes both banks into account in the time periods preceding the merger, and once the merger has occurred the new merger is also included and its behaviour analysed.

# 4 Results

## 4. 1 Extracting the Most Relevant Types of Deposits

The first step in our analysis is to map out liability growth among our banks. The DRPS differentiated between four types of deposits, which in the absence of further information could, in theory, contain either foreign or domestic funds. These were: 7-day deposits, 3-month deposits, interbank deposits, and deposits consisting in the liability part of trade acceptances (as described in Section 2), which we call "trade deposits." In February 1925, the largest holdings on average were of 7-day deposits (RM 24,893), followed by 3-month deposits (RM 19,981), interbank deposits (RM 7,623) and finally trade deposits (RM 3,475), with significant variation across banks (all figures are given in Reichsmarks, although a significant

portion of these deposits were in dollars).[38] In February 1929, before the first currency crisis, the picture was similar although 3-month deposit holdings had now surpassed 7-day deposits, an evolution no doubt resulting, as we shall shortly see, from the growth of foreign deposits.

While we cannot ascertain the geographical origin of those deposits from the DRPS, we know from our 1930 foreign liability data which 22 banks were the largest holders of foreign liabilities at the time, as identified by the Reichsbank. Based on this data, we draw a distinction between what we call "foreign-inflow" banks and "home-focused" ones. Of course, the distinction is exaggerated insofar as many banks in the "home" group likely also received funds from abroad. The dichotomy is useful however in identifying the types of deposits that grew the most in the "foreign" group, thereby inferring which types of deposits are most likely to have contained foreign funds. As expected, and as Figure 2 makes clear, differences are quite stark between the two groups.

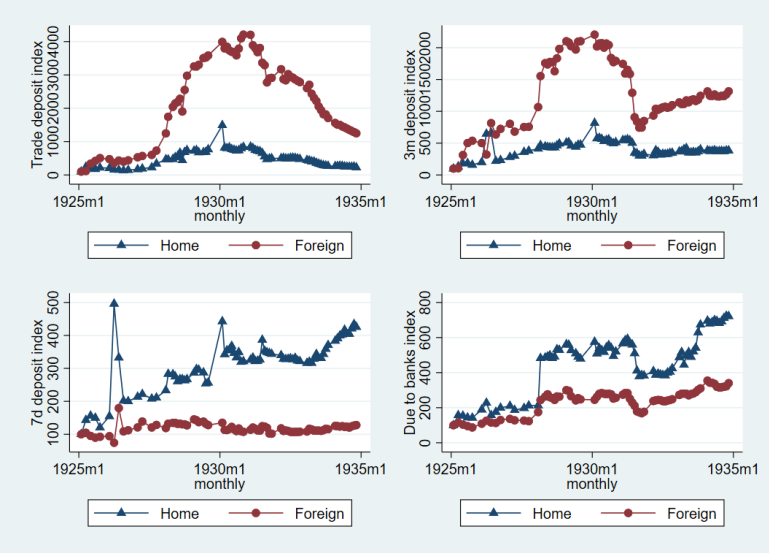


Figure 2
7-day, 3-month, interbank and "trade" deposits at "foreign-inflow" and "home-focused" banks (January 1925 = 100).[39]
*Sources*: DRPS, and Reichsbank R2501 from Blickle et al. (2020).

[38] This suggests the RM amounts might be affected by the dollar exchange rate. However, variations were very small after 1924 due to Germany and the US's adherence to the Gold Standard. For peace of mind, we control for the exchange rate in all our models.
[39] Sudden increases in 7-day and 3-month deposits in the early part of 1926 are unexplained for the time being.

Here we can easily see that among the foreign-inflow banks, 3-month and trade deposits grew tremendously. To be clear, those deposits also greatly expanded among the home-focused banks – at least by a factor of 5. But growth at the foreign-inflow banks was even greater – by a factor of 20 to 40. By contrast, home-focused banks saw a greater increase in their 7-day and interbank deposits than the foreign-inflow banks. Since we know that most of the increase in foreign liabilities occurred between 1926 and 1930 (see Section 2), we can infer that most foreign deposits were likely located in the 3-month and trade deposit category. One possibility however is that foreign liabilities were restricted to one of these two categories. Since we know that most if not all trade deposits were foreign, we can check whether actual foreign liabilities outnumbered trade deposits or not in June 1930. Figure 3 shows that this was indeed the case, suggesting that a significant portion of 3-month deposits must have contained foreign liabilities.[40]

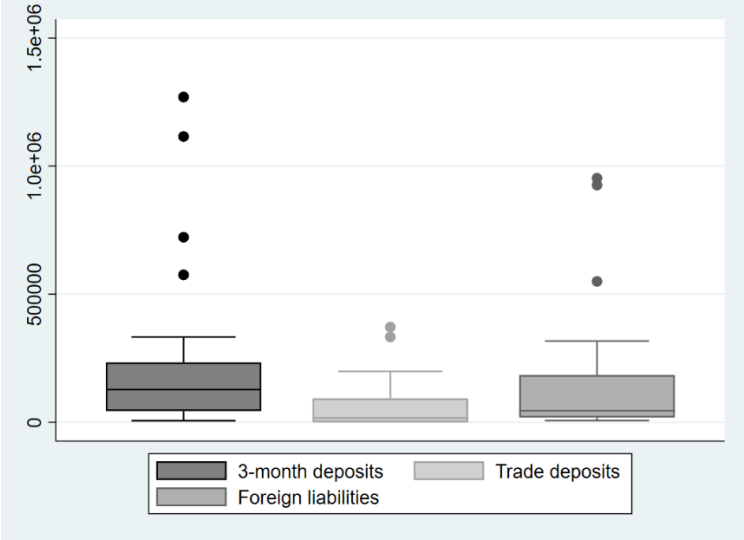


Figure 3
3-month, trade, and foreign liabilities at the 22 "foreign-inflow" banks, June 1930.
*Sources*: DRPS, and Reichsbank R2501 from Blickle et al. (2020).

### 4.2 Random Effects Panel Regressions

We are now in a position to examine the relationship between these two types of deposits on the one hand, and banks' risk-taking behaviour on the other. To mitigate the endogeneity

[40] The median and mean of trade deposits are RM 16,463 and RM 65,528 respectively. For foreign liabilities, the corresponding figures are RM 45,000 and 172,000.

issue, as discussed, we only include months in which German borrowing costs fell, either in foreign currency or relative to US rates (October 1925 to February 1927, February 1928 to March 1929 and October 1929 to October 1930). This makes it more likely that foreign funding supply factors played a greater role than domestic demand in the growth of foreign liabilities during the time periods examined.

### 4.2.1 Baseline Specification

Formally, we estimate random effects[41] models such that:

$$Risk_{it} = \alpha_{it} + \beta Capital\_Inflows_{i,t-1} + \delta Controls_{it} + \epsilon_{it}, \qquad (1)$$

where i indexes banks and t months. In this baseline specification, $Risk_{it}$, our dependent variable, is a measure of risk-taking such as leverage (the ratio of capital to total assets, or $Capital\_TA_{i,t}$), liquidity (the ratio of cash and deposits at central banks to total assets, or $Liquidity\_TA_{i,t}$),[42] the ratio of short-term loans to total assets ($LoanShort\_TA_{i,t}$), or uncollateralised trade loans to total assets $(TradeLoansNoCov\_TA_{i,t})$.[43] $Capital\_Inflows_{i,t-1}$, our main explanatory variable, is the sum of 3-month deposits and trade deposits divided by total assets, lagged one time period to allow for dynamic effects.[44] Due to significant dispersion in this variable we take its natural logarithm.

In each of these models we add a number of controls. One of our most important additional variables is no doubt the Reichsbank discount rate, which controls for German central bank policy affecting the demand for consumer credit and bank funding. We also control for the RM/dollar exchange rate in case it had an impact on RM deposit levels. Several other variables control for domestic demand factors, such as national income, the capital stock, inflation, consumption, investment, the central government budget deficit, and the current account deficit. Appendix A provides some summary statistics on each of these variables, along with information on their frequency and sources.

[41] The Hausman test for the base model yielded $Prob > \chi^2 = 0.9263$.
[42] Because of the *Kreditstopp* of 1924, we study bills of exchange separately.
[43] The absence of data on profits and losses prevented us from using other variables, such as z-scores.
[44] Including more lags leads to significant data attrition due to the number of falling rate periods excluded from the model.

Table 2
The impact of foreign inflows on bank leverage, random effects model

| | *(1)* $Capital\_TA_{i,t}$ | *(2)* $Capital\_TA_{i,t}$ | *(3)* $Capital\_TA_{i,t}$ | *(4)* $Capital\_TA_{i,t}$ | *(5)* $Capital\_TA_{i,t}$ |
|---|---|---|---|---|---|
| $Capital\_Inflows_{i,t-1}$ | -0.0273*** | -0.0253** | | | -0.0541*** |
| | (0.00792) | (0.0114) | | | (0.0124) |
| $Domestic\_Deposits_{i,t-1}$ | | -0.0215 | | | |
| | | (0.0143) | | | |
| $3Month\_Deposits_{i,t-1}$ | | | -0.0233** | | |
| | | | (0.0107) | | |
| $Trade\_Deposits_{i,t-1}$ | | | | -0.230*** | |
| | | | | (0.0519) | |
| $BigBerlin_{i,t}$ | | | | | -0.0833*** |
| | | | | | (0.0243) |
| $Giro_{i,t}$ | | | | | -0.0972*** |
| | | | | | (0.0251) |
| $StaatLand_{i,t}$ | | | | | -0.0889*** |
| | | | | | (0.0214) |
| $Capital\_Inflows_{i,t-1} * BigBerlin_{i,t}$ | | | | | 0.0331** |
| | | | | | (0.0158) |
| $Capital\_Inflows_{i,t-1} * Giro_{i,t}$ | | | | | 0.0465*** |
| | | | | | (0.0131) |
| $Capital\_Inflows_{i,t-1} * StaatLand_{i,t}$ | | | | | 0.0579*** |
| | | | | | (0.0124) |
| $Reichsbank_t$ | 0.0199 | 0.0222 | 0.0162 | 0.0157 | 0.0118 |
| | (0.0963) | (0.0381) | (0.0362) | (0.0362) | (0.0297) |
| $USDX_t$ | -0.00149 | -0.00132 | -0.00154 | -0.00139 | 0.000982 |
| | (0.0105) | (0.00425) | (0.00407) | (0.00386) | (0.00398) |
| $Nat\_Income_t$ | -0.112 | -0.109 | -0.118 | -0.0974 | -0.0614 |
| | (0.369) | (0.184) | (0.177) | (0.173) | (0.168) |
| $Capital\_Stock_t$ | 0.118 | 0.118 | 0.125 | 0.115 | 0.0558 |
| | (0.334) | (0.100) | (0.0923) | (0.0886) | (0.0866) |
| $CPI_t$ | 0.00874 | 0.00881 | 0.00985 | 0.00985 | 0.00660 |
| | (0.0376) | (0.0113) | (0.00926) | (0.00855) | (0.00805) |
| $Consumption_t$ | 0.311 | 0.313*** | 0.305*** | 0.268*** | 0.0693 |
| | (0.275) | (0.111) | (0.109) | (0.102) | (0.105) |
| $Investment_t$ | 0.0898 | 0.0939 | 0.0932 | 0.0789 | 0.0705 |
| | (0.161) | (0.0759) | (0.0720) | (0.0697) | (0.0726) |
| $Deficit_t$ | 4.54e-05 | 5.24e-05 | 4.01e-05 | 3.19e-05 | 3.62e-05 |
| | (0.000302) | (9.20e-05) | (7.82e-05) | (7.54e-05) | (6.13e-05) |
| $Current\_Balance_t$ | -0.241 | -0.249 | -0.262 | -0.248 | -0.148 |
| | (0.829) | (0.311) | (0.287) | (0.276) | (0.270) |
| Constant | -25.89 | -26.82 | -27.41 | -25.33 | -18.91 |
| | (105.2) | (30.80) | (27.82) | (26.18) | (26.38) |
| Time fixed effects | Yes | Yes | Yes | Yes | Yes |
| R2 between | 0.154 | 0.203 | 0.155 | 0.017 | 0.434 |
| R2 overall | 0.061 | 0.102 | 0.06 | 0.005 | 0.249 |
| Observations | 2,085 | 2,085 | 2,085 | 2,096 | 2,085 |
| N | 137 | 137 | 137 | 137 | 137 |

*Notes*: Falling rates periods only. The dependent variable is the ratio of capital to total assets ($Capital\_TA_{i,t}$). *** significant at $\alpha = 0.01$, ** significant at $\alpha = 0.05$, * significant at $\alpha = 0.10$. Robust standard errors in parentheses. *Source*: DRPS.

While our main explanatory variable contains both 3-month and trade deposits, we also compare the relative effects of each, and their effects relative to 7-day and interbank deposits (summed up within $Domestic\_Deposits_{i,t-1}$). They are all divided by total assets,

lagged one period and log-transformed. Finally, we add dummies for different types of banks (Big Berlin, Girozentralen and Staats- and Landesbanken) and interact them with $Capital\_Inflows_{i,t-1}$ to see whether certain banks were more likely than others to experience enhanced risk-taking in the aftermath of a rise in inflows. The results for our first, baseline specification with $Capital\_TA_{i,t}$ as the dependent variable are shown in Table 2. Time fixed effects were included as well as robust standard errors.

In the first column we look at the impact of $Capital\_Inflows_{i,t-1}$ on its own, adding only standard controls. From this model it is clear that, controlling for macroeconomic factors affecting the demand for credit, banks with higher capital inflows exhibit greater risk-taking in the next time period, in the shape of a lower ratio of capital to total assets. Specifically, an increase in the log of capital inflows by one unit reduces $Capital\_TA_{i,t}$ in the next period by 0.027. None of our control variables, be it the Reichsbank rate, the US dollar exchange rate or national income seem to affect capital ratios as much as inflows.

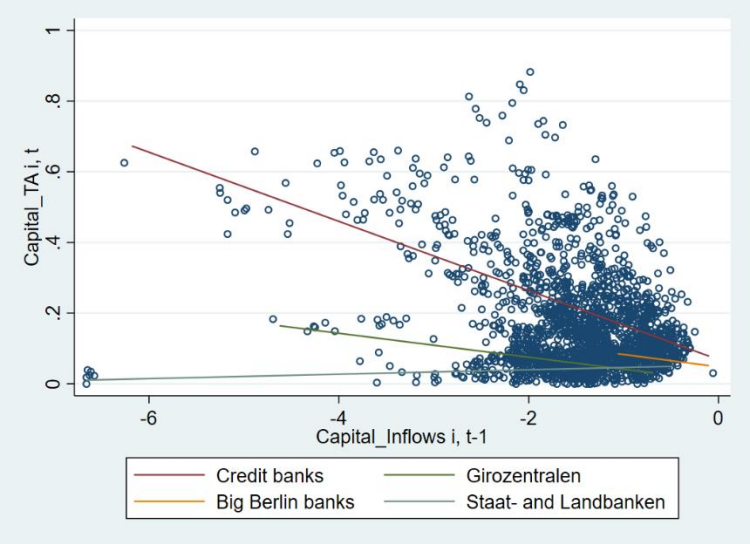


Figure 4
Scatterplot of $Capital\_Inflows_{i,t-1}$ and $Capital\_TA_{i,t}$, by type of bank.
*Sources*: DRPS, and Reichsbank R2501 from Blickle et al. (2020). Falling rates periods only.

In the next column (2), we compare the relative effects of 3-month and trade deposits with $Domestic\_Deposits_{i,t-1}$. The former clearly have a stronger impact on risk-taking than the latter. Measuring the impact of 3-month and trade deposits independently (3, 4), we can see that they reduce banks' capital ratio by 0.023 and 0.230 respectively. An increase in trade deposits is therefore particularly likely to lead to further risk-taking. Finally, in the last column

(5) we examine whether certain types of banks react differently than others to capital inflows. In particular, we compare the six Big Berlin banks, Girozentralen and Staats- and Landbanken with all remaining credit banks, which made up the majority of banks in our sample.[45] Our results, which can be visualised in Figure 4, suggest that capital inflows seemed to have more subdued effects among the former than with the latter. This is interesting because it shows that, contrary to what is sometimes suggested in the literature, much of the action took place among the credit banks as a whole – not just among certain bank categories.

Table 3
The impact of foreign inflows on bank liquidity, random effects model

| | *(1)* $Liquidity\_TA_{i,t}$ | *(2)* $Liquidity\_TA_{i,t}$ | *(3)* $Liquidity\_TA_{i,t}$ | *(4)* $Liquidity\_TA_{i,t}$ | *(5)* $Liquidity\_TA_{i,t}$ |
|---|---|---|---|---|---|
| $Capital\_Inflows_{i,t-1}$ | -0.000104 | -0.000352 | | | -0.000728 |
| | (0.000433) | (0.000616) | | | (0.000972) |
| $Domestic\_Deposits_{i,t-1}$ | | 0.00203*** | | | |
| | | (0.000763) | | | |
| $3Month\_Deposits_{i,t-1}$ | | | 0.000302 | | |
| | | | (0.000613) | | |
| $Trade\_Deposits_{i,t-1}$ | | | | -0.0184*** | |
| | | | | (0.00458) | |
| $BigBerlin_{i,t}$ | | | | | -0.00250 |
| | | | | | (0.00199) |
| $Giro_{i,t}$ | | | | | -0.0106*** |
| | | | | | (0.00213) |
| $StaatLand_{i,t}$ | | | | | -0.0104*** |
| | | | | | (0.00264) |
| $Capital\_Inflows_{i,t-1} * BigBerlin_{i,t}$ | | | | | -0.000539 |
| | | | | | (0.00244) |
| $Capital\_Inflows_{i,t-1} * Giro_{i,t}$ | | | | | 0.000903 |
| | | | | | (0.00104) |
| $Capital\_Inflows_{i,t-1} * StaatLand_{i,t}$ | | | | | 0.00175 |
| | | | | | (0.00110) |
| Constant | 0.0290 | 0.0305 | 0.0284 | 0.0328 | 0.0359* |
| | (0.0401) | (0.0206) | (0.0201) | (0.0200) | (0.0210) |
| Controls | Yes | Yes | Yes | Yes | Yes |
| Time fixed effects | Yes | Yes | Yes | Yes | Yes |
| R2 between | 0.154 | 0.203 | 0.155 | 0.017 | 0.434 |
| R2 overall | 0.061 | 0.102 | 0.06 | 0.005 | 0.249 |
| Observations | 2,085 | 2,085 | 2,085 | 2,096 | 2,085 |
| N | 137 | 137 | 137 | 137 | 137 |

*Notes: Falling rates periods only. The dependent variable is the ratio of liquidity to total assets ($Liquidity\_TA_{i,t}$). *** significant at $\alpha = 0.01$, ** significant at $\alpha = 0.05$, * significant at $\alpha = 0.10$. Robust standard errors in parentheses. Source: DRPS.*

[45] The six big Berlin banks were the Deutsche Bank, the Danat Bank, the Dresdner Bank, the Commerzbank, and the two non-branch banks Reichs-Kredit-Gesellschaft (RKG) and Berliner Handels-Gesellschaft (BHG).

Next, we examine the same baseline specification with $Liquidity\_TA_{i,t}$ as our dependent variable. The results are shown in Table 3, and we can immediately see that the correlation with liquidity is less strong, although it is stronger for banks holding larger amounts of trade deposits (4). It seems therefore that inflows had a greater effect on banks' leverage decisions than on their liquidity-safeguarding measures. A potential explanation for this phenomenon could be that banks were better aware of obvious risks associated with foreign deposit withdrawals and tried to guard against those, while being less vigilant regarding the potential consequences of inflows in terms of credit risk, which may be more insidious. Nevertheless, one should interpret these results with great caution. In the section that follows we explain why.

Appendix B and C also show the results for $LoanShort\_TA_{i,t}$ and $TradeLoansNoCov\_TA_{i,t}$ as dependent variables. Again, the relationship between inflows and short-term, liquid loans does not seem very strong, although interestingly the banks that received more trade deposits were significantly less liquid in this regard. On the other hand, banks that received a larger amount of inflows invested significantly more in uncovered trade loans. Although the relationship is not very stable across specifications, partly due to the smaller number of banks with such investments, this is a confirmation that capital impairment was a real threat for those banks.

#### 4.2.2 Augmented Specification: Bank Size

We have shown that bank type mattered little for the strength of the relationship between inflows and leverage. Yet some might wonder whether this positive relationship could still be driven by the size of banks, which as an omitted variable would introduce bias into our baseline specification. The reasoning would be that larger banks are inherently likely to take more risks, and since they have traditionally attracted the largest foreign inflows, a positive relationship between inflows and risk would mask the true causality channel going from size to risk.

As already noted in Section 3, while the idea of a greater propensity for risk among larger banks makes sense in a modern, Too-Big-To-Fail context, it may be somewhat anachronistic in the 1920s German banking environment. Larger German banks may have believed they benefited from some form of – largely illusory – liquidity guarantee via the 1924

*Kreditstopp*. But whether they also believed they benefited from a bailout guarantee is much more open for debate. Consequently, while a relationship between inflows and lack of liquidity could potentially be explained by the *Kreditstopp* and its effect on larger banks, there is little to substantiate a direct link between bailout policy, large size and leverage. Given a historical context deeply affected by the Gold Standard, it is more likely that bank size affected leverage through capital inflows, rather than capital inflows affecting leverage through bank size. There is, unfortunately, no way to empirically test this assertion. If indeed bank size affected leverage only indirectly through inflows, then including it as a control in our main specification would lead to spurious results. Multicollinearity would be a serious concern and the reliability of our main explanatory variable's coefficient estimate would be thrown into doubt.[46]

On the other hand, if bank size affected *liquidity* directly and independently of inflows, then the model already shown in Table 3, which does not include bank size as an explanatory variable of interest, would have low validity. This is a likely possibility as we know that, since the 1924 *Kreditstopp* larger banks had relied greatly on bills of exchange for their liquidity, which they had been told would be readily accepted by the Reichsbank as collateral for loans in case of a liquidity crisis. It might have given them a false sense of security.[47] This suggests that, in this particular case, including bank size as an additional variable of interest would yield more accurate results. The augmented random effects specification we propose adds bank size, $lnTA_{i,t-3}$, as a control to our baseline liquidity specification and interacts it with $\text{Capital\_Inflows}_{i,t-1}$ to obtain:

$$Liquidity\_TA_{it} = \alpha_{it} + \beta Capital\_Inflows_{i,t-1} + \gamma lnTA_{i,t-3} + \theta Capital\_Inflows_{i,t-1} * lnTA_{i,t-3} + \delta Controls_{it} + \epsilon_{it}. \quad (2)$$

Bank size is measured by the natural logarithm of banks' total assets, lagged three periods to reduce the possibility of endogeneity (contemporary bank size might reflect months of growth and risk-taking, whereas initial bank size may do so to a lesser extent). Note however that a 3-period lag significantly reduces our sample size (from 2,085 observations to

[46] Multicollinearity becomes a serious issue especially when one introduces an additional variable which is correlated with the explanatory variable of interest but has no direct correlation with the dependent variable.
[47] See Sections 2 and 3 above.

1,410) due to the number of falling rate periods excluded from the model.[48] Our results are presented in Table 4.[49]

Table 4
Augmented model with liquidity as dependent variable

| | *(1)* $Liquidity\_TA_{i,t}$ | *(2)* $Liquidity\_TA_{i,t}$ | *(3)* $Liquidity\_TA_{i,t}$ | *(4)* $Liquidity\_TA_{i,t}$ | *(5)* $Liquidity\_TA_{i,t}$ |
|---|---|---|---|---|---|
| $Capital\_Inflows_{i,t-1}$ | -0.00152 | -0.000652 | | | 0.00146 |
| | (0.00248) | (0.00270) | | | (0.00324) |
| $Domestic\_Deposits_{i,t-1}$ | | 0.00158* | | | |
| | | (0.000897) | | | |
| $3Month\_Deposits_{i,t-1}$ | | | -0.00220 | | |
| | | | (0.00247) | | |
| $Trade\_Deposits_{i,t-1}$ | | | | -0.0702 | |
| | | | | (0.0487) | |
| $lnTA_{i,t-3}$ | -0.00162*** | -0.00179*** | -0.00145** | -0.00181*** | -0.00149* |
| | (0.000582) | (0.000592) | (0.000587) | (0.000490) | (0.000793) |
| $Capital\_Inflows_{i,t-1} * lnTA_{i,t-3}$ | 0.000195 | 9.25e-05 | | | -0.000178 |
| | (0.000227) | (0.000252) | | | (0.000380) |
| $Domestic\_Deposits_{i,t-1} * lnTA_{i,t-3}$ | | | 0.000297 | | |
| | | | (0.000231) | | |
| $Trade\_Deposits_{i,t-1} * lnTA_{i,t-3}$ | | | | 0.00519 | |
| | | | | (0.00419) | |
| $BigBerlin_{i,t}$ | | | | | 0.00561 |
| | | | | | (0.00485) |
| $Giro_{i,t}$ | | | | | -0.00652** |
| | | | | | (0.00270) |
| $StaatLand_{i,t}$ | | | | | -0.00869*** |
| | | | | | (0.00328) |
| $Capital\_Inflows_{i,t-1} *BigBerlin_{i,t}$ | | | | | 0.00238 |
| | | | | | (0.00301) |
| $Capital\_Inflows_{i,t-1} * Giro_{i,t}$ | | | | | 0.000880 |
| | | | | | (0.00127) |
| $Capital\_Inflows_{i,t-1} * StaatLand_{i,t}$ | | | | | 0.00102 |
| | | | | | (0.00167) |
| Constant | 2.576 | 0.316 | 1.710 | 2.701 | 10.76 |
| | (12.61) | (12.42) | (11.91) | (13.19) | (15.53) |
| Controls | Yes | Yes | Yes | Yes | Yes |
| Time fixed effects | Yes | Yes | Yes | Yes | Yes |
| R2 between | 0.085 | 0.093 | 0.093 | 0.064 | 0.187 |
| R2 overall | 0.105 | 0.111 | 0.11 | 0.087 | 0.183 |
| Observations | 1,410 | 1,410 | 1,410 | 1,418 | 1,410 |
| N | 137 | 137 | 137 | 137 | 137 |

*Notes*: Falling rates periods only. The dependent variable is the ratio of liquidity to total assets $(Liquidity\_TA_{i,t})$. *** significant at $\alpha = 0.01$, ** significant at $\alpha = 0.05$, * significant at $\alpha = 0.10$. Robust standard errors in parentheses. *Source*: DRPS.

[48] An alternative would have been to measure bank size as the logarithm of total assets at the beginning of our sampling period – February 1925 – however this period is excluded from our panel regressions. It also would have entailed an even greater loss of observations.

[49] For peace of mind Appendix Table XX shows the same model with $Capital\_TA\_\{i,t\}$ as the dependent variable, which for the reasons explained is likely to have low validity.

In this model size has a significant, negative impact on liquidity. However, capital inflows do not seem to have an independent effect on liquidity. Appendix D shows a similar model with the ratio of bills of exchange to total assets, $Billall\_TA_{it}$, as the dependent variable. Although a rise in trade deposits seems to lead to higher bill amounts at larger banks (see column 4), neither total capital inflows nor size seem to have much of an effect. Thus, on the whole, it is unlikely that inflows really had a negative impact on banks' liquidity decisions prior to the crisis. No doubt this is not entirely reassuring: banks receiving large foreign, volatile inflows should in theory *better* prepare themselves than others for possible crises to come. At the same time, it is clear that inflows had a more negative impact on banks' leverage. Whether this is because the potential effects of inflows on capital impairment were less well-known than on withdrawal risks is, at this stage, difficult to tell.

### 4.3 Instrumental Variable Model

If bank size only affected leverage through capital inflows, it can then be used as an instrument for inflows in an instrumental variable (IV) setting. This is the third and last step of our analysis, which complements our baseline estimation strategy in mitigating endogeneity issues. In the IV setting we can measure bank size as the natural logarithm of total assets in 1925 rather than its three-period lag.[50] This makes it more likely yet that our measure of bank size does not simply capture the result of years of risk-taking and asset growth, but rather the initial size of the bank as connected to its visibility from abroad and thus its capacity to attract inflows. Our bank size variable, $InitialBankSize_i$, is thus time-invariant. Because we lose observations the further back we go, however, for robustness we measure bank size at three different points in time: February 1925, August 1925 and August 1926.

As we move away from the panel data setting, we can now also make use of our 1930 foreign liability data, which, contrary to our deposit data, contains information on foreign liabilities *per se*. We again divide banks into two groups according to whether they were large recipients of foreign inflows or not. We can then instrument this binary variable, $\text{ForeignInflowBank}_i$, with our initial bank size variable, taking various measures of risk-taking

[50] Unlike in the baseline estimation setting where 1925 is mostly excluded as a non-falling rate period.

from June 1930, $Risk_i$, as our dependent variables. This is thus a cross-sectional IV analysis which makes use of panel information from 1925 and 1926. More formally, our first stage takes the following form:

$$ForeignInflowBank_i = \alpha_i + \beta Initial\_BankSize_i + \delta Controls_i + \epsilon_i, \quad (3)$$

and our second stage regresses our main risk variables on the estimates obtained from Equation (3) and some controls:

$$Capital\_TA_i = \alpha_i + \beta ForeignInflowBank_i + \delta Controls_i + \epsilon_i. \quad (4)$$

Before we move on to our results, let us first visually explore differences between the two groups of banks. Figure 5, left panel, compares the evolution of their leverage positions from 1925 to 1934 (1925=100). The first striking pattern is the downward trend in capital ratios throughout the second half of the 1920s, indicating that all banks dramatically weakened their buffers around then. Foreign-inflow banks however clearly underwent a greater deterioration than their home-focused counterparts. It is hard to find a similar pattern regarding liquidity (right panel). We saw above that credit banks with larger capital inflows exhibited somewhat greater reliance on this potentially problematic form of liquidity. However, it appears from Appendix Figure D1 that even there the issue seems to have been more serious towards the beginning rather than on the eve of the financial crisis.

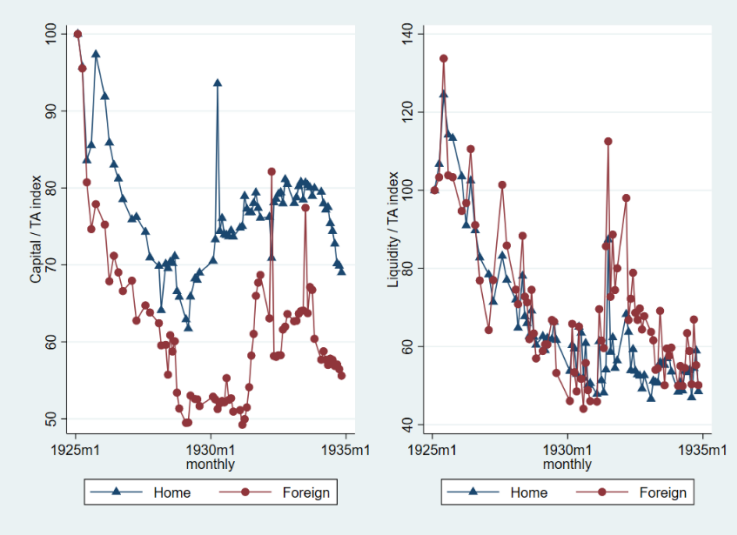


Figure 5
Capital and liquidity ratios (1925=100) at home-focused and foreign-inflow banks, 1925-1934.
*Sources*: DRPS, and Reichsbank R2501 from Blickle et al. (2020).

Is the positive relationship between being a foreign-inflow bank and increasing leverage simply the result of chance correlation? Our instrumental variable approach allows us to minimise this potential explanation. Table 5 gives our estimates of this model.

Table 5
IV estimates for impact of foreign inflows on risk-taking

| | *(1)* | *(2)* | *(3)* |
|---|---|---|---|
| Dependent variable | $Capital\_TA_i$ | $Capital\_TA_i$ | $Capital\_TA_i$ |
| Instrument | $LnTA\_25m2_i$ | $LnTA\_25m8_i$ | $LnTA\_26m8_i$ |
| $ForeigInflowBank_i$ | -0.195*** | -0.241*** | -0.271*** |
| | (0.062) | (0.059) | (0.063) |
| *Constant* | -0.0539 | -0.139 | -0.002 |
| | (0.807) | (0.854) | (0.915) |
| Controls | Yes | Yes | Yes |
| 10% Stock-Yogo critical value | 16.38 | 16.38 | 16.38 |
| 1st Stage F-Statistic | 43.9 | 50.35 | 51.6 |
| 1st Stage P-value | 0.000 | 0.000 | 0.000 |
| R-squared | -0.104 | -0.297 | -0.433 |
| Observations | 69 | 95 | 106 |

*Notes*: The dependent variable is the ratio of capital to total assets ($Capital\_TA_{i,t}$) in June 1930. *** significant at $\alpha = 0.01$, ** significant at $\alpha = 0.05$, * significant at $\alpha = 0.10$. Robust standard errors in parentheses.
*Source*: DRPS.

The first stage of our model indicates that there is little doubt about the relevance of our instrument. In all models our F-statistics are well above their corresponding Stock-Yogo critical values. The instrument's relevance is further illustrated in Figure 6, which shows a significant difference in initial size between home-focused and foreign-inflow banks. The second stage estimations, which control for the same variables as in our baseline regression, support our baseline specification results. Being in the foreign-inflow group significantly lowers a bank's capital ratio by between 0.195 and 0.271. And as with our baseline, the results are less consistently strong regarding liquidity.

All in all, these results give further weight to the idea that, controlling for macroeconomic factors and mitigating endogeneity concerns in a number of ways, large banks, which as a result of their greater visibility abroad received a larger amount of foreign funds, were in turn more likely to take risks than other banks. This was especially true on the leverage side.

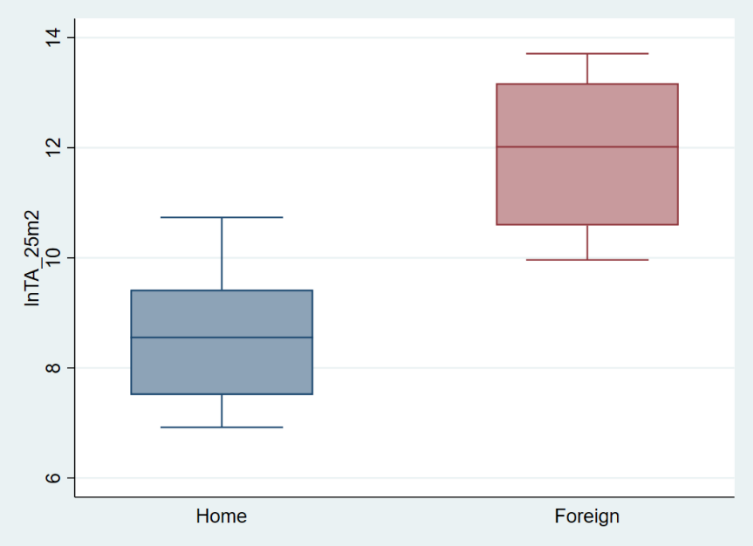


Figure 6
Boxplot of $\ln TA\_25m2_i$, by $ForeignInflowBank_i$.
*Sources*: DRPS, and Reichsbank R2501 from Blickle et al. (2020).

## 5 Conclusion

Until recently, debates around the causes of the Germany crisis of 1931 had focused on the relative importance of domestic bank risk-taking and that of sudden capital withdrawals consequent to fiscal troubles. Some had rightly pointed out that both problems were equally likely to have emerged, and the modern concept of "twin crisis" was applied more frequently to this event. Nevertheless, the possible connections between the capital flows that had occurred in the years preceding the crisis and banks' increasingly risky behaviour were not explored in detail. While some authors alluded to it in implicit terms, a systematic analysis of those connections was lacking.

Through both historiographical and statistical analysis our paper contributes to the debate by highlighting the importance of those connections. We present a rich new dataset on the evolution of individual banks' behaviour which allows us to research the impact of the sudden and large post-1924 capital inflow on banks' leverage and liquidity. In a three-step empirical approach which also makes use of 1930 data on banks' foreign liabilities, we find that while capital inflows had few effects on banks' liquidity choices, their consequences for banks' leverage were significant. We mitigate endogeneity concerns by focusing only on

months of falling spreads and complementing our analysis with the use of an instrument (bank size). Our results are consistent across both specifications.

What these results tend to suggest is that the post-1924 inflows cannot simply regarded as having created sudden liquidity and withdrawal risks in 1931. Their impact on banks was likely much more profound and longer-term. Banks' vulnerability was thus enhanced by inflows in a way that had not previously been highlighted. In turn, our findings give further weight to the idea that international capital flows can reinforce domestic credit cycles in destabilising ways. As such, our results speak to broader debates on the impact of cross-border capital flows (see Borio, James and Shin 2014, Borio and Disyatat 2011, Rey 2015, Tooze 2018).

## Data and Archival Sources


Carter, S., Gartner, S., Haines, M., Olmstead, A., Sutch, R., and G. Wright. (2006). *Historical Statistics of the United States, Earliest Times to the Present: Millennial Edition*. New York: Cambridge University Press, 2006.

Conolly, F. (1936). *Memorandum on the International Short-Term Indebtedness*. Joint Committee, Carnegie Endowment International Chamber of Commerce.

*Deutscher Reichsanzeiger and Preußischer Staatsanzeiger* [DRPS]. (German Imperial Gazette and Prussian Official Gazette). Online access through the University of Mannheim.

Jordà, O., Schularick, M. and Taylor, A. (2016) [JST Database]. "Macrofinancial History and the New Business Cycle Facts." in *NBER Macroeconomics Annual*, volume 31, edited by Martin Eichenbaum and Jonathan A. Parker. Chicago: University of Chicago Press.

Lary, H. (1943). *The United States in the World Economy: The International Transactions of the United States during the Interwar Period*. Prepared for the International Economics and Statistics Unit. Washington: Government Printing Office.

National Bureau of Economic Research (NBER), *Official Bank Discount Rate for Germany* [M13015DEM156NNBR], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/M13015DEM156NNBR, September 16, 2021.

Ritschl, Albrecht. (2002a). *Deutschlands Krise und Konjunktur: Binnenkonjunktur, Auslandsverschuldung und Reparationsproblem zwischen Dawes-Plan und Transfersperre 1924-1934* (The German Business Cycle, 1924-1934: Domestic Activity, Foreign Debt, and

Reparations from the Dawes Plan to the Debt Default, in German), Berlin: Akademie-Verlag.

*Untersuchung des Bankwesens* 1933 (Teil I + Teil II = vollständig). 1. Teil (Band 1 u. Band 2): Vorbereitendes Material (Ansprachen und Referate) 2. Teil: Statistiken. Publisher: Berlin: Heymann.

## References


Accominotti, O. and Eichengreen, B. (2016). "The mother of all sudden stops: capital flows and reversals in Europe, 1919–32." *The Economic History Review*, 69(2), 469-492.

Acharya, V. and Naqvi, H. (2012). "The seeds of a crisis: A theory of bank liquidity and risk taking over the business cycle." *Journal of Financial Economics*, 106(2), 349-366.

Balderston, T. (1991). "German Banking between the Wars: the Crisis of the Credit Banks," *The Business History Review*, 65, pp. 554-605.

--- (1993). *The Origins and Course of the German Economic Crisis*, 1923-1932. Haude and Spener.

--- (2002). *Economics and Politics in the Weimar Republic*. New Studies in Economic and Social History. Cambridge University Press.

Berg, A. (1999), "The Asia Crisis: Causes, Policy Responses and Outcomes", *IMF Working Paper* 99/138.

Blickle, K., Brunnermeier, M. and Luck, S. (2020). "Micro-Evidence From a System-Wide Financial Meltdown: the German Crisis of 1931," Mimeo. Available at SSRN.

Borchardt, K. (1976). "Währung und Wirtschaft," in *Währung und Wirtschaft in Deutschland 1876-1975*, ed. by Deutsche Bundesbank, Fritz Knapp Verlag.

Borio, C. E. and Disyatat, P. (2015). *Capital flows and the current account: Taking financing (more) seriously*. Mimeo. Available at SSRN.

Borio, C., James, H., and Shin, H. S. (2016). *The International Monetary and Financial System*. Central Banks at a Crossroads: What Can We Learn from History? 356.

Born, K.E.. (1967). *Die deutsche Bankenkrise 1931: Finanzen und Politik*. R. Piper & Co Verlag.

--- (1983). *International Banking in the 19th and 20th Centuries*. Berg Publishers Ltd.

Burhop, C. (2011). "The historiography of the 1931 crisis in Germany," *Jahrbuch für Wirtschaftsgeschichte* 52, pp. 9-27.

Calomiris, C. W. and Mason, J. R. (2003). "Fundamentals, panics, and bank distress during the depression." *American Economic Review*, 93(5), 1615-1647.

Calvo, G. A. (1998). "Capital flows and capital-market crises: the simple economics of sudden stops." *Journal of Applied Economics*, 1(1), 35-54.

--- and Mendoza, E. G. (1996). "Mexico's balance-of-payments crisis: a chronicle of a death foretold." *Journal of International Economics*, 41(3-4), 235-264.

Conolly, F. (1936). *Memorandum on the International Short-Term Indebtedness*. Joint Committee, Carnegie Endowment International Chamber of Commerce.

Corsetti, G., Pesenti, P. and Roubini, N. (1998). "What caused the Asian currency and financial crisis? Part II: The policy debate". *NBER Working Paper* No. w6834.

Dell'Ariccia, G. and Marquez, R. (2006). "Lending booms and lending standards." *The Journal of Finance*, 61(5), 2511-2546.

Diaz-Alejandro, C. (1985), "Good-Bye Financial Repression, Hello Financial Crash", *Journal of Development Economics*, vol. 19, pp. 1-24.

Dinger, V. and te Kaat, D. M. (2020). "Cross-border capital flows and bank risk-taking." *Journal of Banking & Finance*, 117, 105842.

Goldfajn, I. and Valdes, R. (1995). "Balance-of-Payments Crises and Capital Flows: The Role of Liquidity." Mimeo. Massachusetts Institute of Technology.

Edwards, S. "How effective are capital controls?" *Journal of Economic Perspectives* 13, no. 4 (1999): 65-84.

Eichengreen, B., Rose, A. K., and Wyplosz, C. (1995). "Exchange market mayhem: the antecedents and aftermath of speculative attacks." *Economic Policy*, 10(21), 249-312.

--- and Hausmann, R. (1999). "Exchange rates and financial fragility." *NBER Working Paper* No. 7418.

Farhi, E. and Tirole, J. (2012). "Collective moral hazard, maturity mismatch, and systemic bailouts." *American Economic Review*, 102(1), 60-93.

Feldman. G. (1993). *The Great Disorder: Politics, Economics, and Society in the German Inflation, 1914-1924*. Oxford University Press.

Ferguson, T. and Temin, P. (2003). "Made in Germany: the German currency crisis of July 1931." *Research in Economic History* 21.

Fohlin, C. (2002). "Regulation, taxation and the development of the German universal banking system, 1884–1913." *European Review of Economic History*, 6(2), 221-254.

Gerschenkron, A. (1962). *Economic Backwardness in Historical Perspective*. Harvard University Press.

Goetz, M. R., Laeven, L. and Levine, R. (2013). "Identifying the valuation effects and agency costs of corporate diversification: Evidence from the geographic diversification of US banks." *The Review of Financial Studies*, 26(7), 1787-1823.

Farhi, E. and Tirole, J. (2012). "Collective moral hazard, maturity mismatch, and systemic bailouts". *American Economic Review*, 102(1), 60-93.

Ha, J., Kose, M. A., Otrok, C., and Prasad, E. S. (2020). "Global macro-financial cycles and spillovers." *NBER Working Paper* No. 26798).

Hardach, G. (1976). *Weltmarktorientierung und relative Stagnation: Währungspolitik in Deutschland 1924-1931*. Duncker & Humblot, Berlin.

--- (1984). "Banking and Industry in Germany in the Interwar Period 1919-1939," *The Journal of Economic History* 13, 203-234.

--- (1995a). "Banking in Germany, 1918-1939." In *Banking, Currency and Finance in Europe between the Wars*, ed. by C. H. Feinstein. Clarendon Press Oxford.

--- (1995b). "Zwischen Markt und Macht: Die deutschen Banken 1908-1934," in *Viertljahrschrift für Sozial- und Wirtschaftsgeschichte, Beiheft: Wirtschaftm Gesellschaft, Unternehmen. Festschrift für Hans Pohl zum 60. Geburstag, 2. Teilband*. Franz Steiner Verlag.

Harris, C., (1935). *Germany's Foreign Indebtedness*. London: [s.n.]. Royal Institute of International Affairs. Information Department.

Houston, J., James, C. and Marcus, D. (1997). "Capital market frictions and the role of internal capital markets in banking." *Journal of Financial Economics*, 46(2), 135-164.

James, H. (1984). "The Causes oof the German Banking Crisis of 1931," *The Economic History Review* 37, pp. 68-87.

--- (1985). *The Reichsbank and Public Finance in Germany 1924-1933: A study of the Politics and Economics During the Great Depression*. Schriftenreihe des Instituts für Bankhistorische Forschung E.V. Fritz Knapp Verlag.

--- (1986). *The German Slump: Politics and Economics 1924-1936*. Clarendon Press Oxford.

--- (1998): "Die Reichsbank 1876 bis 1945, in (ed.) Deutsche Bundesbank, *Fünfzig Jahre Deutsche Mark: Notenbank und Währung in Deutschland seit 1948*, Munich: C.H. Beck, pp. 29–89.

Kaminsky, G. L. and Reinhart, C. M. (1999). "The twin crises: the causes of banking and balance-of-payments problems." *American Economic Review*, 89(3), 473-500.

---, Medina, L. and Wang, S. (2020). "The Financial Center Leverage Cycle: Does it Spread Around the World?" *AEA Papers and Proceedings* (Vol. 110, pp. 504-10).

Krieghoff, N. (2013). *Banking regulation in a federal system: lessons from American and German banking history*. PhD thesis, The London School of Economics and Political Science (LSE).

Laeven, L. and and Levine, R. (2007). "Is there a diversification discount in financial conglomerates?" *Journal of Financial Economics*, 85(2), 331-367.

Laeven, L., Ratnovski, L., and Tong, H. (2016). "Bank size, capital, and systemic risk: Some international evidence." *Journal of Banking & Finance*, 69, S25-S34.

Lary, H. (1943). *The United States in the World Economy: The International Transactions of the United States during the Interwar Period*. Prepared for the International Economics and Statistics Unit. Washington: Government Printing Office.

Lewis, C. (1938). *America's Stake in International Investments*. The Brookings Institution.

Lüke, R. (1958). *Von der Stabilisierung zur Krise*. Zürich.

Martinez-Miera, D. and Repullo, R. (2017). "Search for yield." *Econometrica*, 85(2), 351-378.

Mauro, P., Sussman, N., and Yafeh, Y. (2006). *Emerging markets and financial globalization: sovereign bond spreads in 1870-1913 and today*. Oxford University Press.

Miller, V. (1995). "Central Bank Reactions to Banking Crises in Fixed Exchange Rate Regimes." Mimeo, Universite de Quebec a Montreal, 1995.

Odell, K. A., and Weidenmier, M. D. (2004). "Real shock, monetary aftershock: The 1906 San Francisco earthquake and the panic of 1907." *The Journal of Economic History*, 64(4), 1002-1027.

Postel-Vinay, N. (forthcoming). "Was the US Great Depression a Credit Boom Gone Wrong?" in Schularick, Moritz (ed.). *Leveraged: The New Economics of Debt and Financial Fragility* (Chicago University Press).

Radelet, S. and J. Sachs (1998), "The East Asian Financial Crisis: Diagnosis, Remedies, Prospects", *Brooking Papers on Economic Activity*, vol. 29, pp. 1-90.

Rey, H. (2015). "Dilemma not trilemma: the global financial cycle and monetary policy independence." *NBER Working Paper* No. 21162.

Ritschl, Albrecht. (2002a). *Deutschlands Krise und Konjunktur: Binnenkonjunktur, Auslandsverschuldung und Reparationsproblem zwischen Dawes-Plan und Transfersperre 1924-1934* (The German Business Cycle, 1924-1934: Domestic Activity, Foreign Debt, and Reparations from the Dawes Plan to the Debt Default, in German), Berlin: Akademie-Verlag, 2002.

--- (2002b). "International Capital Movements and the Onset of the Great Depression: Some International Evidence", in: H. James (ed.), *The Interwar Depression in an International Context*, Munich: Oldenbourg, 2002, 1-14.

--- (2012). "The German Transfer Problem, 1920–33: A Sovereign Debt Perspective," *European Review of History: Revue europeenne d'histoire* 10 (2012), 943-964.

--- (2013). "Reparations, Deficits, and Debt Default: the Great Depression in Germany," in: Nicholas Crafts and Peter Fearon (eds.), *The Great Depression of the 1930s*, Oxford: Oxford University Press, 2013, 110-139.

Schnabel, I. (2004). "The German twin crisis of 1931." *The Journal of Economic History*, 64(3), 822-871.

--- (2009). "The role of liquidity and implicit guarantees in the German twin crisis of 1931." *Journal of International Money and Finance*, 28(1), 1-25.

Straumann, T. (2019). *1931: Debt, Crisis, and the Rise of Hitler*. Oxford University Press.

Tooze, A. (2018). *Crashed: How a Decade of Financial Crises Changed the World*. Penguin.

Velasco, A. (1987). "Financial crises and balance of payments crises: a simple model of the southern cone experience." *Journal of Development Economics*, 27(1-2), 263-283.

# Appendix A Summary statistics and sources

| Variables | Unit | Median | S.D. | Description | Source | Frequency |
|---|---|---|---|---|---|---|
| *TA* | RM thousand | 21,681 | 467,297 | Total assets | DRPS | ≈ Monthly |
| *Capital* | RM thousand | 2,010 | 34,356 | Capital | DRPS | ≈ Monthly |
| *Liquidity* | RM thousand | 212 | 9465 | Cash + Deposits at Central Banks | DRPS | ≈ Monthly |
| *LoanShort* | RM thousand | 9298 | 220,640 | Short-term loans | DRPS | ≈ Monthly |
| *TradeLoansNoCov* | RM thousand | 0 | 23,444 | Uncollateralised trade loans | DRPS | ≈ Monthly |
| *Billall* | RM thousand | 1660 | 100,059 | Bills of exchange | DRPS | ≈ Monthly |
| *3Month_Deposits* | RM thousand | 4349 | 165,917 | 3-month deposits | DRPS | ≈ Monthly |
| *Trade_Deposits* | RM thousand | 0 | 50,038 | Trade deposits (see text) | DRPS | ≈ Monthly |
| *Capital_Inflows* | RM thousand | 4637 | 211,088 | 3-month + trade deposits | DRPS | ≈ Monthly |
| *Domestic_Deposits* | RM thousand | 7009 | 210,866 | 7-day + interbank deposits | DRPS | ≈ Monthly |
| *Reichsbank* | Rate | 5 | 1.73 | Reichsbank discount rate | Balderston (1993), p. 148 and NBER "Official Discount Rate for Germany" | Monthly |
| *USDX* | Rate | 4.20 | 0.6 | RM/USD exchange rate | JST Database | Annual, interpolated |
| *Nat_Income* | RM billion | 12.55 | 1.36 | Gross national product | Ritschl (2002), Table C2 | Quarterly, interpolated |
| *Capital_Stock* | RM billion | 242.16 | 4.98 | Capital stock | Ritschl (2002), Table C2 | Quarterly, interpolated |
| *CPI* | Index | 140 | 13 | Consumer Price Index | Ritschl (2002), Table C2 | Quarterly, interpolated |
| *Consumption* | RM billion | 10.01 | 0.7 | Consumption | Ritschl (2002), Table C2 | Quarterly, interpolated |
| *Investment* | RM billion | 4.92 | 1.55 | Investment | Ritschl (2002), Table C2 | Quarterly, interpolated |
| *Deficit* | RM billion | 75.96 | 301.98 | Central government deficit, including job creating bills and Mefo-bills | Ritschl (2002), Table C2 | Quarterly, interpolated |
| *Current_Balance* | RM billion | 0.21 | 1.12 | Current account balance | JST Database | Annual, interpolated |
| *BigBerlin* | Dummy | | | One of 6 largest Berlin banks | DRPS | ≈ Monthly |
| *Giro* | Dummy | | | Girozentral | DRPS | ≈ Monthly |
| *StaatLand* | Dummy | | | Staatbank or Landbank | DRPS | ≈ Monthly |
| *ForeignInflowBank* | Dummy | | | See text | Reichsbank R2501 and Blickle et al. (2020) | June and September 1930 |

# Appendix B Short-term loans

Table B1
The impact of foreign inflows on banks' holdings of short-term loans, random effects model

| | *(1)* $LoanShort\_TA_{i,t}$ | *(2)* $LoanShort\_TA_{i,t}$ | *(3)* $LoanShort\_TA_{i,t}$ | *(4)* $LoanShort\_TA_{i,t}$ | *(5)* $LoanShort\_TA_{i,t}$ |
|---|---|---|---|---|---|
| $Capital\_Inflows_{i,t-1}$ | -0.000147 | -0.00269 | | | -0.0146 |
| | (0.00420) | (0.0107) | | | (0.0181) |
| $Domestic\_Deposits_{i,t-1}$ | | 0.0233 | | | |
| | | (0.0191) | | | |
| $3Month\_Deposits_{i,t-1}$ | | | 0.00707 | | |
| | | | (0.0111) | | |
| $Trade\_Deposits_{i,t-1}$ | | | | -0.327*** | |
| | | | | (0.0469) | |
| $BigBerlin_{i,t}$ | | | | | -0.158*** |
| | | | | | (0.0389) |
| $Giro_{i,t}$ | | | | | -0.173*** |
| | | | | | (0.0429) |
| $StaatLand_{i,t}$ | | | | | -0.161*** |
| | | | | | (0.0458) |
| $Capital\_Inflows_{i,t-1}$ | | | | | -0.0560* |
| $*BigBerlin_{i,t}$ | | | | | (0.0311) |
| $Capital\_Inflows_{i,t-1}$ | | | | | 0.0354* |
| $* Giro_{i,t}$ | | | | | (0.0212) |
| $Capital\_Inflows_{i,t-1}$ | | | | | 0.0381* |
| $* StaatLand_{i,t}$ | | | | | (0.0223) |
| Constant | -91.64* | -87.04** | -93.41** | -87.40* | -71.35 |
| | (47.80) | (42.30) | (46.54) | (46.42) | (48.52) |
| Controls | Yes | Yes | Yes | Yes | Yes |
| Time fixed effects | Yes | Yes | Yes | Yes | Yes |
| R2 between | 0.017 | 0.031 | 0.019 | 0.017 | 0.29 |
| R2 overall | 0.003 | 0.017 | 0.007 | 0.013 | 0.286 |
| Observations | 2,085 | 2,085 | 2,085 | 2,096 | 2,085 |
| N | 137 | 137 | 137 | 137 | 137 |

*otes: Falling rates periods only. The dependent variable is the ratio of short-term loans to total assets ($LoanShort\_TA_{i,t}$). *** gnificant at $\alpha = 0.01$, ** significant at $\alpha = 0.05$, * significant at $\alpha = 0.10$. Robust standard errors in parentheses. Source: DRPS.*

# Appendix C Uncovered trade loans

Table C1
The impact of foreign inflows on banks' holdings of uncovered trade loans, random effects model

| | *(1)* $TradeLoanNoCov\_TA_{i,}$ | *(2)* $TradeLoanNoCov\_TA_{i,}$ | *(3)* $TradeLoanNoCov\_TA_{i,}$ | *(4)* $TradeLoanNoCov\_TA_{i,}$ | *(5)* $TradeLoanNoCov\_TA_{i,}$ |
|---|---|---|---|---|---|
| $Capital\_Inflows_{i,t-1}$ | 0.00919*** | 0.0108 | | | 0.0137 |
| | (0.00135) | (0.00683) | | | (0.00905) |
| $Domestic\_Deposits_{i,t-1}$ | | -0.0122 | | | |
| | | (0.00982) | | | |
| $3Month\_Deposits_{i,t-1}$ | | | -0.00268 | | |
| | | | (0.00370) | | |
| $Trade\_Deposits_{i,t-1}$ | | | | 0.562*** | |
| | | | | (0.102) | |
| $BigBerlin_{i,t}$ | | | | | 0.0340 |
| | | | | | (0.0217) |
| $Giro_{i,t}$ | | | | | -0.0372** |
| | | | | | (0.0184) |
| $StaatLand_{i,t}$ | | | | | -0.0309** |
| | | | | | (0.0151) |
| $Capital\_Inflows_{i,t-1}$ *$BigBerlin_{i,t}$ | | | | | 0.00235 |
| | | | | | (0.0183) |
| $Capital\_Inflows_{i,t-1} * Giro_{i,t}$ | | | | | -0.0143 |
| | | | | | (0.00951) |
| $Capital\_Inflows_{i,t-1} * StaatLand_{i,t}$ | | | | | -0.0131 |
| | | | | | (0.00896) |
| Constant | -2.886 | 1.925 | 0.0811 | -9.470** | -5.770 |
| | (23.28) | (3.889) | (4.471) | (3.835) | (7.710) |
| Controls | Yes | Yes | Yes | Yes | Yes |
| Time fixed effects | Yes | Yes | Yes | Yes | Yes |
| R2 between | 0.112 | 0.106 | 0.040 | 0.798 | 0.209 |
| R2 overall | 0.094 | 0.094 | 0.003 | 0.776 | 0.166 |
| Observations | 2,077 | 2,077 | 2,077 | 2,077 | 2,077 |
| N | 137 | 137 | 137 | 137 | 137 |

*Notes: Falling rates periods only. The dependent variable is the ratio of uncollateralised trade loans to total assets ($TradeLoanNoCov\_TA_{i,t}$). *** significant at $\alpha = 0.01$, ** significant at $\alpha = 0.05$, * significant at $\alpha = 0.10$. Robust standard errors in parentheses. Source: DRPS.*

# Appendix D Bills of exchange

Table D1
The impact of foreign inflows on banks' holdings of bills of exchange, random effects model

| | *(1)* $Billall\_TA_{i.t}$ | *(2)* $Billall\_TA_{i.t}$ | *(3)* $Billall\_TA_{i.t}$ | *(4)* $Billall\_TA_{i.t}$ | *(5)* $Billall\_TA_{i.t}$ |
|---|---|---|---|---|---|
| $Capital\_Inflows_{i,t-1}$ | -0.00841 | -0.00886 | | | -0.0207 |
| | (0.0288) | (0.0300) | | | (0.0247) |
| $Domestic\_Deposits_{i,t-1}$ | | -0.000744 | | | |
| | | (0.00772) | | | |
| $3Month\_Deposits_{i,t-1}$ | | | -0.00421 | | |
| | | | (0.0299) | | |
| $Trade\_Deposits_{i,t-1}$ | | | | -1.504*** | |
| | | | | (0.431) | |
| $lnTA_{i,t-3}$ | -0.00205 | -0.00198 | -0.00202 | -0.00546 | 0.000442 |
| | (0.00527) | (0.00512) | (0.00551) | (0.00527) | (0.00632) |
| $Capital\_Inflows_{i,t-1}$ | 0.00137 | 0.00142 | | | 0.00389 |
| $* lnTA_{i,t-3}$ | (0.00253) | (0.00267) | | | (0.00244) |
| $Domestic\_Deposits_{i,t-1}$ | | | 0.00109 | | |
| $* lnTA_{i,t-3}$ | | | (0.00264) | | |
| $Trade\_Deposits_{i,t-1}$ | | | | 0.130*** | |
| $* lnTA_{i,t-3}$ | | | | (0.0378) | |
| $BigBerlin_{i,t}$ | | | | | 0.0535 |
| | | | | | (0.0398) |
| $Giro_{i,t}$ | | | | | -0.113*** |
| | | | | | (0.0233) |
| $StaatLand_{i,t}$ | | | | | -0.0824*** |
| | | | | | (0.0259) |
| $Capital\_Inflows_{i,t-1}$ | | | | | -0.0157 |
| $*BigBerlin_{i,t}$ | | | | | (0.0229) |
| $Capital\_Inflows_{i,t-1}$ | | | | | -0.0418*** |
| $* Giro_{i,t}$ | | | | | (0.00818) |
| $Capital\_Inflows_{i,t-1}$ | | | | | -0.0231** |
| $* StaatLand_{i,t}$ | | | | | (0.00924) |
| Constant | -28.70 | -27.88 | -30.49 | -34.10 | -19.65 |
| | (58.53) | (58.23) | (57.21) | (57.33) | (57.75) |
| Controls | Yes | Yes | Yes | Yes | Yes |
| Time fixed effects | Yes | Yes | Yes | Yes | Yes |
| R2 between | 0.052 | 0.052 | 0.052 | 0.057 | 0.157 |
| R2 overall | 0.063 | 0.062 | 0.059 | 0.063 | 0.177 |
| Observations | 1,410 | 1,410 | 1,410 | 1,418 | 1,410 |
| N | 137 | 137 | 137 | 137 | 137 |

*Notes*: Falling rates periods only. The dependent variable is the ratio of bills of exchange to total assets ($Billall\_TA_{i,t}$). *** significant at $\alpha = 0.01$, ** significant at $\alpha = 0.05$, * significant at $\alpha = 0.10$. Robust standard errors in parentheses. *Source*: DRPS

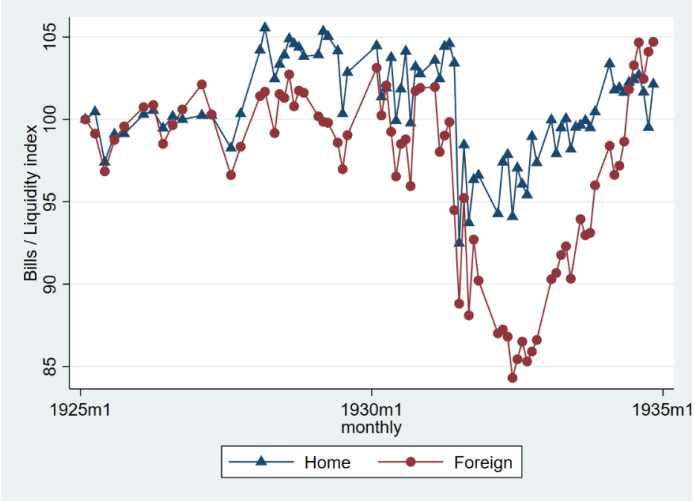


Figure D1
Ratio of bills of exchange to liquidity (1925=100), by type of bank
*Sources*: DRPS and and Reichsbank R2501 from Blickle et al. (2020).