



Hot money inflows and bank risk-taking: Germany from the 1920s to the Great Depression

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Abstract

This paper explores the origins of German banks' risk-taking in the years preceding the 1931 crisis. The 1920s were marked by a large and prolonged increase in capital flows into Germany, chiefly from the United States and the United Kingdom. This coincided, at the individual bank level, with a rise in leverage and a fall in liquidity. We examine possible connections between the two phenomena. Our analysis is based on a combination of historiographical work and statistical modelling based on a newly hand-collected bimonthly dataset on German reporting banks from 1925 to 1935. Bank by bank we examine the effects of foreign inflows on decisions related to leverage, lending, and liquidity. The Dawes Plan of 1924 and the relative absence of a too-big-to-fail (TBTF) environment allow us to mitigate endogeneity concerns. We suggest that while capital inflows did not seem to impact banks' liquidity decisions, their impact on leverage was non-negligible.

KEYWORDS

capital flows, credit, financial crisis, financial development, financial globalization, foreign debt, international lending, money supply

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‘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. Keynes¹

Do sudden large capital inflows increase bank risk-taking in the destination country? The question deserves to be asked, not least because of the great increase in global financial flows since the end of Bretton Woods. Since the 1970s there have been numerous episodes of an extended surge in capital flows to a country followed shortly after by a banking crisis there. Examples can be found in Latin America in the 1980s, in East Asia and Sweden in the 1990s, and in the Eurozone in the 2010s. Interwar Germany is also one such example, where a period of surging money flows from abroad in 1924–30 was followed by a severe banking crisis in 1931.

Until recently, the causes of the 1931 German crisis were the subject of active debate. Some emphasized domestic bank risk-taking,² while others stressed the importance of fiscal imbalances and investors’ flimsiness leading to flight from the Reichsmark (RM).³ Now many agree that both domestic banking and fiscal factors were at play, which in combination gave rise to a ‘twin crisis’.⁴ Within this new framework, the occurrence of a banking crisis partly driven by domestic bank risk-taking is now rarely disputed. Schnabel has convincingly shown that, although depositors were concerned about the currency, they withdrew more from banks that had taken more risks in the 1920s.⁵

Yet what led some German banks to take those risks in the first place has remained relatively unexplored. In particular, potential links between risk-taking behaviour and the unusually large inflow of capital that characterized the 1924–30 period have not been examined systematically. The historical literature hints at connections but these have not been the subject of empirical analysis.⁶

The lack of analysis of the impact of inflows on bank risk-taking in the run-up to the 1931 German twin crisis mirrors a similar absence of empirical treatment of the issue in so-called third-generation models of twin crises. These models have tended to focus on the dynamics of the crises themselves rather than the years preceding them.⁷ Although they have emphasized the role of capital flows in exacerbating those crises at the time they erupt, they have mainly focused on the

¹ Keynes, *General theory*, p. 139.

² For instance, Born, *Deutsche Bankenkrise*; Hardach, *Weltmarktorientierung*; idem, ‘Banking and industry’; idem, ‘Banking in Germany’; idem, ‘Zwischen Markt und Macht’; Balderston, *Origins*; idem, *Economics and politics*; James, ‘Causes of the German banking crisis’; idem, *Reichsbank*; idem, *German slump*.

³ Ferguson and Temin, ‘Made in Germany’; Accominotti and Eichengreen, ‘Mother’.

⁴ A twin crisis is the double occurrence of a banking crisis and a currency crisis. There is still a debate around the relative importance of each kind of factor in the 1931 German crisis.

⁵ Schnabel, ‘German twin crisis’; eadem, ‘Role of liquidity’. See also more recently Bickle, Brunnermeier and Luck, ‘Who can tell which banks will fail?’, *NBER Working Paper*, no. 29753 (2022).

⁶ Balderston, *Origins*.

⁷ For instance, Velasco, ‘Financial crises’; Calvo, ‘Capital flows’; Goldfajn and Valdés, ‘Capital flows and the twin crises: the role of liquidity’, *IMF Working Paper*, 87 (1997); and Miller, ‘Central bank reactions’.



role of outflows in straining banks' search for liquidity at the peak of instability.⁸ The question of the origins of banks' risk-taking in preceding years and its potential connections with the coinciding large capital inflows are left understudied. While some authors have indeed emphasized interactions between inflows and bank risk-taking, empirical evidence on those relationships is scant.⁹

In the 1920s, Germany was the recipient of an estimated total of RM 18.2 billion in inflows coming primarily from the United States, Great Britain, and other European countries.¹⁰ 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.¹¹ Over time the US–German long-term interest rate spread fell, indicating the presence of push factors in the supply of capital.

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.¹² There has been increasing awareness of the potential for international capital flows to reinforce domestic credit cycles in a destabilizing way.¹³

In one of the only crisis-specific empirical investigations of the topic, Dinger and te Kaat have compellingly shown how capital inflows in the run-up to the Eurozone crisis of the 2010s led to increased bank risk-taking at the time.¹⁴ In the German post-First World War context, the possibility of a positive relationship between inflows and risk-taking is mentioned in several narratives.¹⁵ In section I, we present a rich account of the existing evidence on the topic drawn from the historiography.

To analyse these interactions in the pre-Depression German context in a more systematic way, we collected, by hand for the first time, the entire balance sheet data of the 137 monthly reporting banks from 1925 to 1935. The balance sheet information has been used in previous studies but the focus has almost always been on the crisis years, and never before had these data been collected

⁸ Kaminsky and Reinhart, 'Twin crises'. Third-generation models tend to emphasize 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, 'Exchange rates and financial fragility', NBER Working Paper, no. 7418 (1999)].

⁹ Diaz-Alejandro, 'Goodbye'; Berg, 'The Asia crisis: causes, policy responses and outcomes', *IMF Working Paper*, 99/138 (1999); Corsetti, Pesenti and Roubini, 'What caused the Asian currency and financial crisis? Part II: The policy debate', *NBER Working Paper*, no. 6834 (1998); Calvo, 'Capital flows'; Alvarez, *Mexican banks*.

¹⁰ Harris, *Foreign indebtedness*, p. 7. This includes both long- and short-term capital flows, from 1924 to 1930. Short-term capital flows amounted to RM 13.1 milliard (ibid.). This amounts to 138% of 1925 German gross national product (GNP).

¹¹ Ritschl, *Deutschlands Krise*; idem, 'Transfer problem'.

¹² Dell'Arriccia and Marquez, 'Lending booms'; Acharya and Naqvi, 'Seeds of a crisis'; Dinger and te Kaat, 'Capital flows'.

¹³ Borio, James, and Shin, 'Monetary and financial system'; Ha, Kose, Otrok and Prasad, 'Global macro-financial cycles and spillovers', *NBER Working Paper*, no. 26798 (2020); Kaminsky, Medina, and Wang, 'Financial center'; Rey, 'Dilemma not trilemma: the global financial cycle and monetary policy independence', *NBER Working Paper*, no. 21162 (2015); Tooze, *Crashed*.

¹⁴ Dinger and te Kaat, 'Capital flows'.

¹⁵ See in particular Balderston, *Origins*; Straumann, *1931*.



since 1925.¹⁶ Covering the years 1925–30 is essential if one wants to explore the evolution of bank risk-taking in the years preceding the crisis.

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 is the first study to do so at the individual bank level in the 1920s and thereafter.¹⁷ 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 on different types of (un-)collateralized investments.¹⁸ A potential issue with our analysis, however, might be that economic growth, risk preference, or any other unobserved variable caused some banks to take more risks, and only as a result expand their assets and liabilities. An additional concern could be the absence of a reliable way to determine the geographical provenance of banks' liabilities in the 1920s.

We propose a three-step approach to mitigate those issues. First, to deal with the problem of geographical origin, we make use of additional data on banks' largest foreign liability holdings in 1930 to explore their relationship with deposit growth in the 1920s.¹⁹ From this analysis we can extract the most relevant types of liabilities in our monthly data, whose growth should be analysed. Next, we run panel regressions focusing on the relationship between risk-taking variables and the relevant changes in deposits. To mitigate the endogeneity issue, we use fixed effects and analyse the model only in months in which the short-term interest rate spreads between the United States and Germany fell, a strategy also followed by Dinger and te Kaat.²⁰

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 was some form of liquidity guarantee at the time, it is much harder to find evidence of a bailout guarantee even in the context of 'corporatist regulation'.

This three-step approach allows us to highlight a number of important points. Clearly, 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.

Our account also speaks to more general debates. It is in line with Borio, James, and Shin, who emphasize excess '[international] financial elasticity', amplifying domestic financial booms and busts.²¹ It reinforces the idea that a 'global financial cycle' can amplify bank risk-taking at

¹⁶ See in particular Schnabel, 'German twin crisis'; Blicke, Brunnermeier and Luck, 'Who can tell?'

¹⁷ Dinger and te Kaat's analysis of the years preceding the Eurozone crisis is at the country level.

¹⁸ Note, however, that we are not able to determine the exact maturity transformation of those banks, as the categories for assets in our data are too generic and do not hold information on precise maturity (only 'short-term/long-term'). We also lack information on the assets' currency, and net foreign liabilities are hard to estimate as a result. We discuss this in greater detail in sect. II.

¹⁹ We thank Stephan Luck, Markus Brunnermeier, and Kristian Blicke for kindly sharing their data with us.

²⁰ Dinger and te Kaat, 'Capital flows'.

²¹ Borio, James, and Shin, 'Monetary and financial system'; see also Borio and Disyatat, 'Capital flows and the current account: taking financing (more) seriously', (mimeo, 2015).



the local level.²² The German central bank struggled to simultaneously control domestic inflation and capital inflows. With the interest rate as its main policy tool, it clearly faced a dilemma.²³ An attempt to control credit more directly in 1924 had perverse effects.²⁴ Controls on capital inflows or greater regulatory oversight might have given the Reichsbank greater leverage if interest rates needed to be kept high due to inflationary pressures.²⁵

The rest of the paper proceeds as follows. Section I 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 II). Finally, in section III we present our results. Section IV concludes and is followed by an online appendix.

I | PROBING THE RELATIONSHIP BETWEEN CAPITAL SUPPLY SHOCKS AND BANK RISK-TAKING: HISTORIOGRAPHICAL EVIDENCE

The literature on German banking developments in the post-First World War era is very 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.

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 1930.²⁶ During this expansion, banks prioritized less liquid but more remunerative assets, so that their liquidity did not keep pace with the expansion of their liabilities or relative to 1913.²⁷ The average estimated liquidity ratio among all banks fell from 7.3 per cent in 1913 to 3.8 per cent in 1929.²⁸ Their liquidity ratio worsened especially in 1925–6 as they invested more in less liquid assets such as stock market loans and advances.²⁹ In addition, as has been noted by numerous authors, the expansion occurred on a thinning capital base. At the big Berlin banks, capital ratios fell from 19 per cent to 7 per cent in 1929.³⁰ Schnabel showed how

²² Rey, 'Dilemma not trilemma: the global financial cycle and monetary policy independence', *NBER Working Paper*, no. 21162 (2015); Tooze, *Crashed*.

²³ This dilemma would have arguably been present regardless of adherence to the Gold Standard. See Rey, 'Dilemma not trilemma'.

²⁴ See sect. III.

²⁵ Chile's experience of controls on capital inflows in the 1990s offers interesting ground on which to test their effectiveness in terms of various desirable economic outcomes. On this subject, see Edwards, 'How effective'; and Edwards and Ribogon, 'Capital controls'.

²⁶ Schnabel, 'German twin crisis'.

²⁷ Hardach, 'Banking and industry'.

²⁸ *Ibid.*, see also James, *German slump*.

²⁹ James, *German slump*.

³⁰ Hardach, 'Banking and industry'; see also James, *German slump*, p. 294; and Balderston, 'German banking'.



depositors worried about those trends, and in 1931 ran especially on banks with lower liquidity and capital.³¹ Banks were thus ‘extremely vulnerable’.³²

Many banks participated actively 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.³³ 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 specialized in communal business.³⁴ The publicly-owned *Sparkassen* or savings banks, which were made up of 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.³⁵ 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-Ausschuß*) warned that many concentrated too much of their lending in a small number of big customers.³⁶ 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.³⁷ Other accounts paint a more aggressive behaviour, with the ‘wild men’ of Behrenstraße investing in new ‘growth’ areas such as municipal finance and mechanized, rationalized production (dubbed ‘rationalisation mania’ by some), leading to excess capacity in those areas.³⁸ 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.³⁹ ‘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.⁴⁰ 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.⁴¹

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 came into trouble in the late 1920s. The case of the Danat bank is even more notorious. Also one

³¹ Schnabel, ‘German twin crisis’.

³² Hardach, ‘Banking and industry’.

³³ James, *German slump*, p. 91.

³⁴ *Ibid.*, p. 99.

³⁵ *Ibid.*, p. 102. The then mayor of Cologne, Konrad Adenauer, was intimately involved in these borrowing campaigns.

³⁶ James, *German slump*, p. 141.

³⁷ *Ibid.*, p. 143.

³⁸ Balderston, ‘German banking’; Harris, *Foreign indebtedness*.

³⁹ Balderston, ‘German banking’.

⁴⁰ *Ibid.*, p. 148.

⁴¹ *Ibid.*



of the banking giants of the time, its financial health became tied up with a small number of local authorities (including, famously, the City of Berlin) as well as with firms such as Nordwolle.⁴² The Danat is famous for exposing the extent of its troubles when it refused to renew a loan to the City of Berlin on 5 June 1931. Under the leadership of Jakob Goldschmidt, a former stock market trader and strong believer in the benefits of industry rationalization for the German economy, it had facilitated mergers and acquisitions by large firms, bought shares in them, and lent to them.⁴³ At the same time as the financial and fiscal wellbeing of the firms and local authorities it had invested in became increasingly questioned, its capital ratio came dwindled down (4.8 per cent in 1929). Danatbank is sometimes portrayed as an outlier, although as our results shall further suggest, it is probably best thought of as an extreme example of underlying trends.⁴⁴ Due in part to an atmosphere of relative secrecy among banks, some of their weaknesses only came to light when the 1931 crisis unfolded.⁴⁵ According to Schnabel, depositors became relatively well informed around that time and withdrew more from banks that had adopted riskier investment strategies earlier on.⁴⁶

The causes of these bank weaknesses have been widely debated. Lack of regulation and strong competition may have also played a role.⁴⁷ Krieghoff insists that competition increased after the First World War, and notes the Reichsbank's apparent powerlessness in its attempts to restrain it.⁴⁸ A good example of this is its authorizing of the widening of range of operations of the public banks (*Sparkassen*), which it had hoped would check the growth of large credit banks.⁴⁹ 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. The great Berlin banks fiercely competed with each other for market share in their new nationwide expansion.⁵⁰ Provincial banks large 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.⁵¹ Additionally, while before the war the largest 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 (see section II).⁵²

The Danat bank spurred some of this competition through its central involvement in the merger and rationalization activity of the mid-1920s – for instance in the steel and automobile industries – and its channelling of foreign funds towards modernization programs.⁵³ Banks also

⁴² The mayor of Berlin, Gustav Böss, was heavily involved in corruption cases and responsible for many of the loans contracted with Danat.

⁴³ Pohl and Beckers, *Deutsche Bankiers*; J. Goldschmidt, 'Economic tendencies in Germany and their influence on the formation of capital', Address delivered at the seventh General Congress of German Bankers in Cologne (1930); Shearer, 'Talking about efficiency'; Straumann, 1931, p. 153.

⁴⁴ See Ferguson and Temin, 'Made in Germany'.

⁴⁵ James, *German slump*; Straumann, 1931.

⁴⁶ Schnabel, 'German twin crisis'.

⁴⁷ James, 'Causes of the German banking crisis'.

⁴⁸ Krieghoff, 'Banking regulation', p. 76.

⁴⁹ Born, *International banking*.

⁵⁰ Balderston, 'German banking'; Burhop, 'Historiography'.

⁵¹ Hardach, 'Banking and industry'.

⁵² From 1924 the Reichsbank also supported a coordinated effort to harmonize interest rates across bank types but only achieved its goal in early 1931; see Krieghoff, 'Banking regulation', p. 80.

⁵³ *Ibid.*



faced competition from foreign investors who were direct, avid lenders to German businesses in 1925–7. According to Balderston, foreign banking competition certainly worsened the quality of banks' advances portfolios.⁵⁴ Search for yield was thus partly induced by the erosion of rents.⁵⁵

The developing relationship between the Danat bank and Nordwolle illustrates the impact of foreign banking competition and lack of regulation quite well. Nordwolle had direct access to foreign lenders and at some point became indebted to as many as 22 foreign banks.⁵⁶ In response, the Danat worked to strengthen its position in the Bremen firm. Along with a number of other large German banks, it did not refrain from raising new capital for the firm to help it pay some of its own loans in 1928.⁵⁷ Contrary to the another bank Berliner Handelsgesellschaft (BHG), it ignored warning signs such as increasing secrecy on the part of the Lahusen brothers, who owned the company, and continued to lend to it massively up until the spring of 1931, when it finally ordered a comprehensive audit of the firm, which revealed the extent of its troubles.⁵⁸

What remains unexplored is the extent to which foreign investment in banks themselves 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.⁵⁹ In the highly competitive context of 1920s Germany, it is also possible that the goal of expanding market share came at the expense of leverage control. It is estimated that foreign liabilities increased by a factor of 7.4 between 1925 and 1929, and that by the end of the period 18 per cent of all liabilities in the banking sector were of foreign origin.⁶⁰

Of course, capital inflows to Germany could at first be explained by sharp increases in the demand for funds following hyperinflation.⁶¹ Hyperinflation destroyed savings and corporate capital, which brought interest rates very high as the economy recovered following the stabilization of the RM 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.⁶²

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 banks in

⁵⁴ Balderston, 'German banking'.

⁵⁵ Schnabel, 'German twin crisis'.

⁵⁶ Wixforth, 'Die Beziehungen der Norddeutschen Wollkämmerei und Kammgarnspinnerei zu den Banken', IBF Paper Series 04-17 (2017).

⁵⁷ This is reminiscent of similar conflicts of interest at universal banks across the Atlantic in the same period. Chase National Bank notoriously raised new capital for General Theaters and Equipment (GTE) in an attempt to help it pay back its own loans. This case became central in the Pecora Committee investigations, eventually leading to the Glass–Steagall Act. See Wigmore, *The crash and its aftermath*, p. 175; Wilmarth, *Taming the megabanks*.

⁵⁸ The reasons behind the BHG's eventually more cautious behaviour remain unknown. It too had participated in Nordwolle's 1928 capital increase. However, it gradually withdrew its investments in the firm. Wixforth speculates that it may have acted just as riskily as the Danat bank but somehow accessed particularly compromising information about Nordwolle that Goldschmidt did not access. See Wixforth, 'Die Beziehungen'.

⁵⁹ Dell'Arriccia and Marquez, 'Lending booms'; Acharya and Naqvi, 'Seeds of a crisis'; Dinger and te Kaat, 'Capital flows'.

⁶⁰ Schnabel, 'German twin crisis'. James 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 (see James, *German slump*). Unfortunately, we do not know their exact proportion.

⁶¹ Straumann, 1931, p. 9.

⁶² *Ibid.*, pp. 10, 31.



a way that it thought had promoted excessive money growth.⁶³ 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*.⁶⁴ In effect, this meant that by focusing lending on trade, some banks could continue to benefit from rediscounting, at least in good times.⁶⁵ One way of expanding trade lending was to acquire more funds from abroad via trade acceptances.⁶⁶ As Balderston puts it, ‘the *Kreditstopp* opened the door to the internationalization of the German money supply’.⁶⁷

Finally, some of the ‘foreign’ capital was arguably of domestic origin. James 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.⁶⁸ 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’.⁶⁹ His statement likely applied to both municipalities and banks. Balderston blames excess capacity in the mechanized industries on an ‘excess supply of real capital’ channelled by the financial system.⁷⁰ Lewis, 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’.⁷¹

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 long-term gross lending to central Europe also points in this direction. Accominotti and Eichengreen 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.⁷² They assign some of the volatility in foreign investment to the failure of lenders to assess debtors’ creditworthiness.⁷³

⁶³ This credit growth had been in part fuelled by inflation, which had meant increasing profits for firms and easy repayment of debt, thereby incentivizing borrowing. See James, *German slump*, p. 134.

⁶⁴ The *Kreditstopp* was implemented to ‘shake the bad apples out of the tree’ (see James, *German slump*, p. 134). Schacht thought there had been ‘massive misinvestment’ during the inflation period.

⁶⁵ 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 II.

⁶⁶ Balderston, *Origins*, p. 140.

⁶⁷ *Ibid.*

⁶⁸ James, ‘Causes of the German banking crisis’; *idem*, ‘Die Reichsbank’.

⁶⁹ Straumann, 1931, pp. 4–5. J. P. Morgan also famously criticized 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, 1931, p. 17).

⁷⁰ Balderston, *Origins*, p. 80.

⁷¹ Lewis, *America’s stake*, p. 377.

⁷² Accominotti and Eichengreen, ‘Mother’.

⁷³ Borio, James, and Shin, ‘Monetary and financial system’.



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.⁷⁴ 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.⁷⁵ 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.⁷⁶ The fact that investors responded more to factors outside the recipient countries is in line with Mauro, Sussman, and Yafeh's suggestion that investors in emerging markets have become increasingly concerned with global financial conditions rather than the economic state of individual countries.⁷⁷

The effect of the Dawes Plan was enhanced by intense competition for foreign lending coming especially from the United States. Latin America and Central Europe figured prominently as exciting destinations for loans, with Lewis, 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.'⁷⁸ Thomas Lamont of J. P. Morgan & Co., in 1927, described a 'horde of American bankers sitting on [European governments'] doorsteps, and offering them money'.⁷⁹ Germany ended up the top recipient of foreign dollar loans over the period 1925–9.⁸⁰

Many banks had welcomed the capital inflow, which induced them to pursue aggressive investment strategies. Some of the inflow was initially 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-sized 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 (alternatively referred to as 'liabilities for clients' or trade acceptances).⁸¹ These credits were initially contingent on the presentation of documents proving the trade transaction, so that they be matched by a loan of similar maturity on the asset side. However, over time firms with ongoing foreign business became allowed to use such credits for domestic, potentially longer-term business,

⁷⁴ Ritschl, *Deutschlands Krise*; idem, 'Reparations'. 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, 'Transfer problem').

⁷⁵ On the impact of high rates leading to a supply shock in the US stock market as well, see Postel-Vinay, 'Credit boom'.

⁷⁶ Ritschl, 'International capital movements'; Straumann, 1931, p. 12.

⁷⁷ Mauro, Sussman, and Yafeh, *Emerging markets*. 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, *Origins*, p. 129).

⁷⁸ Lewis, *America's stake*, p. 377.

⁷⁹ *Ibid.*, p. 380. 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).

⁸⁰ Following Germany were Canada, Italy, Australia, Chile, Argentina, Brazil, and Colombia (*ibid.*, p. 393).

⁸¹ Balderston, *Origins*, p. 141; Harris, *Foreign indebtedness*, p. 19.

**TABLE 1** Types of foreign liabilities at German banks, 1925–33 (estimated, RM million).

State at end of June	'Liabilities for clients' or 'trade deposits' (1)	Foreign-owned deposits (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

Note: In column (1) 'Liabilities for clients' (*Seitens der Kundschaft bei Dritten benutzte Kredite* on the monthly balance sheets) were initially credits arranged on clients' behalf with foreign banks for the financing of foreign trade, often referred to as trade acceptances. 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, *Foreign indebtedness*; Conolly, *Memorandum*; and Lary, *United States*. These estimates relate to all types of banks (not just the monthly reporting banks) and are taken from *Untersuchung des Bankwesens* 1933, part I, p. 512, and Balderston, *Origins*, tab. 5.7, p. 144.

and the practice became widespread.⁸² In this paper we loosely refer to those initially trade-related acceptances or contingent liabilities as 'trade deposits' to reflect this evolution.⁸³

Eventually, as presented in table 1, 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 then exchanged it into Reichsmarks.⁸⁴ 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'.⁸⁵ Conolly and Lary estimated that about half the short-term inflow to banks was made up of deposits unrelated to trade.⁸⁶

There is widespread, albeit 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'.⁸⁷ The rate at which Germans could take out foreign-currency loans from banks tended to fall further than the Reichsbank rate, which

⁸² Balderston, *Origins*, p. 141; see also Harris, *Foreign indebtedness*.

⁸³ On banks' liability side these appeared as '*Seitens der Kundschaft bei Dritten benutzte Kredite*,' hence 'Liabilities for clients'. Initially, when they were properly matched by a trade-based asset, their properties were quite different to 7-day and 3-month deposits. The literature suggests that they became increasingly similar to the latter, although their exact properties at the end of the period remain unknown.

⁸⁴ *Ibid.*

⁸⁵ James, *German slump*, p. 320. Harris, *Foreign indebtedness*, notes that credits from London were more likely to be related to trade than those coming from the United States.

⁸⁶ Conolly, *Memorandum*, pp. 362, 356; Lary, *United States*, p. 113.

⁸⁷ Harris, *Foreign indebtedness*, p. 6; Conolly, *Memorandum*, pp. 356–62.



made them more attractive than domestic-currency borrowing. Schacht felt powerless about this issue despite central bank rates falling from 9 per cent in January 1926 to 5 per cent in 1927.⁸⁸ 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'.⁸⁹

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...'.⁹⁰

James criticizes the level of blindness among public authorities about bank weaknesses towards the end of the 1920s.⁹¹ He incriminates their 'misplaced optimism' and, later, their focus on banks' foreign deposits as a potential source of instability in case of withdrawals, rather than 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.⁹² Even on the question of foreign deposits' prevalence among banks, the Reichsbank was badly informed.⁹³ 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.⁹⁴

II | EMPIRICAL APPROACH AND DATA COLLECTION

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 be met with two main challenges. The first is the possibility that some 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. Demand may have been particularly high just following hyperinflation. Such confounding factors would

⁸⁸ Balderston, *Origins*, p. 149.

⁸⁹ Straumann, *1931*, pp. 32–3.

⁹⁰ *Ibid.*, p. 159.

⁹¹ James, 'Causes of the German banking crisis'.

⁹² Schacht was more vocal about the risks private US investors were taking in directly investing in German municipalities (see James, *German slump*, 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 of RM 120 million to the City of Berlin.

⁹³ Burhop, 'Historiography'.

⁹⁴ 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 (see James, 'Causes of the German banking crisis').



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, from a historical perspective the importance or otherwise of foreign inflows matters, and data on the geographical origin of the new deposits seem necessary at first sight.⁹⁵

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 liability growth in the 1920s. The banks that had the largest such holdings in 1930 saw their 3-month and 'trade deposits' grow fastest, whereas the other banks saw greater growth in their 7-day and interbank deposits. This suggests that we should focus on the former (for more detail on data sources and definitions, see sections II and III).

The next natural step is to run a panel regression over the period 1925–30 in which we explore the relationship between the relevant deposit types and changes in risk-taking. We use fixed effects to control for any unobserved heterogeneity coming from individual banks such as different risk-preference profiles. Additionally, to alleviate endogeneity concerns, we follow Dinger and te Kaat in including only the months in which German borrowing costs fell, either relative to US rates or in foreign currency.⁹⁶ 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.⁹⁷ 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 US 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.'⁹⁸

Our second foreign funding supply indicator is the German foreign borrowing cost, taken from Balderston.⁹⁹ 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 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.

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

⁹⁵ Parallels between a foreign capital inflow and a loosening of domestic monetary policy are explicitly drawn by Acharya and Naqvi and Dinger and te Kaat, with implied similar consequences in terms of bank risk-taking. See Acharya and Naqvi, 'Seeds of a crisis'; Dinger and te Kaat, 'Capital flows'. Note, however, that some differences might persist. For instance, given the known volatility of foreign inflows, banks might act more cautiously as recipients. However, 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.

⁹⁶ Dinger and te Kaat, 'Capital flows'.

⁹⁷ More specifically, the US commercial paper rate and the Berlin rate on 3-monthly paper (see Ritschl, *Deutschlands Krise*; and idem, 'Capital movements').

⁹⁸ Balderston, *Origins*, p. 149.

⁹⁹ Ibid.

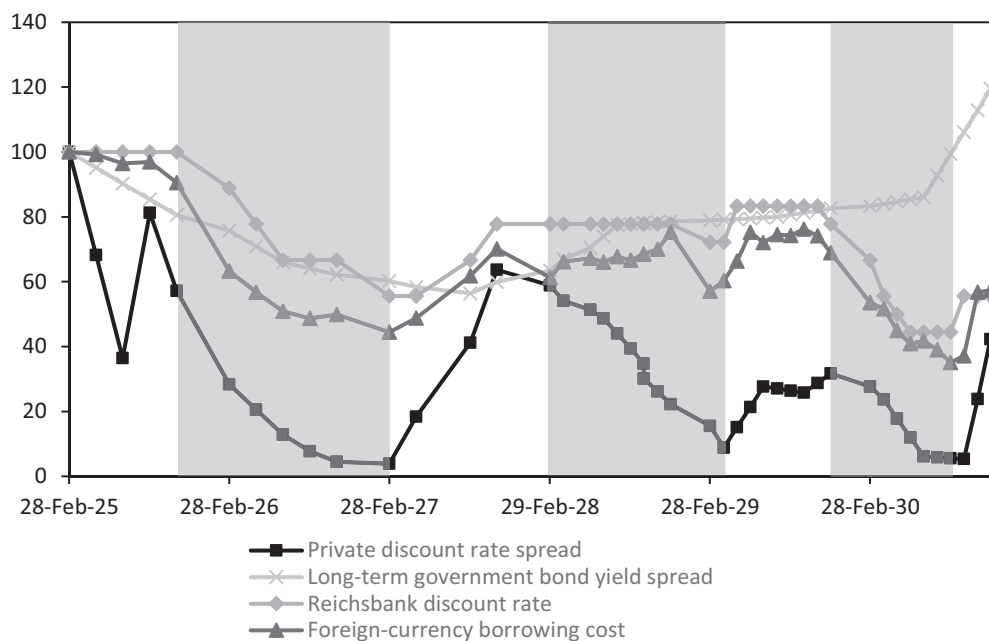


FIGURE 1 US–Germany private discount spread, foreign-currency borrowing cost, long-term government bond yield spread and Reichsbank discount rate indices (28 February 1925 = 100). *Sources:* The Reichsbank discount rate is from Balderston, *Origins*, tab. 5.9, p. 148. The German long-term bond yield is from Jordà, Schularick and Taylor, *Macrofinancial History*, and the US equivalent from Carter et al., *Historical Statistics*, Series Cj1192. The US and German private discount rates are from Ritschl, *Deutschlands Krise*: respectively, these are the US commercial paper rate and the Berlin rate on 3-monthly paper (see also Ritschl, ‘Capital movements’). 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, *Origins*, p. 141 and tab. 5.6 and 5.8).

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, meanwhile, remained far above the Federal Reserve discount rate throughout the period (its lowest level was 5 per cent in January 1927, a level at which it stayed only briefly before quickly reaching 7 per cent once again).¹⁰⁰ The cost of borrowing from German banks in foreign currency also declined significantly more than the Reichsbank discount rate, a point clearly emphasized by Balderston.¹⁰¹ 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’.¹⁰²

¹⁰⁰ The Reichsbank’s relative and very temporary loosening was a reaction to the supply of funds from abroad – 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).

¹⁰¹ Balderston, *Origins*, p. 149.

¹⁰² Ibid. Schacht attempted to limit foreign lending by freeing up the parity within the gold points in August 1926, but to little effect. See also Hardach, *Weltmarktorientierung*.



And insofar as exogenous domestic monetary policy mattered 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, the increase in international deposits at some banks might lead to more domestic funds being available at other banks.¹⁰³ 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.

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.¹⁰⁴ This puts this instrument's relevance under little doubt and is confirmed by our first-stage results (see section III).

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 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, as some of the largest banks benefitted from bailout guarantees that could potentially fuel further risk-taking.¹⁰⁵ In the German historiography, however, increases in risk-taking in the 1920s have usually been explained by the intensification of interbank competition around that time, and not by a TBTF environment.¹⁰⁶

Granted, large banks benefitted 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.¹⁰⁷ 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.

However, similar evidence for an implicit bailout guarantee is lacking.¹⁰⁸ At the time, oversight of the German banking system was largely influenced by 'corporatist regulation'. The German

¹⁰³ Dinger and te Kaat, 'Capital flows'. 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.

¹⁰⁴ Dinger and te Kaat, 'Capital flows'; Schnabel, 'German twin crisis'.

¹⁰⁵ Fahri and Tirole, 'Moral hazard'. In addition, in the United States the largest banks are more likely to be universal banks, which can lead to agency and corporate governance issues (see Leaven, Ratnovski, and Tong, 'Bank size, capital, and systemic risk').

¹⁰⁶ See section I. See also Born, *Bankenkrise*; Lüke, *Von der Stabilisierung*; Balderston, 'German banking'. In 1920s Germany, joint-stock credit banks were nearly all universal banks (see Fohlin, 'Regulation'), so universal banking is unlikely to have been a characteristic confined to the largest banks.

¹⁰⁷ Balderston, *Origins*, p. 140.

¹⁰⁸ On 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 (see Schnabel, 'German twin crisis'). However, in what follows we show that 'corporatist regulation' hardly amounted to a bailout guar-



banking system had been only very lightly regulated through most of the nineteenth century. Following the 1907 crisis,¹⁰⁹ 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 the country (e.g. 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.¹¹⁰

In the end, the Reichsbank felt rather powerless in the face of increased competition in the 1920s and was dissatisfied with the resulting lack of constraints on bankers' investment and growth decisions. However, 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.¹¹¹ On the contrary, the emphasis is usually on the rather restrictive, albeit ineffective given the international context, credit policies at the Reichsbank. For instance, Hardach notes that '[large] German banks borrowed heavily abroad to circumvent the restrictive credit policy of the Reichsbank'.¹¹² In addition, adherence to the Gold Standard imposed severe fiscal constraints on the German state that bankers could hardly have been unaware of in terms of any implicit bailout guarantee.¹¹³

antee. Her 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, 'Twin crises'), although they are usually applied to later periods.

¹⁰⁹ The 1907 crisis started in the United States 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 (see Odell and Weidenmier, 'Real shock'). It affected Germany to a much lesser extent (see Borchart, 'Währung und Wirtschaft').

¹¹⁰ Feldman, *Great disorder*, p. 31; Hardach, 'Zwischen Markt und Macht'; Krieghoff, 'Banking regulation', p. 71.

¹¹¹ Contrary to the credit banks, the publicly owned *Sparkassen* probably benefitted from a more credible guarantee. They made reference to it in their aggressive attempts to acquire new customers (see Krieghoff, 'Banking regulation', p. 76).

¹¹² Hardach, 'Banking and industry'. In the end though, some of the largest banks were bailed out in 1931–2. Note, however, that this could not have been predicted in the 1920s on the basis of all the available information at the time. The bailouts could not have happened without such unpredictable external events as Hoover's moratorium on German debt and the Standstill Agreements, which considerably increased the fiscal headroom and made these bailouts possible.

¹¹³ Germans got a taste of the kinds of dilemmas generated by the Gold Standard in 1927. Shortly after the crash, which had been partly engineered by Schacht himself, economic activity was reduced and banks were contracting lending. At the same time, confidence in the currency was weakening and the country experienced some capital outflow. Schacht hesitated between a slight loosening of monetary policy to help the banking system and tightening in defence of the currency. In June 1927 he reversed his cheap money policy, and tightened it further in October (see Balderston, *Origins*, p. 155; see also Voth, 'With a bang'). The central bank's response to the crisis echoed earlier decisions made when the 1907 panic reached German shores (Borchart, 'Währung und Wirtschaft', p. 30). 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. Here, she openly admits the dilemmas mentioned above. She tones down the issue by emphasizing 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. 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 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.



To summarize, the presence of an implicit liquidity guarantee for Germany's largest banks cannot be excluded. At the same time, the argument that they also benefitted 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, which is more likely to be affected by any bailout guarantee than liquidity, are much less likely to be found. Although it is true that the largest banks tended to be more levered, 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. Capital inflows enticed banks to expand market share further and lend in new territories, which impacted their leverage.

The conclusion we draw from the above is that initial bank size can be used as an instrument in an IV regression of leverage on being a 'foreign-inflow' bank, but not in an IV regression where liquidity is the dependent variable. In our panel regressions of leverage on foreign inflows, controlling for bank size would be both unnecessary, since it does not represent a significant source of omitted variable bias (OVB), and lead to spurious results (due to strong multicollinearity concerns). However, in our regressions of liquidity on foreign inflows, bank size should be included, as OVB would be a greater concern than collinearity.¹¹⁴ Before we present our results, however, let us first introduce our data.

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 1930. The DRPS released data to the public almost every month from 1928 onwards except in December and January, and on a bimonthly basis prior to this. This source – its 1930 and 1931 sections in particular – has previously been used (notably by Schnabel and Blickle, Brunnermeier, and Luck) but to the best of our knowledge no one had collected these data on such a long time span before.¹¹⁵ The most important months for our analysis are the ones preceding the 1931 crisis, from 1925 to 1930. As the accounting scheme changed slightly in 1928, we merged the two accounting schemes in such a way that all items present in 1925 could be followed up to 1930.¹¹⁶

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.¹¹⁷ Our data include more than 50 balance sheet items. Unfortunately, we cannot exclude the possibility of some measure of window dressing in these published balance sheets. The fact that the banks were regulated by an independent central bank mitigates the issue but does not eliminate it.¹¹⁸

¹¹⁴ 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. To the extent that bank size has a direct effect on liquidity, collinearity becomes less of an issue than OVB.

¹¹⁵ Schnabel, 'German twin crisis'; eadem, 'Role of liquidity'; and Blickle, Brunnermeier, and Luck, 'Who can tell?'

¹¹⁶ Items only present from 1928 onwards were discarded.

¹¹⁷ Schnabel, 'German twin crisis'. Data on private banks are thin.

¹¹⁸ For example, there is some evidence that, from 1929 onwards, some banks bought their own shares (see James, 'Causes of the German banking crisis'). This would overestimate the level of capital and therefore lead to an underestimation of the level of leverage at some banks. In general, there is evidence from tax assessments that banks overestimated their profits



To complement this information, we make use of data obtained from confidential filings to the Reichsbank in 1930.¹¹⁹ 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. Interestingly, although the data do not differentiate between RM and foreign currency items, it reveals that the median bank held around 2.2 times as many foreign liabilities as foreign assets, and the average bank almost four times as many.¹²⁰

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.¹²¹ 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, 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.¹²² 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 9499 observations from 1925 to 1935 on a bimonthly or monthly basis, and appendix A provides a summary of the main statistics and sources for these data.

The German banking landscape kept evolving throughout the 1920s. Although most of the merging activity took place before 1926, the process was not over.¹²³ 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.¹²⁴ This process affected a small minority of banks. In appendix F we explain how we dealt with those.

III | RESULTS

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 I), which we call ‘trade deposits’. In February 1925, the largest holdings on average were of 7-day deposits (RM 24 million), followed by 3-month deposits (RM 19 million), interbank deposits (RM 7 million), and finally, trade deposits (RM 3 million), with significant variation across banks (all figures are given in Reichsmarks, although a significant portion of these deposits were in US

in the 1920s (see Spörer, ‘Window-dressing’). Unfortunately, such behaviour is difficult to account for. One can hope that overestimation behaviour affected all banks uniformly, in which case the impact on our data would be mitigated.

¹¹⁹ We thank Stephan Luck, Markus Brunnermeier, and Kristian Blickle for kindly sharing their data with us.

¹²⁰ It is of course possible that some banks would have dropped in and out of a high-foreign-inflow group between 1925 and 1929, but unfortunately it is not possible to exclude this possibility.

¹²¹ Ritschl, *Deutschlands Krise*.

¹²² Balderston, *Origins*.

¹²³ Hardach, ‘Banking and industry’.

¹²⁴ This number usually hovers between 130 and 140.

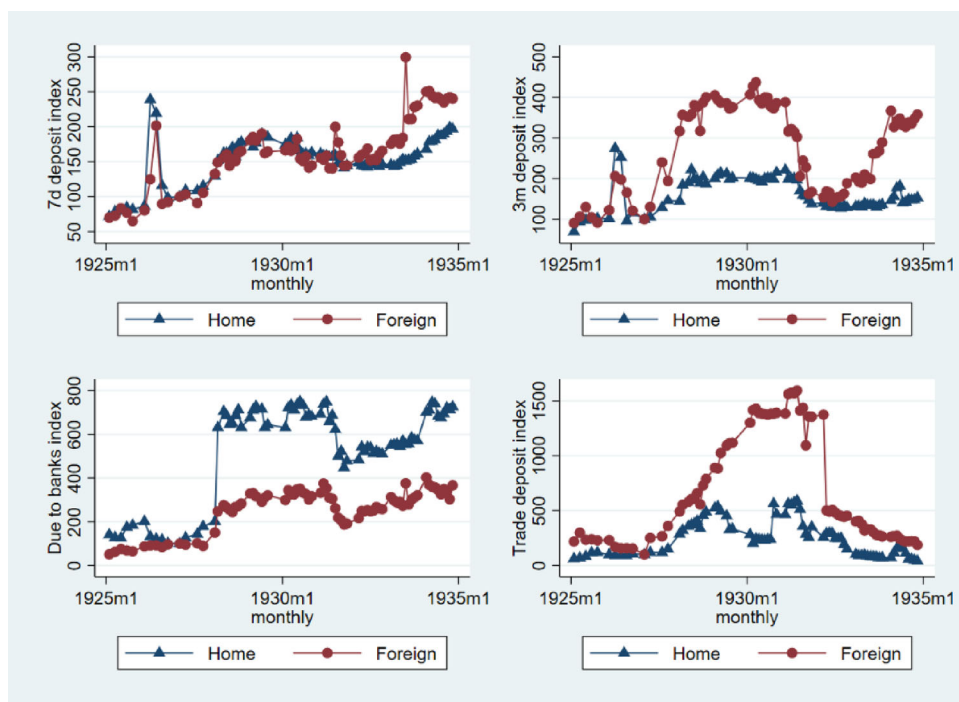


FIGURE 2 The 7-day, 3-month, interbank and ‘trade’ deposits at ‘foreign-inflow’ and ‘home-focused’ banks (February 1927 = 100). *Note:* Sudden movements in 7-day and 3-month deposits in 1926 are unexplained for the time being. This and the relatively low number of banks at the start of the period explain the choice of early 1927 as the index base. The data are winsorized at the 1st and 99th percentile due to large outliers. *Source:* See text. [Colour figure can be viewed at wileyonlinelibrary.com]

dollars).¹²⁵ 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. On the basis of these 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.

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, by a factor of 2–5. However, growth at the foreign-inflow banks was even greater, by a factor of 4–15. By contrast, home-focused banks saw a greater increase in their interbank deposits than the

¹²⁵ This suggests the RM amounts might be affected by the US dollar exchange rate. However, variations were very small after 1924 due to Germany and the United States’s adherence to the Gold Standard. For peace of mind, we control for the exchange rate in all our models.

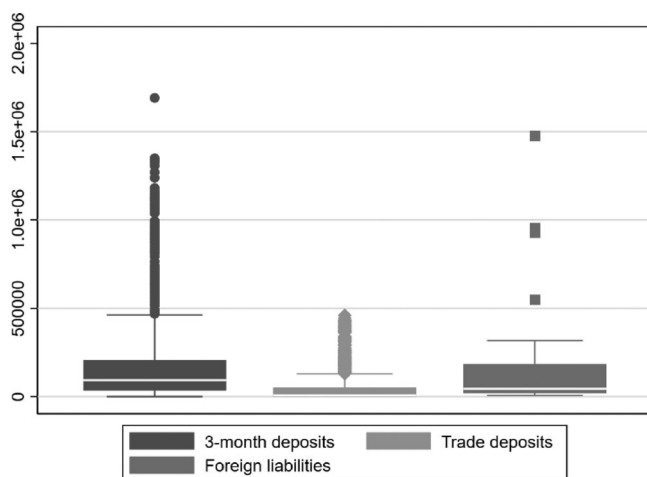


FIGURE 3 The 3-month, trade, and foreign liabilities at the 22 foreign-inflow banks, June 1930 (thousand RM). *Source:* See text.

foreign-inflow banks, and there is not much difference in terms of 7-day deposits. Since we know that most of the increase in foreign liabilities occurred between 1926 and 1930 (see section I), 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 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.¹²⁶

Formally, we first estimate a model such that:

$$Capital_TA_{i,t} = \alpha_{i,t} + \beta Capital_Inflows_{i,t-3} + \delta Controls_{i,t} + \epsilon_{it}, \quad (1)$$

where i indexes banks and t months. In this baseline specification, $Capital_TA_{i,t}$, the ratio of capital to total assets, is our dependent variable.¹²⁷ $Capital_Inflows_{i,t-3}$, our main explanatory variable, is the sum of 3-month deposits and trade deposits divided by total assets, lagged three time periods to allow for dynamic effects.¹²⁸ This model is estimated via fixed effects. Individual (bank) fixed effects help control for any unobserved heterogeneity that may affect each particular bank individually (for instance, different risk-preference profiles).

We then add a number of time-varying macroeconomic controls. These help control for any macroeconomic shocks that may affect all banks at a particular point in time. 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/US dollar exchange rate in case it had an impact on RM deposit levels.¹²⁹ 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

¹²⁶ 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.

¹²⁷ The absence of data on profits and losses prevented us from using other variables, such as z-scores.

¹²⁸ The results are robust to other lag specifications.

¹²⁹ The exchange rate was not completely fixed due to adherence to the gold 'exchange' standard.



account deficit. Appendix A provides some summary statistics on each of these variables, along with information on their frequency and sources. For robustness, we also estimate an OLS model with time fixed effects. In this model, macroeconomic controls are redundant as any macroeconomic fluctuations that vary only in the time dimension are automatically controlled for. These results are presented in appendix table B1, and they are very similar.¹³⁰

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-3*}). They are all divided by total assets and lagged three periods. Finally, we add dummies for different types of banks (Big Berlin, Girozentralen, and Staats- and Landesbanken) and interact them with *Capital_Inflows*_{*i,t-3*} 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 presented in table 2.

In the first column we look at the impact of *Capital_Inflows*_{*i,t-3*} 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 *Capital_Inflows*_{*i,t-3*} 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.

In the next column (2), we compare the relative effects of 3-month and trade deposits with *Domestic_Deposits*_{*i,t-3*}. 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 0.031 and 0.2, 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.¹³¹ Our results, which can be visualized 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.

Another interesting aspect of our results is that banks receiving greater inflows also ended up investing more in uncollateralized loans. This is shown in appendix C, in which *TradeLoansNoCov_TA*_{*i,t*}, the ratio of uncollateralized trade loans to total assets, is the dependent variable. These loans constituted a particular type of asset counterpart of acceptances, which, as we saw in section I, ended up being increasingly used for purposes unrelated to trade, and indeed increasingly uncollateralized. The results presented in table C1 imply that it was especially the banks receiving high amounts of trade deposits that invested in these uncovered loans. This strengthens the idea that those banks' equity profile changed over time.

¹³⁰ Note, however, that our main model is stronger as it controls for both bank fixed effects and many significant time-varying macroeconomic variables, whereas this one only includes time fixed effects. Including both types of fixed effects simultaneously would greatly reduce any available variation in the dataset.

¹³¹ 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).

**TABLE 2** The impact of foreign inflows on bank leverage, fixed effects model.

Dependent variable	(1) <i>Capital_TA_{i,t}</i>	(2) <i>Capital_TA_{i,t}</i>	(3) <i>Capital_TA_{i,t}</i>	(4) <i>Capital_TA_{i,t}</i>	(5) <i>Capital_TA_{i,t}</i>
<i>Capital_Inflows_{i,t-3}</i>	-0.0782*** (0.0146)	-0.0781*** (0.0146)			-0.114*** (0.0170)
<i>Domestic_Deposits_{i,t-3}</i>		-0.0153 (0.0121)			
<i>3Month_Deposits_{i,t-3}</i>			-0.0319** (0.0155)		
<i>Trade_Deposits_{i,t-3}</i>				-0.200*** (0.0292)	
<i>Capital_Inflows_{i,t-3}</i> * <i>BigBerlin_{i,t}</i>					0.0874 (0.0768)
<i>Capital_Inflows_{i,t-3}</i> * <i>Giro_{i,t}</i>					0.139*** (0.0537)
<i>Capital_Inflows_{i,t-3}</i> * <i>StaatLand_{i,t}</i>					0.141*** (0.0372)
<i>Reichsbank_t</i>	-0.00517 (0.00484)	-0.00495 (0.00485)	-0.00514 (0.00488)	-0.00545 (0.00482)	-0.00480 (0.00482)
<i>USDX_t</i>	-0.000233 (0.000857)	-0.000335 (0.000861)	-0.000209 (0.000864)	-0.000155 (0.000853)	-0.000166 (0.000854)
<i>Nat_Income_t</i>	0.0212 (0.0342)	0.0159 (0.0345)	0.0237 (0.0345)	0.0235 (0.0340)	0.0222 (0.0341)
<i>Capital_Stock_t</i>	-0.0317 (0.0257)	-0.0236 (0.0265)	-0.0372 (0.0259)	-0.0380 (0.0256)	-0.0340 (0.0257)
<i>CPI_t</i>	-0.00152 (0.00260)	-0.00172 (0.00260)	-0.00148 (0.00262)	-0.00126 (0.00258)	-0.00133 (0.00259)
<i>Consumption_t</i>	-0.00495 (0.0413)	-0.00735 (0.0414)	-0.00144 (0.0417)	-0.000315 (0.0411)	-0.00312 (0.0411)
<i>Investment_t</i>	-0.0114 (0.0184)	-0.00739 (0.0187)	-0.0139 (0.0186)	-0.0139 (0.0183)	-0.0121 (0.0183)
<i>Deficit_t</i>	-1.40e-05 (2.00e-05)	-1.81e-05 (2.02e-05)	-1.26e-05 (2.01e-05)	-1.07e-05 (1.99e-05)	-1.25e-05 (1.99e-05)
<i>Current_Balance_t</i>	0.0802 (0.0657)	0.0599 (0.0676)	0.0936 (0.0662)	0.0959 (0.0652)	0.0860 (0.0655)
Constant	8.923 (6.175)	7.493 (6.277)	10.07 (6.223)	10.00 (6.136)	9.124 (6.157)
Bank fixed effects	Yes	Yes	Yes	Yes	Yes
R ² between	0.109	0.141	0.1245	0.002	0.019
R ² overall	0.064	0.085	0.044	0.002	0.036
Observations	1670	1670	1670	1669	1670
N	137	137	137	137	137

Note: 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 $\alpha = 0.10$. Standard errors in parentheses. Source: See text.

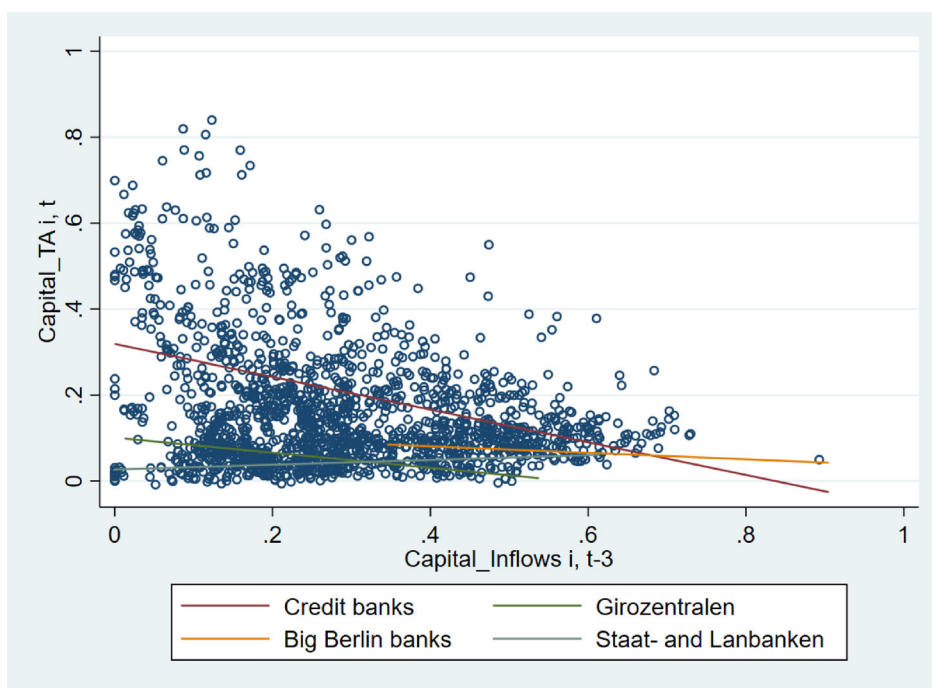


FIGURE 4 Scatterplot of $Capital_Inflows_{i,t-3}$ and $Capital_TA_{i,t}$, by type of bank. *Source:* See text. Falling rates periods only. [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com/doi/10.1111/ehr.13277)]

Next, we examine the same baseline specification with $Liquidity_TA_{i,t}$ as our dependent variable. This is the ratio of cash and deposits at central banks to total assets. We look at the effect on bills of exchange separately given their connection with the *Kredistopp* of 1924, which may have led some banks to become complacently reliant on this form of liquidity (see section II). As previously explained in section II, in this model it makes sense to control for bank size. If bank size affected leverage only indirectly through inflows, then including it as a control in our main specification would be unnecessary and 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.¹³² Furthermore, if bank size affected liquidity directly and independently of inflows, then in a model with liquidity as the dependent variable omitting bank size entirely would be worse than including it. The augmented fixed effects specification we propose adds bank size, $\ln TA_{i,t-3}$, as a control to our baseline liquidity specification and interacts it with $Capital_Inflows_{i,t-3}$ to obtain:

$$Liquidity_TA_{it} = \alpha_{it} + \beta Capital_Inflows_{i,t-3} + \gamma \ln TA_{i,t-3} + \theta Capital_Inflows_{i,t-3} * \ln TA_{i,t-3} + \delta Controls_{it} + \epsilon_{it}. \quad (2)$$

This model is superior to an equivalent model without bank size, but still suffers from some level of collinearity. Bank size is measured by the natural logarithm of banks' total assets, lagged

¹³²The assumption that bank size affected leverage only indirectly through inflows is untestable. We can only rely on a description of the historical context. This is done in section II.

**TABLE 3** The impact of foreign inflows on liquidity, augmented fixed effects model.

Dependent variable	(1)	(2)	(3)	(4)	(5)
	<i>Liquidity_</i> <i>TA</i> _{<i>i,t</i>}	<i>Liquidity_</i> <i>TA</i> _{<i>i,t</i>}	<i>Liquidity_</i> <i>TA</i> _{<i>i,t</i>}	<i>Liquidity_</i> <i>TA</i> _{<i>i,t</i>}	<i>Liquidity_</i> <i>TA</i> _{<i>i,t</i>}
<i>Capital_Inflows</i> _{<i>i,t-3</i>}	0.0235 (0.0158)	0.0274* (0.0158)			0.0468 (0.0311)
<i>Domestic_Deposits</i> _{<i>i,t-3</i>}		0.00619*** (0.00236)			
<i>3Month_Deposits</i> _{<i>i,t-3</i>}			0.0179 (0.0172)		
<i>Trade_Deposits</i> _{<i>i,t-3</i>}				0.0606 (0.0699)	
<i>lnTA</i> _{<i>i,t-3</i>}	-0.00346*** (0.00124)	-0.00360*** (0.00124)	-0.00433*** (0.00122)	-0.00376*** (0.00124)	-0.00230 (0.00226)
<i>Capital_Inflows</i> _{<i>i,t-3</i>}	-0.00314** (0.00152)	-0.00352** (0.00153)			-0.00599* (0.00308)
<i>3Month_Deposits</i> _{<i>i,t-3</i>}			-0.00227 (0.00169)		
<i>Trade_Deposits</i> _{<i>i,t-3</i>}				-0.00694 (0.00619)	
<i>Capital_Inflows</i> _{<i>i,t-3</i>}					0.0226 (0.0156)
<i>*BigBerlin</i> _{<i>i,t</i>}					0.0191** (0.00943)
<i>Capital_Inflows</i> _{<i>i,t-3</i>}					0.0207** (0.00920)
<i>*Giro</i> _{<i>i,t</i>}					0.0207** (0.00920)
<i>Capital_Inflows</i> _{<i>i,t-3</i>}					0.0207** (0.00920)
<i>*StaatLand</i> _{<i>i,t</i>}					0.0207** (0.00920)
Constant	-2.905** (1.200)	-2.326* (1.217)	-2.820** (1.203)	-2.748** (1.200)	-2.785** (1.083)
Controls	Yes	Yes	Yes	Yes	Yes
<i>R</i> ² between	0.101	0.104	0.100	0.100	0.105
<i>R</i> ² overall	0.073	0.060	0.100	0.074	0.089
Observations	1670	1670	1670	1670	1670
<i>N</i>	137	137	137	137	137

Note: 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 $\alpha = 0.10$. Standard errors in parentheses. Source: See text.

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).¹³³ Although a good degree of caution is warranted in interpreting this model's results, they are presented in table 3.

¹³³ 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.

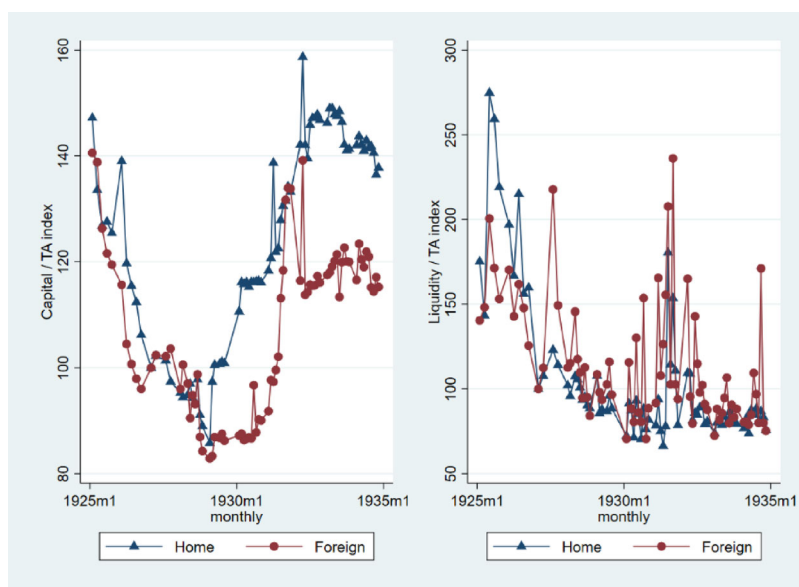


FIGURE 5 Capital and liquidity ratios (1927 = 100) at home-focused and foreign-inflow banks, 1925–34. *Source:* See text. [Colour figure can be viewed at wileyonlinelibrary.com]

Not surprisingly, size has a significant, negative impact on liquidity. However, capital inflows do not seem to have a strong independent effect on liquidity. Although larger banks tend to reduce their liquidity more in response to inflows, the effect is quite small (0.003). The negative effect among larger banks on short-term lending is bigger, but the average effect is in fact positive (see appendix D, which uses $LoanShort_TA_{i,t}$, the ratio of short-term loans to total assets, as the dependent variable). Similar conclusions can be drawn relative to the ratio of bills of exchange to total assets, $Billall_TA_{i,t}$ (appendix E). Although a rise in trade deposits seems to lead to higher bill amounts at larger banks (see column 4), neither average capital inflows nor size seem to have much of an effect. Thus, on average, it is unlikely that inflows really had a negative impact on banks' liquidity decisions prior to the crisis.

It is therefore clear that inflows had a more negative impact on banks' leverage. Figure 5 in section III below lends further support to this finding by showing a contrast between leverage and liquidity trends among foreign-inflow and home banks. It is possible to speculate that banks were aware of possible withdrawal risks associated with the German government's fiscal troubles leading to currency risk. After all, the hyperinflation of 1923 and its concurrent episodes of capital flight were only a few years back. As a result, banks may have sought to compensate movements in foreign money with additional liquidity. Furthermore, since the scale of capital inflow was unprecedented, it is likely that they were less aware of its potential impact on lending decisions and leverage.¹³⁴

If bank size only affected leverage through capital inflows, it can then be used as an instrument for inflows in an 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

¹³⁴Note, however, that in the early years of the inflation, foreign capital had flown to Germany to a significant extent (see [Holtfrerich](#), 'Capital exports'). Yet the scale of the inflow was likely unprecedented.



bank size as the natural logarithm of total assets in 1925 rather than its three-period lag.¹³⁵ 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. We can then instrument this binary variable, *ForeignInflowBank_i*, with our initial bank size variable, taking various measures of risk-taking 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:

$$Capital_T A_i = \alpha_i + \beta ForeignInflowBank_i + \delta Controls_i + \epsilon_i. \quad (4)$$

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 some credit banks with larger capital inflows exhibited somewhat greater reliance on this potentially problematic form of liquidity. However, it appears from appendix figure E1 that even there the issue seems to have been more serious towards the beginning rather than on the eve of the financial crisis.

Is the positive relationship between being a foreign-inflow bank and increasing leverage simply the result of chance correlation? Our IV approach allows us to minimize this potential explanation. Table 4 gives our estimates of this model. 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. Additionally, as with our baseline, the results are less consistently strong regarding liquidity.

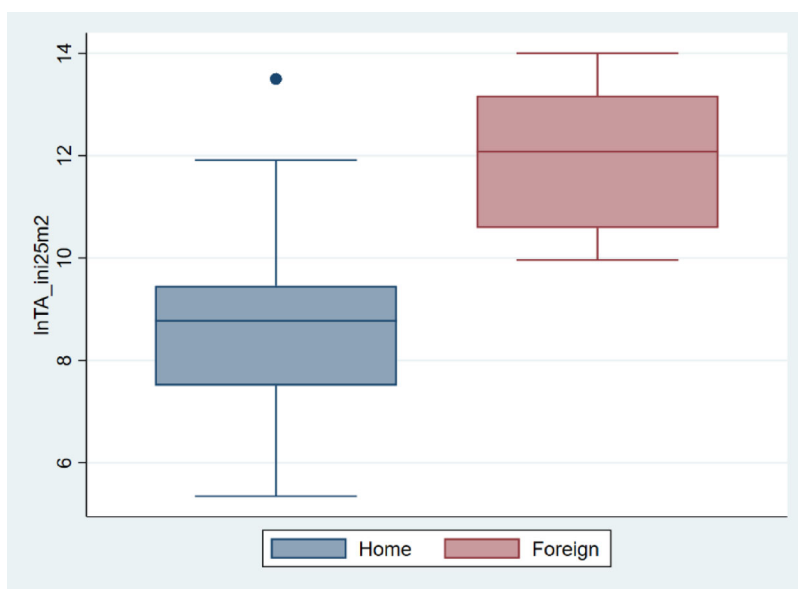
All in all, these results give further weight to the idea that, controlling for macroeconomic factors and mitigating endogeneity concerns in a number of ways, large banks, which as a result of

¹³⁵ Unlike in the baseline estimation setting, where 1925 is mostly excluded as a non-falling rate period.

**TABLE 4** Instrumental variable (IV) estimates for impact of foreign inflows on risk-taking.

Dependent variable	(1) <i>Capital_TA_i</i>	(2) <i>Capital_TA_i</i>	(3) <i>Capital_TA_i</i>
Instrument	<i>LnTA_25m2_i</i>	<i>LnTA_25m8_i</i>	<i>LnTA_26m8_i</i>
<i>ForeignInflowBank_i</i>	-0.195*** (0.062)	-0.241*** (0.059)	-0.271*** (0.063)
Constant	-0.0539 (0.807)	-0.139 (0.854)	-0.002 (0.915)
Controls	Yes	Yes	Yes
10% Stock–Yogo critical value	16.38	16.38	16.38
1st stage <i>F</i> -statistic	43.9	50.35	51.6
1st stage <i>p</i> -value	0.000	0.000	0.000
<i>R</i> ²	-0.104	-0.297	-0.433
Observations	69	95	106

Note: 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 $\alpha = 0.10$. Standard errors in parentheses. Source: See text.

**FIGURE 6** Boxplot of *lnTA_25m2_i*, by *ForeignInflowBank_i*. Source: See text. [Colour figure can be viewed at wileyonlinelibrary.com]

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.

IV | CONCLUSION

Until recently, debates around the causes of the Germany crisis of 1931 have 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. Through both historiographical and statistical analysis our paper contributes to the debate by highlighting the importance of those connections. What these results tend to suggest is that the post-1924 inflows cannot simply be 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 destabilizing ways. As such, our results speak to broader debates on the impact of cross-border capital flows.¹³⁶

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¹³⁶ See Borio, James, and Shin, ‘Monetary and financial system’; Borio and Disyatat, ‘Capital flows’; Rey, ‘Dilemma not trilemma’; Tooze, *Crashed*.



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