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Abstract

We investigate the causal impact of bank runs by exploiting a key feature of the French Great Depression (1930-1931) that created exogenous geographical variations in the withdrawals of bank deposits. Unregulated commercial banks coexisted with government-backed saving institutions (Caisses d'épargne). During the crisis, depositors who had an account in Caisses d'épargne were more likely to withdraw from banks. Pre-crisis density of Caisses d'épargne accounts was unrelated to economic and bank characteristics. Using this variable as an instrument, we find that a 1% decrease in bank branches reduced aggregate income by 1%. Our identification highlights how a shift of deposits towards safer institutions can affect financial fragility. It holds lessons for current financial regulation and the design of central bank digital currency (CBDC).

JEL Classification: E44, E51, G01, G21, N14, N24

Keywords: bank runs, flight-to-safety, banking panics, Great Depression

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1 Introduction

Should we worry about the negative effects of bank runs on real economic activity? The building block of modern banking theory interprets bank runs as a shift in expectations. It follows that "bank runs in the model cause real economic damage, rather than simply reflecting other problems" (Diamond and Dybvig, 1983, p.401). Subsequent theories consider that runs may also be motivated by fundamentals or noisy information (rather than being sunspot equilibria). Nevertheless, they also leave room for contagious panics leading to real effects that are independent of pre-crisis economic and bank fundamentals (Gorton, 1985; Chari and Jagannathan, 1988; Allen and Gale, 1998; Goldstein and Pauzner, 2005; Keister and Narasiman, 2016).

From an empirical point of view, however, the real effects of bank runs are very challenging to estimate. And such difficulties might be interpreted as evidence that genuine bank runs - independent from the quality of assets - are in fact either benign or even non existent. This is first because of the straightforward reverse causality issue. In most cases, a bank run does indeed partly or mostly "reflect other problems" (White 1984, Gorton 1988, Calomiris and Mason 2003b, Iyer et al. 2016 and Mitchener and Richardson 2020). Second, borrowers (firms or households) can find alternative sources of financing, whether debt or equity, to compensate for the stop in bank lending (Khwaja and Mian, 2008). If the Modigliani-Miller theorem holds, the general equilibrium effect of bank runs is null.

This paper identifies the causal effect of bank runs on real activity during the French Great Depression (1930-1931). The identification relies on a key institutional characteristic of this crisis and of the French interwar banking system: the existence of safe alternatives to banks - and their heterogeneous establishment across the country - generated an exogenous variation in the probability of bank runs.

Starting early November 1930, French depositors suddenly withdrew their funds from commercial banks all across the country. Banks were still unregulated at that time (the first banking laws were passed in 1941). As elsewhere during the Great Depression, the French central bank did not expand credit with full allotment to stop the banking panics (Baubeau et al., 2021). A second series of bank runs occurred in the next year, with a spike in September 1931. During both waves

of runs, depositors transferred the funds withdrawn from banks to savings institutions (*Caisses d'épargne*). Contrary to banks, *Caisses d'épargne* (CE from now on) were regulated and they benefited from the guarantee of the government. French *Caisses d'épargne* were of two types: the *Caisses Nationales d'Epargne* (henceforth CNE) and the *Caisses d'épargne ordinaires* (henceforth CEO). The former were created by the French State in 1882 and were accessible everywhere in the country through the Post Office network. The latter had been created earlier by private interests in the mid-19th century and, for historical reasons, heterogeneously distributed across the country. The CEO provided services almost equivalent to banks (except that they did not lend to individuals and firms) and paid a higher interest rate, so that they became more attractive to depositors when banks suddenly faced a nationwide contagion of fear.

The pre-crisis number of CEO accounts per capita was heterogeneously distributed across departments (the French administrative division) and unrelated to local economic performances and bank characteristics. Savings institutions were not allowed to lend (they could only hold government securities), so other sources of borrowing were cut at the local level. We then use the pre-crisis density of CEO to instrument the decline in banking activity during the crisis. Our study is conducted at the departmental level with yearly data. We have reconstructed a comprehensive measure of local economic activity based on tax data on agricultural, commercial, non-commercial and industrial revenues (wages and profits). Banking activity is measured by the number of bank branches in each department. Overall, we find that a 1% decrease in bank branches reduced aggregate income by around 1%. A back-of-the-envelope calculation suggests that our identified causal effect of bank runs may explain one third of the drop in real GDP in 1930-1931.

Our empirical strategy is directly related to the theoretical literature that, following the Diamond-Dybvig model, considers that bank runs can be driven by other factors than fundamentals (see Iyer et al. 2016, Keister and Narasiman 2016 and Mitchener and Richardson 2020 for recent reviews). However, we take into account that banking panics were not independent of economic fundamentals by controlling for many local economic and financial characteristics. Our starting point is that national news and economic events triggered bank runs. But we then aim to explain the heterogeneity of the contagion of bank runs across departments. The key mechanism driving

this heterogeneity (besides fundamentals) in our empirical setting is the existence of safe alternatives to bank deposits, as in the theoretical models of Gorton (1985) or Fernández-Villaverde et al. (2020).[1]

The French panics were not characterized by runs on the interbank market, which have generated a lot a attention in the literature (Freixas et al. 2000, Gorton et al. 2019, Mitchener and Richardson 2019 and Blickle et al. 2020). French banks neither suspended convertibility to signal a better health (Gorton, 1985) nor punish early withdrawals (Fernández-Villaverde et al., 2020). These important characteristics are very helpful for our econometric identification since they make the effect of deposit withdrawals on the health of the bank more direct (and thus on the probability to close a branch).

Two additional considerations are important to justify our identification. First, there are several alternatives to bank deposits, of which the most obvious is cash. Access to cash, nonetheless, is homogeneous across the country. Furthermore, deposits in CE were preferable to cash for savers, as they paid interest rates and were not subject to the risk of destruction or theft. Second, we claim that the pre-crisis density of CEO determines the ex ante probability of a bank run at the department level, not the ex post allocation of deposits. In other words, we do not claim that our instrumental variable explains all withdrawals of deposits or accumulation of savings in 1930-1931. For our instrument to be valid and strong, it is sufficient that it explains a significant part of the differences across French departments in the initial decision to run. We will show that usual statistical tests and the first stage of our IV estimation support our hypothesis.

Our instrumental variable (IV) is the pre-crisis number of accounts in CEO per capita, measured for each department. This is justified by the fact that the transfer of deposits from banks to CEO occurred at the intensive margin: depositors that transferred bank deposits to CEO did not open a new account but already had a CEO account before the crisis.[2] Transaction costs to open an account in a CEO were non negligible. Most d: bank runs were a portfolio reallocation within individuals' wealth. The increase in the ceiling on CE deposits passed by Parliament in

[1] Gorton (1985) models the arbitrage of depositors between cash and bank deposits. Fernández-Villaverde et al. (2020) models the arbitrage of depositors between commercial bank deposits and deposits at the central bank.

[2] The volume of deposits in CEO increased by 50% in two years while the number of accounts increased by 4%. And historical accounts suggest that the increase in the later was driven by the opening of new accounts for various family members.

March 1931 - between the two waves of banking panics - contributed to this trend.

Sections 4 to 6 conduct a large number of robustness checks and statistical tests to justify our instrumental variable. In particular, there was no substitution – but complementarity – between commercial banks and CEO before the crisis, so that departments with a higher density of CEO had also more bank branches. Most important, pre-crisis growth rates of economic activity and of bank branches in the 1920s were unrelated to the density of CEO. It is only during the years of banking panics that the density of CEO started to be significantly correlated (negatively) with the growth rate of bank branches. Consistent with our hypothesis, our instrumental variable is indeed only valid for the years of banking panics. As the heterogeneous localisation of CEO was highly persistent over time and unrelated to economic development, we still find significant results when we use the density of CEO as an IV for other pre-crisis years, until 1865 (the first year we have data for).

We also control for a number of potential confounding factors such as the growth of total savings, the activity of other financial institutions (mortgage and agricultural lending), sectoral composition or possible determinants of CEO establishments in the 19th century. Last, we confirm the reliability of our measure of pre-crisis CEO density in two ways. First, we provide and compare alternative measures of the density of CEO. Second, we show that our effect is not observed for the other type of CE, the CNE, whose distribution across the country was not heterogeneous.

Not all banks that experienced a bank run failed. Excluding banks that eventually failed is a way to abstract from a potential wealth effect due to creditors' losses (Ashcraft, 2005). In this case, we more precisely isolate the real effect of bank runs from potential wider effects associated with bank failures. The effect is lower but still strong (3/4 of the effect on the whole sample).

Data availability and identification issues explain why the literature on the sources and mechanics of bank runs was unable to provide causal estimates of their effects (Kelly and Ó Gráda 2000, Ó Gráda and White 2003, Iyer and Puri 2012, Acharya and Mora 2015 and Iyer et al. 2016). By contrast, landmark articles that study the regional impact of bank failures or bank lending frictions on the real economy do not deal with bank runs per se (Peek and Rosengren 2000; Calomiris

and Mason 2003a; Ashcraft 2005; Chodorow-Reich 2014). [3] Likewise, the large literature on the real effects of US bank failures and credit frictions during the Great Depression (Bernanke 1983, White 1984, Calomiris and Mason 2003a, Ziebarth 2013, Gorton et al. 2019, Benmelech et al. 2019) does not distinguish between the effect of bank runs and general effects of bank lending frictions caused by bankruptcies or declining activity. Frydman et al. (2015) have studied the consequences of a run on trust companies in New York during the 1907 panic. Their identification is based on the fact that runs were caused by the identity of the trust company but they were unrelated to the financial health of the corporations financed by the trust. Although their article is closest to estimating the real effect of bank runs, the authors' historical framework allows them to examine the consequences of the financial turmoil on the investment of selected firms only, rather than on the local economy. Contrary to ours, their study focuses on financial trusts rather than commercial banks and their identification strategy is not based on a difference in the intensity of banking panics and the existence of safer assets.

Although current banking systems are different from the interwar French system, our study also provides relevant implications for today. First, as highlighted by Iyer and Puri (2012) and Iyer et al. (2016), bank runs still exist despite deposit insurance. And they are of course an enduring feature of the many emerging market economies that have not yet implemented deposit insurance. Second, we highlight how the dualism between very regulated deposit-taking institutions and unregulated institutions may be a source of financial instability. Our identification strategy relies on the fact that we know where funds withdrawn from banks were ultimately deposited. Our paper thus provides insights on what would happen if households or firms suddenly transfer their funds from unsafe shadow banks to regulated safe banks or from banks to central bank digital currencies (CBDC) if they eventually exist. The possibility of bank runs caused by the existence of deposits of individuals at the central banks has been identified as one of the main dangers of CBDC (see Bindseil 2020, Fernández-Villaverde et al. 2020 among others), but no

[3] Moreover, while Peek and Rosengren (2000), Calomiris and Mason (2003a) and Ashcraft (2005) all used instrumental variables that are related to the characteristics of distressed banks (i.e., how pre-bankruptcy characteristics affect the probability of failure in crisis time). On the contrary, our instrument is based on local conditions that are uncorrelated to the pre-crisis characteristics of distressed banks. As a result, the exclusion restriction is more likely to be respected and the omitted variable bias is less likely. As a precedent to our method, Braggion et al. 2017 used the number of Post Office Saving Banks as a IV to study, in a panel dataset and at county level, the effect of banking concentration on bank loan contract in England and Wales between 1885 and 1925

empirical study had supported this claim.[4]

The article is structured as follows. Section 2 describes the French banks runs in 1930-1931 and the flight-to-safety from commercial banks to CEO. Section 3 presents the CE and their key characteristics. Section 4 describes briefly the data used for this study on banking and economic activity and presents simple graphical evidence supporting our main hypothesis. All data are newly collected statistics from previously unused sources. Section 5 presents our main econometric specification, findings and robustness checks. Section 6 discusses further the validity and the strength of the instrumental variable. Section 7 presents conclusions for banking history, theory and current policy issues. The Appendix provides more information about data sources and construction, as well as additional robustness checks.

2 Banking panics during the French Great Depression

2.1 Two waves of bank runs

At the onset of the Great Depression, France suffered from two severe waves of banking crisis in 1930 and then 1931 (Bouvier 1984, Baubeau et al. 2021). Overall, the crisis led total bank deposits to decrease by 25% in these two years. The magnitude of this decline is strikingly similar to the one experienced by US banks between 1929 and 1931. Although bank runs and most bank failures were concentrated during these two waves, some banks continued to fail during the recession, so that between 1929 and 1936, one-third of French commercial banks disappeared (Baubeau et al. 2021). As French banks were neither regulated nor supervised before 1941, there is limited information on the health of banks throughout the panics. Yet, contemporary documents and archival evidence have clearly documented the existence and timing of bank runs. Investigating the determinants of bank failures during these crises with previously unused balance sheet data, Baubeau et al. 2021 also found that a substantial part is not explained by bank fundamentals.

The first important run occurred in November-December 1930, and banks continued to fail until March-April 1931 (Baubeau et al., 2021). It began with *Banque Adam*, a well-established im-

[4]See Auer et al. (2020); Bordo and Levin (2019) for a general introduction to the literature on CBDC, and Andolfatto (2020) for the opposite argument.

portant regional bank in the north of France. The run on this bank started on November 3th, 1930 at the same time as the closing of the *Banque Oustric*. Unable to meet the request of its customers, *Banque Adam* entered liquidation on November 5th. *Banque Oustric* was an investment bank that had recently taken over *Banque Adam*. The causes of the *Oustric's* bankruptcy are not yet fully understood, although frauds and loss-making stock market transactions were certainly among them. The fall of *Banque Adam* – a regional institution that enjoyed a good reputation – was the spark leading to a nationwide panic. It led to a contagion of fear among French depositors, in a context of an absence of banking regulation and deposit guarantee. In the *Revue d'économie politique*, the major outlet of professional economists at that time, the economist Loriot wrote that: 'an extremely intense crisis of mistrust' had erupted in November 1930 (Loriot, 1930, p.584). According to discussions within the French central bank: "the failure of *Banque Adam* had repercussions, not only in the north, but throughout France, on the public mind, and especially on small depositors."[5]. Paul Reynaud, Minister of finance at the time of the run, later gave his account of those events in front of the Commission of finance of the Senate on February 28 1931: "It was then, as a result of the emotion caused by the closing of this bank, that we found ourselves in this anxious situation of banks, even excellent ones, threatened to collapse" (Le Temps, March 1st, 1931). Many important local and regional banks suffered from bank runs in November and December, as well as a national bank with branches over the whole territory (*Banque Nationale du Crédit*).[6] The central bank did not play a full role of lender of last resort.[7] It is important to note that, when this first wave of bank runs started, France had not yet entered the Great Depression. It is only in December 1930 that the official French index of industrial production experienced a marked decrease (Sauvy 1984, Eichengreen 1992).

The second wave of bank runs spiked between September and November 1931. Bank failures

[5] Archives of the Banque de France, PVCG November 27th 1930; see also CLP December 4th 1930.

[6] One bank only, the *Banque d'Alsace et de Lorraine* was bailed out by the government in December 1930 (through a deal that remained secret until the end of 1931).

[7] The central bank did not expand credit, both because it was a for-profit institution reluctant to take too much risk, and because it was still influenced by the real bills doctrine (Baubeau et al. 2021). According to the real bills doctrine, lending is not inflationary if it is backed by real (that is commercial) transactions. Most loans during this period were indeed discounting of commercial paper and officials of the Banque de France were strong believers in the real bills doctrine. As such they interpreted the fall in commercial lending as a normal - cyclical - decrease in economic activity rather than a sudden stop in liquidity. For the importance of the real bills doctrine for the Federal Reserve in the US during the 1930s, see Meltzer (2003).

went on until the spring 1932 (Baubeau et al., 2021). Some banks had started to experience difficulties as soon as July 1931 (prominently the large *Banque Nationale du Crédit* or BNC) although no bank runs are documented before September. Many banks were then affected by runs, including the BNC. On September 25th, few days after the international shock of the devaluation of sterling, the BNC lost about half of its deposits and it was eventually bailed out by the government.[8] The BNC was arguably "too big too fail", but many smaller banks that also faced withdrawals following the run on the BNC were not rescued. Contrary to 1930, the French economy was in bad shape in late 1931 and commercial banks notoriously suffered from non performing loans and failures of firms. Although publicly known insolvency issues might have motivated the withdrawals of deposits, contemporaries also observed it was not everywhere the case. There was a noted "contagion of fear" so that banks in supposedly good health were also subject to runs. In his speech in front of the *Chambre des Députés* on 27 November 1931, the Minister of Finance Pierre-Etienne Flandin explicitly mentioned bank runs (*"les déposants se ruent aux guichets"*) and unjustified withdrawals caused by the panic of depositors (*"les retraits inutiles causés par la panique"; "un vent de panique s'emparant des déposants, une ruée s'était produite"*) [9]. We find similar judgments in the local press, in professional journals, as well as from the officials of the central bank.[10] In all these statements, contemporaries recognized that some (if not most) of the banks that experienced withdrawals of deposits were not insolvent and had a well-established reputation before the crisis. There were victims of a sudden "reversal in confidence". [11] According to several testimonies, this contagion of fear was due to international events (devaluation of the pound sterling in September 1931 and major banking crises in East European countries – although French banks were in fact little exposed to Eastern Europe) as well as false rumors that spread indiscriminately

[8] French National Archives. Archives Flandin. 28201 Box 60, *Dossier sur la liquidation de la BNC (report by M.Maringe, nov. 1933*.

[9] *Journal Officiel de la République Française. Débats Parlamentaires. Chambres des députés* of November 28, 1931; session of November 27, 1931, p. 4131

[10] For example, some articles the regional press in the south of France or in the East in November-december 1931 explicitely mention the runs of depositors and that banks were indistinctly affected, regardless the composition and quality of their assets: Le Petit Marseillais, *"En combien de jours rebâtir le Temple de la prospérité?"* Marcel Lucain (3 november 1931).; *Le Républicain de Belfort, "Un nouveau crédit de 100 millions pour aider l'agriculture française"* (16 december 1931). In the *Revue d'économie politique*, the major outlet for academic and professional economists at that time, the economist J.Loriot (1932, p.664) observed massive withdrawals of deposits and added that "of course these withdrawals did not always testify to a perfect discernment" (*"et naturellement ces retraits ne témoignaient pas toujours d'un discernement parfait"*).

[11] *Le Petit Marseillais*, "En combien de jours rebâtir le Temple de la prospérité?" Marcel Lucain (3 november 1931).

after the first bank failures. [12]

2.2 The Flight-to-Safety

As shown by Baubeau et al. (2021), the banking crisis mostly took the form of a flight-to-safety of deposits, from banks to savings institutions (CE). Figure 1 shows the amount of total deposits held in banks and the total amount of deposits in both banks and CE. Throughout the 1920s, deposits increased in both banks and CE at the same pace. By contrast, they strongly diverge starting 1930. In December 1929, 86 billion francs were deposited in banks. By the end of 1931, banks had lost some ten billion francs in firms deposits and six billion francs in individuals' deposits, representing 20% of their total amount of deposits. Meanwhile, deposits in CE had increased by 60% throughout the same period.

The large increase in the deposits with the CE during the crisis became an issue in the public debate. Some accused the CE of creating bank runs and ruining the banking system (Loriot 1932, Vergeot 1932, Darres 1933, Laufenburger 1940). Given the facilities associated with savings bank accounts (see Sect. 3), some observers argued that they were competing not only with bank savings accounts but also with bank demand deposits. According to this view, "improductive" savings in the state-regulated CE was crowding out "productive" savings held in unregulated banks that could lend to businesses. Others argued that deposits with CE were the safest way to protect depositors in a crisis.

The second argument eventually won on the political scene: in March 1931, and due to inflows of deposits, the legal maximum amount for an account in the CE was increased by Parliament from 12,000 to 20,000 francs for individuals and 50,000 to 100,000 for corporations. Several representatives asked for a law allowing the CE to buy nongovernment securities and lend to businesses, but such proposals were not passed, as the Parliament feared that it would damage the confidence in CE (Coupry 1935). The increase in the ceiling on CE deposit accounts voted in March 1931 was then considered by the critics of CE as a fatal blow that worsened the severity of the second wave of banking panic at the end of 1931.

[12] See for example Loriot (1932) and the annual report of the central bank: *Compte rendu de la Banque de France présenté à l'Assemblée générale du 28 janvier 1932*.

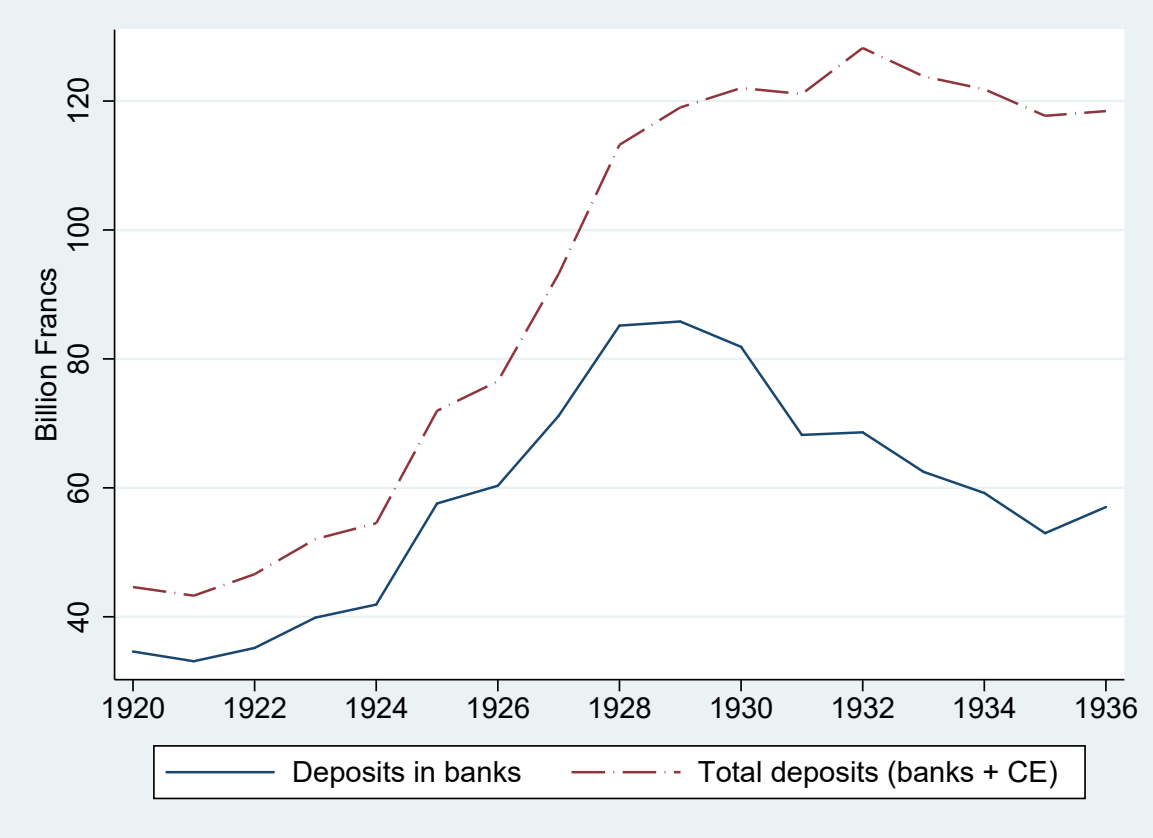


Figure 1: Total deposits in banks and in CE, 1920-1936. Sources: Baubeau et al. (2021) for banks; Statistique de la France (1966) for CE.

3 The *Caisses d'épargne* before and during the crisis

Some contemporaries believed that the CE endangered the banking system by attracting funds from depositors. Yet, before this systemic crisis, the two types of institutions used to coexist peacefully since the 19th century and, in normal times, were complements rather than substitutes (Bonin, 1999). So, why were CE perceived as safer and more attractive than banks during the panic? Most important, is there any reason to believe that the CE caused the difficulties of banks? Could differential geographical access to CE thus explain – at least partly - the heterogeneity of bank distress across space? This section reviews the evidence on whether the CE competed with banks during the crisis and, if so, how and where. It also gives information on the history of the CE system that are essential to justify the econometric identification presented in the reminder of the paper.

We reach three conclusions. First there were two types of CE - the CNE and the CEO - but the CEO provided a much better alternative to banks in hard times. Second, most depositors

who increased their deposits in CEO during the panic already had an account opened in CEO before (i.e. the rise in CEO deposits occurred at the intensive margin). So, bank runs can be seen as a portfolio reallocation of an agent that shifted deposits from her bank account to her CEO account. Third, contrary to the CNE, the CEO were heterogeneously and almost randomly distributed across the territory.

3.1 The advantages of the Caisses d'épargne Ordinaires

There were two types of CE. The CEO had been created in the 19th century by private interests to safely collect petty savings in exchange for low interest rates (Christen-Lécuyer 2004, Baubeau et al. 2021). In 1882, the French State created the CNE, which branched across France by being incorporated in the post office network. From then on, two types of CE co-existed.

Funds of both types of CE were, by law, centralized and managed by the *Caisse des dépôts et consignations* (CDC), a state-led financial institution created in 1816. The deposits of the both CEO and CNE were used by CDC to buy long-term government bonds or, alternatively, kept in cash on a the current account of the CDC at the Treasury.[13] As a result, the CE were perceived as being as safe as the French state. Unlike Germany and other Eastern European countries, France did not experience a public debt crisis in 1930-1931 and remained in the gold standard. French public debt - and therefore CE deposits - was therefore almost as good as gold.

For both CNE and CEO, the Parliament fixed the maximum amount that individuals and firms could deposit in their savings accounts. Interest rates on CE deposits were also regulated by the government. Figure 2 shows that, from 1927 through 1932, the latter were regularly higher than interest rates paid by commercial banks on sight deposits[14]. However, in untroubled time, the means of payment and the services provided - often for free - by banks such as the management of securities portfolios and investment advice, and the credit relationship as well, ensured depositors also directed money to banks, in spite of the rate differential. In November 1930, when

[13] The later option meant that the Treasury could use this inflow of cash to reimburse public debt and thus decrease its level. Such a policy of public debt reduction was followed in 1930-1932 (Baubeau et al., 2021).

[14] Data are from Darrès (1933), who provides information of the interest rates paid by three categories of banks (big four, other national banks, regional institutions) on their sight deposits. We calculate the average to obtain a reference interest rate paid on bank deposits. These rates were applied to sight deposits. it is worthy to note that time deposits were very limited in volume at the time, as they represented less than 10% of total bank deposits (Baubeau et al., 2021).

the panic broke out, the spread between the CEO rate and the average commercial banks deposit rate was as high as 1.75%.

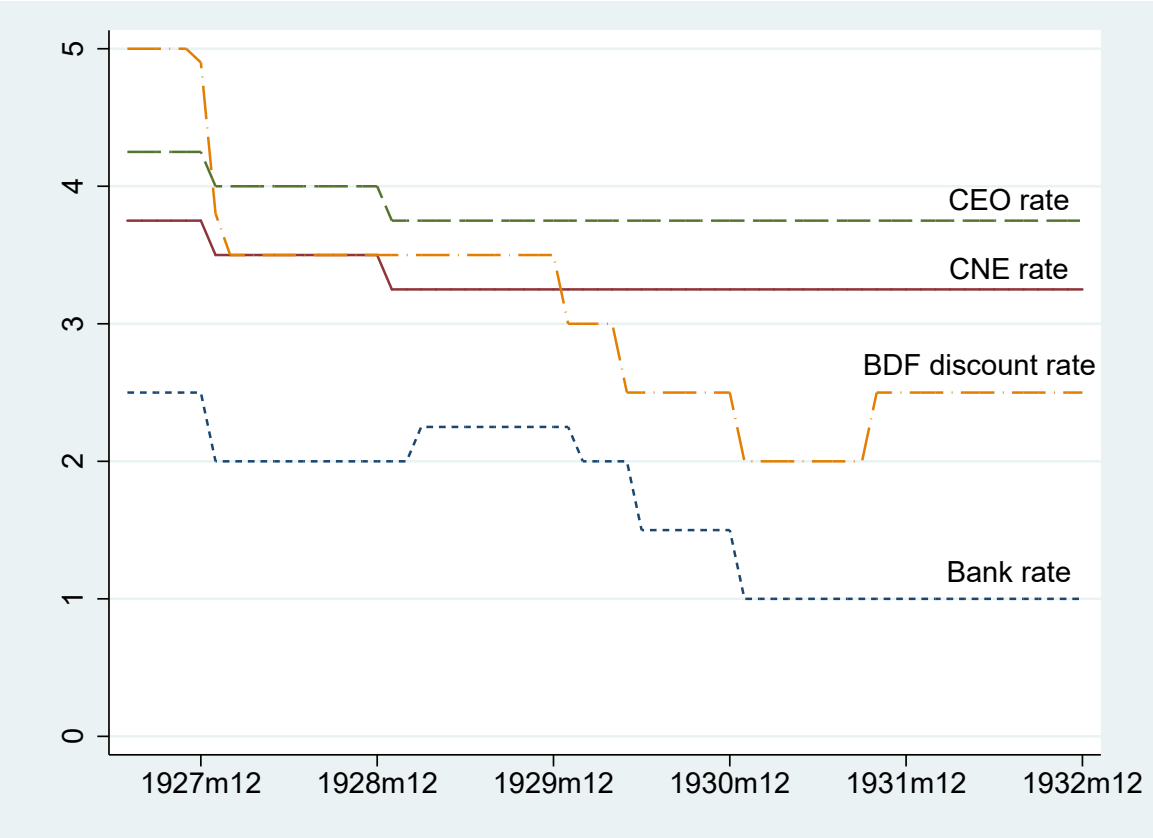


Figure 2: Interest rate on CEO deposits, interest rate on CNE deposits, average interest rate paid by commercial banks on deposits, and *Banque de France* discount rate. Sources: Interest rates on CE deposits from Rist (1933); BDF discount rate from Banque de France, Conseil Général minutes; Interest rates paid by commercial banks on sight deposits from Darrès (1933).

Commercial banks remunerated deposits with rates below the central bank discount rate. Even during the crisis, they could not increase their deposit rate to limit the flight-to-safety. To compensate for the cost of this rise they should have increased their lending rates. The latter were nevertheless capped at the Banque de France (BDF) discount rate: if the bank lending rate exceeded the BDF rate, firms and entrepreneurs could turn to the BDF. The consequences of this mechanism are clearly shown by the joint dynamics of the BDF and bank rates shown in Figure 2, with the average deposit rate paid by banks following the subsequent reductions of the discount rate decided by the central bank between December 1929 and December 1930.

The CE, on their part, kept on offering rates close to the rates of French government bonds, the only assets they were entitled to invest in. Moreover, they could pay interest rates even higher

than the ones of banks on time deposits because they did not pay corporate taxes and did not have to remunerate equity(Boulle, 1938). Interests on deposits with the CE were not taxable (Boulle 1938, p. 58-59 ; Laufenburger 1940, p. 191 ; Ajam Ajam, p. 181, Denuc 1937) [15]. Hence, both CNE and CEO were more attractive than banks for depositors wanting to earn returns on their savings. Although deposits in CEO were very liquid and earned a higher rate than bank deposits (see below), depositors still held demand deposits in banks in normal times, because banks provided payment services and also offered ability to contract a loan. Yet, when rumors started to spread about the health of banks, savings institutions were an easily accessible alternative that – except lending – provided most of the services usually offered by banks.

Not all CE had the same attractive power however. CEO were more attractive than CNE, especially for wealthier depositors, both because they provided better services and higher returns, and because their deposits were more liquid. By law, deposits could be withdrawn on demand within eight days in both CEO and CE, but in practice, payment was almost always immediate (Rist 1933, Coupry 1935), especially in CEO that – contrary to post offices – always keep large amounts of cash in their vault. During the 1920s, the CEO developed services, like vault and custody of securities, making them more similar to banks, and recruited door-to-door salesman to market them (Boulle 1938, p. 59). The personnel of CNE was less skilled than at the CEO: in many post offices, the postman handled the financial operations.

Transactions to and from CNE accounts in post-offices also raised difficulties. A depositor could withdraw on demand just in a single post office branch after having fulfilled a specific file to obtain a "local account" [16]. However, respectively at the end of 1927, 1930 and 1932, only 8,4%, 16% and 21,5% of the CNE accounts holders had a local account[17]. This low percentage, even if increasing during the crisis, suggests that the process was perceived as heavy or useless by the

[15] In the context of higher pressures by the Government to tax financial incomes, in 1932, the scandal of the *Banque commerciale de Bâle* upset public opinion: this Swiss bank discreetly receives its clients, including politicians, in a Parisian apartment in order to bring their capital to Switzerland and to avoid taxes on income from deposits and securities (Guex, 1999).

[16] The depositor must fill a form and deliver the form and his saving book at the chosen office. The office send the documents to the "succursale" (a regional center centralizing the accounting for the offices of the region). The book saving covered by the succursale with a label authorizing repayment at sight shall be returned to the depositor "as soon as possible" (Ministry of Trade and Industry, Annual report to the President of the French Republic on the operations of the Caisse Nationale d'Epargne, 1930, p; 74).

[17] Ministry of Trade, 1928, p. 72-73 for 1927 data; 1932, p. 75-76 for 1930 data; 1934, p. 62-63 for 1932 data.

	Caisses ordinaires (CEO)			Caisse Nationale (CNE)		
	Nb of accounts (Mill.)	Deposits (Bill. FF)	Average per account	Nb of accounts (Mill.)	Deposits (Bill. FF)	Average (FF) per account
1929	9.415	20 314	2147	8.507	11 659	1370
1930	9.628	23 570	2248	8.957	15 033	1678
1931	9.838	30 175	3067	9.382	20 686	2205
1932	9.971	33 669	3377	9.669	23 614	2442

Table 1: Deposits and number of accounts in Caisses d'épargne (Statistique de la France 1966)

depositors. Most important for our purpose, it means that, when the crisis hit, most deposits in CNE were in fact not liquid. By contrast, deposits in CEO were very liquid, without additional constraints for depositors. Since they targeted wealthier depositors (including firms), it is not surprising that the average amount of deposits by account was higher in CEO than in CNE (Table 1). Sociological accounts and statistics confirm that CEO were mostly used by wealthy depositors rather than by poor workers (Rist 1933, Bonin 1999, Christen-Lécuyer 2004).

3.2 Flight-to-safety at the intensive margin

Table 1 exhibits an important characteristic of the flight-to-safety from banks to CE (as already highlighted Darres (1933) and Laufenburger (1940)): the transfer of deposits from banks to CE was mostly made by depositors who already had an account in CE before the crisis. In particular, the nominal volume of deposits in CEO increased by 66% between the end of 1929 and the end of 1932 (that is around 88% in real terms, because of the 1931-32 deflation) whereas the increase in the number of accounts was only 14%.

Furthermore, it is likely that a part of new accounts created in 1930 and 1931 were in fact opened by wealthy individuals for other members of their family because they had already reached the maximum of their own account (Tournié, 2011, pp.152-153). Thus, the flight-to-safety was mainly a reallocation of portfolio within a family's wealth and to already existing CEO accounts.

	Caisses ordinaires (CEO)	Caisse Nationale (CNE)
Mean (account per capita)	0.2484	0.1797
Standard deviation	0.1387	0.0583
Coefficient of Variation	0.5583	0.3245

Table 2: Descriptive statistics for the number of CEO and CNE accounts over population, by department. Year 1930

3.3 Heterogeneity

CNE were accessible to almost everyone in France through the Post Office network. There were more than 15 000 post offices in France in the early 1930s, that is almost half of French cities had one. By contrast, there were 560 CEO. Only few of them had branches so that, in total, there were around 2 500 branches of CEO in 1930.

Contrary to Post offices, the distribution of CEO was uneven across the country. CEO were set up in the early 19th century, mostly due to paternalistic and religious reasons. The reason why CNE were created by the French government in 1882 was in fact to reach depositors throughout the country – which CEO did not – and to target specifically poorer people than the usual customers of the CEO. The CEO did not follow the expansion of the CNE network. Table 2 shows that still in 1930, CEO were more heterogeneously distributed than CNE. The table presents descriptive statistics for a measure of CE density, namely the number of CE accounts per capita. The higher standard deviation and coefficient of variation for CEO reveal that CEO accounts were more unevenly distributed across French departments.

The localization of CEO remained highly path dependent over time. Departments with early CEO adoptions in the mid-19th century still had a higher CEO density one century later (Christen-Lécuyer 2004, Proettel 2017). Figure 3 plots the number of CEO accounts per capita in 1924, against the same measure in 1865[18].

[18] We choose 1865 because it is the first year for which we have information on CEO accounts, after CEO were set up in all French departments. The last department to have at least on savings institution was Savoy: the *Caisse d'épargne de Chambery* was founded in 1860. 1924 is chosen because it is before the financial stabilization of 1926, see below. Conclusions would be unchanged if we pick another year in the 1920s

Figure 3: The density of CEO at the department level is calculated as the ratio of number of CEO accounts over population. Sources: Rapport à Sa Majesté l'Empereur sur les Caisses d'épargne, 1865; Rapport à M. le Président de la République sur les Caisses d'épargne, 1924.

According to Christen-Lécuyer (2004), who follows previous historians Lepelletier (1911) and Lepetit (1986), CEO were established across France quasi-randomly, without a clear link to the density of economic activity (agriculture was still by far the leading sector at the time of their establishment). They were not established out of the initiative of central or local government authorities. It was local elites - magistrates, retail traders, manufacturers, local bankers - who pooled together to create and expand local CEO activity (Lepetit, 1986, p. 355). The main ideological reasons behind the creation of CEO were paternalistic and religious ones. In the minds of their creators, savings institutions allowed the working class to save money otherwise consumed in gambling or alcohol (Christen-Lécuyer, 2004). Early adoption, though quasi-random, can at least be partially attributed to two factors: urbanization, as well as a high share of protestants in the department (Lepetit, 1986).

Because of path dependency, the establishment of CEO remained indeed very heterogeneous,

	Mean	Std	Min	Max	N
Total deposits (billion francs)	0.2650	0.2427	0.0087	1.4000	85
Million of accounts	0.1058	0.0970	0.0038	0.5250	85
Amount of deposits per capita	0.6312	0.3409	0.0294	1.8550	85
Number of accounts per capita	0.2484	0.1387	0.0128	0.7074	85
Amount of deposits over GDP	0.6845	0.3309	0.0833	2.0092	85
Number of accounts over GDP	0.2664	0.1317	0.0443	0.7503	85

Table 3: Descriptive statistics for CEO density, year 1930. Source : Our elaboration on data from Statistique de la France, 1966

by all accounts. Table 3 presents descriptive statistics on the total amount of deposits in CEO and the number of CEO saving accounts, by department, in 1930. In this year, the average amount of deposits in CEO by department was 265 million francs. Standard deviation is 243 million francs, representing some 92% of the average. The average department had 106 thousand CEO accounts, with a standard deviation of 97 thousand accounts [19]. Most importantly, normalizing these two measures by population or GDP does not eliminate heterogeneity. Lines three to six of Table 3 present descriptive statistics on four measures of CEO density by department: the amount deposited per inhabitant (in francs), the number of accounts per capita, the amount deposited over GDP, and the number of accounts over GDP. For all these variables, the standard deviation amounts to around a half of the average.

4 Main data sources and graphical evidence

The narrative of the 1930-1931 bank runs suggests that depositors' ability to use alternatives to banks may have worsened the intensity of bank runs. Our contention is that this hypothesis can be tested. If verified, the pre-crisis density of CEO accounts can be used as an exogenous source of variation to investigate the causal impact of bank runs on the real economy. This section presents the main data that are necessary to conduct such investigation (on real GDP, banks and savings institutions) and provide graphical evidence supporting our main hypotheses. Econometric estimations will follow in the next section and we will introduce a large set of economic controls in this second step. Detailed information and additional reliability checks on the main data and

[19] The department with fewer accounts was Corsica (with only 3800 accounts), while in the Rhône département there were 525 thousand accounts in total, five times the average.

control variables are presented in a data appendix.

4.1 Data

Our three main variables are the following. First we proxy real GDP at the departmental level using fiscal data on a very large tax base. In the interwar period, the French government levied a schedular tax that covered almost all sectors and economic activities (*impôt cédulaire*). We use data on the aggregate tax base for each department as our measure of total income. Comparisons with comprehensive departmental GDP data constructed by Combes et al. (2011) for a single year (1930) show that our measure tracks the differences in GDP across department very well (see Appendix A, Section 8.3). We first present results with real GDP growth, where growth rates of all departments are deflated by the national consumer price index. Robustness checks will show results using nominal GDP growth. No local price index is available for this period.

Second, we measure banking activity by the number of bank branches. Figure 12 in Appendix A (Section 8.4) shows that the number of bank branches follows the total assets of commercial banks over the period. No statistics on bank assets are available at the departmental level, because banks published consolidated balance sheets while their branches usually span several departments. As we also discuss in length in the appendix, the growth of bank branches is likely to underestimate the effect of bank runs. The number of bank branches by department is obtained from the *Annuaire des Banques et des Banquiers* (Yearbook of Banks and Bankers), also known as *Annuaire Favre*. Banks are defined as in Baubeau et al. (2021): all public limited companies collecting deposits and discounting commercial paper. This excludes non deposit-taking financial institutions and saving institutions (CEO and CNE) that did not lend to private agents[20].

Third, we measure CEO density as the number of CEO accounts per capita at department level. In line with our previous discussion, we will first use data on CEO and then present alternative results with data on CNE. Robustness checks in section 5 will also use alternative definitions of "density" (volumes of CE deposits as a share of GDP, etc.).[21]

[20] The list and balance sheets of public limited companies receiving deposits and discounting commercial paper are taken from the "Album", a collection of banking statistics built by the *Crédit Lyonnais* in the interwar. See Baubeau et al. (2021) for a description of the source and data.

[21] Data on CE are obtained from the annual reports of the CNE and CEO supervisory body, the *Ministère du*

Because of missing data on bank branches, we have to exclude the department of the Seine where Paris was located. We also exclude the three departments of eastern France (conquered by Germany in 1871 and shifted to France after the First World War) because they had a different system of CE. The banks in these four departments were also hit by the crisis however. We still have complete data on 86 departments representing 85 observations: because of its limited geographical area, data on the Territoire de Belfort department were aggregated to data on the Haute-Saône department (see the Appendix A for further details).

4.2 Figures and correlations

Figure 4 shows the cumulative rate of growth of bank branches between the end of 1929 and the end of 1932, by department. The map shows a strong heterogeneity in the intensity of the crisis across French departments. 55 departments, the lighter ones in the map, experienced a decline in bank branches. Departments in white, hit harder by the runs, witnessed a decrease in bank branches spanning between 40% and 67%. In other departments, banks suffered less severely from the crisis. 31 of them, the darkest ones, even experienced a positive growth rate of bank branches.[22]

Commerce et de l'Industrie (Ministry of Trade and Industry), to the President of the Republic (see Appendix A, Section 8.5 for detail). Population by department is only available from the *Annuaire Statistique de la France* for the census years (1921, 1926, 1931, 1936 and 1941). For the other years, we interpolate missing values by applying growth rates that follow a logistic distribution.

[22] The highest growth rate is 120% in Corsica, which had a few branches in 1929. Excluding Corsica from our estimation does not change our results.

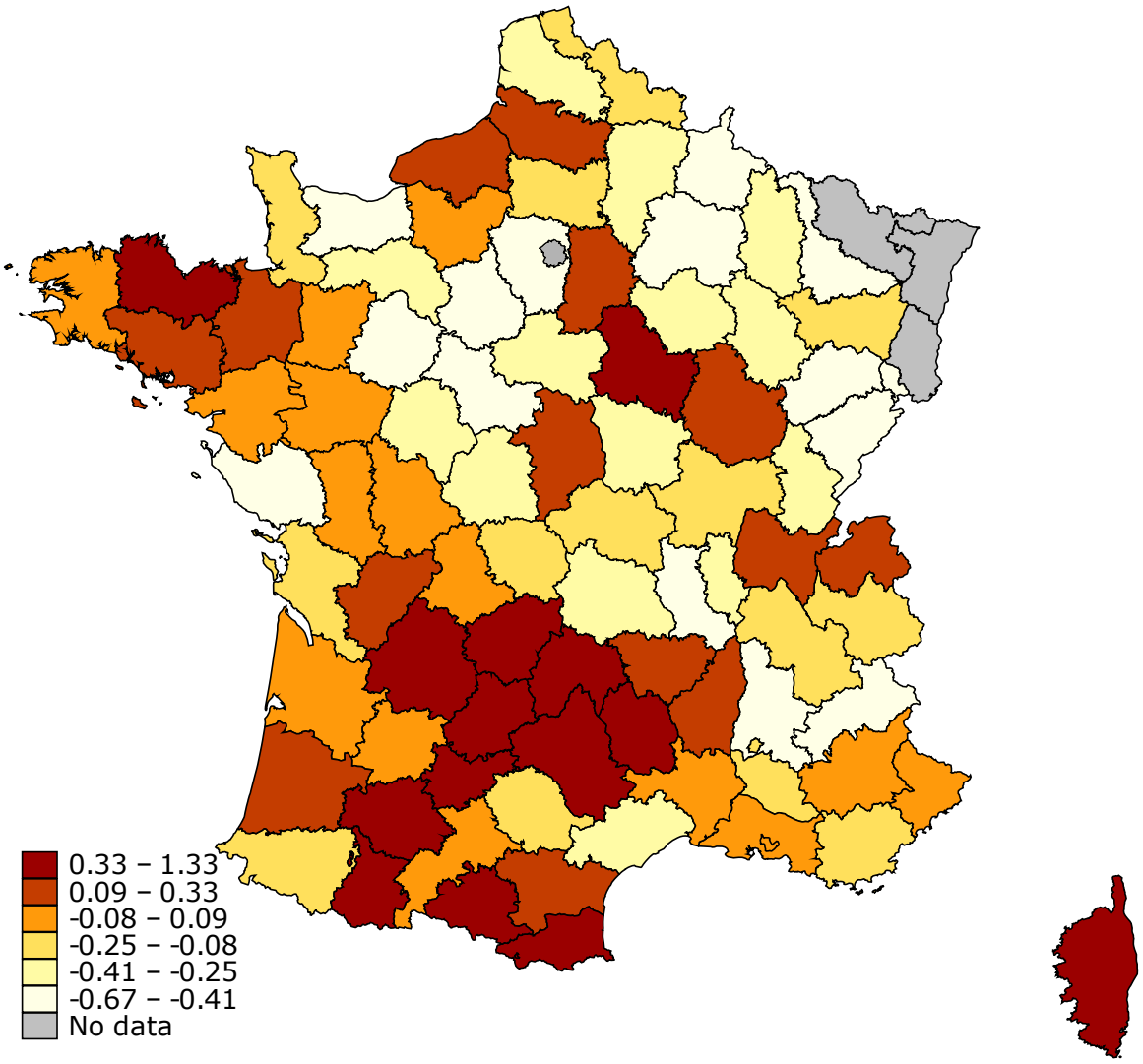
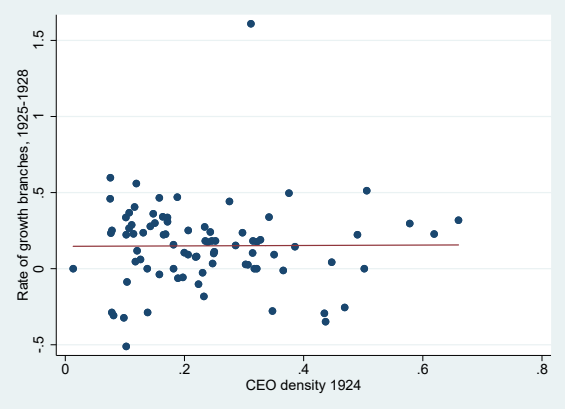


Figure 4: Growth rates of bank branches (cumulative, 1929-1932). Source: Our elaboration on *Annuaires Favre* data.

(a) Growth rate of bank branches 1929-1932



(b) Growth rate of bank branches 1925-1928

Figure 5: Number of accounts per capita in CEO in 1924 vs. growth rate of bank branches between 1929 and 1932 (panel a) and between 1925 and 1928 (panel b). Sources: *Rapport au Président de la République sur les Caisses d'Epargne Ordinaires*, 1924, pour CEO density. Our elaboration on data from *Annuaires Favre* for the rates of growth of bank branches.

As conjectured in Section 3, differences in the growth rate of banking activity during the crisis might be linked to the pre-crisis distribution of CEO accounts at the department level. Panel (a) in Figure 5 provides some evidence on this conjecture. The scatterplot shows the correlation between CEO density in 1924, measured by the number of CEO accounts per capita, and the rate of growth of bank branches between 1929 and 1932. The strong negative correlation coefficient (- 0.48) means that departments with a higher density of CEO experienced a larger decline in banking activity during the crisis.

This dynamics was not the continuation of a pre-trend. Panel (b) in Figure 5 shows that there is no correlation between pre-crisis CEO density in 1924 and the growth rate of bank branches between 1925 and 1928 (correlation coefficient = 0.007). CEO and banks were not substitutes but complements before the crisis.

(a) Growth rate of GDP, 1929-1932

(b) Growth rate of GDP, 1925-1928

Figure 6: Growth rate of GDP vs. growth rate of bank branches, between 1929 and 1932 (panel a) and between 1925 and 1928 (panel b). Sources: Our elaboration on fiscal data from *Renseignements statistiques relatifs aux contributions directes et aux taxes assimilées* for GDP growth rates. Our elaboration on data from *Annuaires Favre* for the rates of growth of bank branches.

By contrast, there is always a positive correlation between the growth rate of bank branches and the growth rate of GDP (Figure 6). This positive correlation was observed during the times of positive growth (panel (b), correlation coefficient = 0.19) as well as during the crisis years with negative growth (panel (a), correlation coefficient 0.46). Based on these observations, our econometric strategy is to use the relationship in Figure 5 panel (a) as an instrumental variable to overcome the reverse causality in Figure 6 panel (a).

5 Econometric specification and results

5.1 Instrumental variable and estimation periods

In order to causally identify the real effects of bank runs on GDP, we use the pre-crisis density of CEO to instrument the growth rate of bank branches during the crisis. Thus, we estimate the following system of equations through two-stage least squares:

$$(1)\Delta Y_i = \quad c + \alpha \Delta B_i^* + \beta \Delta X_i + \gamma Z_{i,1924} + \sigma W_{i,1872} + \epsilon$$

$$(2)\Delta B_i = \quad k + u\frac{C_{i,1924}}{P_{i,1924}} + v\Delta X_i + \mu Z_{i,1924} + \nu W_{i,1872} + e$$

where ΔY_i is the growth rate of real GDP for all departments (i) and ΔB_i is the growth rate of bank branches. Equation (2) is the first stage that provides a predicted value ΔB_i^* of ΔB_i that is used in the second stage (1). The instrumental variable is $\frac{C_{i,1924}}{P_{i,1924}}$: the number of CEO accounts opened in a department divided by the population of the department. For our benchmark estimations, we use the year 1924 as a reference in order to measure the pre-crisis density of CEO. The year 1924 was before the stabilization of the French economy and financial system that occurred in 1926. Yet, robustness checks will show that our conclusions are unchanged if we use other reference years, from 1865 to 1929. A statistical assessment of the relevance and validity of the instrument is provided below in Section 6.

We use a series of cross-section estimations rather than a panel because our instrumental variable is not time varying. Using a panel would prevent us from using departmental-fixed effects in the first stage because they would be confounded with the instrument. [23]

Although different periods might be considered to calculate the growth rate of our variables of interest, we choose to restrict our attention to two periods: 1929-1931 and 1930-1932. This choice is motivated as follows. Since the two waves of crisis straddled over two calendar years and there was probably some delay in the administrative and legal closure of bank branches (even if operations were suspended immediately), it is likely that our data about the end of the year value of bank branches may not capture the whole intensity of bank runs in a given year. The first wave of bank runs hit in November-December 1931, but some bank failures occurred until March (Baubeau et al., 2021). The second one began in July 1931, spiked between September and November 1931, and ended in January 1932 with some failures taking place in the spring 1932. We thus cannot strictly separate the effects of the two waves of crisis, and the potential delay in the closure of branches creates some measurement issues for the relationship between bank branches

[23] We nevertheless ran such estimations and the main results do not differ. Results available upon request.

and GDP. Grouping data over windows of two years of growth rate is a way to limit the measurement issue.

Hence we distinguish two estimation periods in Table 5: i) the *period Dec. 1929-Dec. 1931* captures the whole intensity of the 1930 wave of bank runs and probably a significant part of the 2nd wave of crisis; ii) the *period Dec. 1930-Dec. 1932* is likely to capture most of the 1st wave and the whole 2nd wave. Estimations whose results are presented in Figure 14 of the Appendix show that we reach the same conclusions if we run a series of estimations based on a single year, or if we run the estimation over 1929-1932. Unsurprisingly, the effect is maximum in 1931 when the effects of both waves of runs are confounded.

5.2 Control variables

In equations (1) and (2), X_i and $Z_{i,1924}$ are a set of control variables that are respectively contemporaneous to Y_i and fixed before the crisis. For consistency, we use the same reference year - 1924 - for pre-crisis controls as for the instrumental variable. These controls are used to account for any economic characteristic that could have affected at the same time the growth of GDP, the evolution of the banking sector and the density of CEO in the interwar and crisis years. In order to limit the omitted-variable bias as much as possible, we collected the totality of French departmental statistics on economics and finance available over this period. In addition, we control for some variables that might have driven the adoption of savings institutions (CEO) in the 19th century: $W_{i,1872}$. In this case, our purpose is to account for variables that may affect at the same time the density of CEO and subsequent economic development in the longer term. We use 1872 for reference because this is the only year data on these variables were available after the establishment of the first CEO.

We group these numerous control variables in four broad categories, summarized in Table 4. The sources of these variables are presented in Appendix A. In Appendix B, we also present the results of regressions including separately different subsets of controls.

To control for pre-crisis economic conditions, we build indicators of economic specialization based on the fiscal data we used to measure departmental GDP (see previous section). Finan-

cial preconditions are also considered to control for the fact that a higher density of CEO may have coincided with lower pre-crisis financial development and bank concentration, themselves associated with lower GDP growth. We then control for the activity and interest rates of two semi-public specialized credit institutions, the *Crédit Agricole* and the *Crédit Foncier*. All these data were collected at the departmental level.[24] We also control by the growth rate of total CE deposits in each department to account for a potential negative effect of precautionary savings on economic growth, as predicted by Keynes'paradox of thrift (see Degorce and Monnet 2020 for discussion in the context of the Great Depression). The increase in CE deposits during the crisis might not only be caused by the transfer from bank deposits but also by the behavior of households and firms that started to save more as a share of their income (at the expense of consumption). Finally, we control for factors that may have affected historically the location of CEO, and more specifically the early foundation of CEO in some *départements*. We follow the historical literature that has emphasized two key characteristics (see Section 3): the share of protestant and urban population by department (as per 1872 census data). After 1872, the French state stopped to collect information on religion in censuses.

5.3 Estimation results

Table 5 provides estimates of the causal impact of the growth rate of local banking activity on local GDP growth. Columns from 1 through 4 show the results when ΔY is the rate of growth between 1929 and 1931. Columns 5 through 8 show the results for the growth rate between 1930 and 1932. For each temporal window, we present four separate estimates. The first column provides the estimates obtained through OLS. In the second column, we show the results of the first stage (equation (2)), which is the relationship between pre-crisis CEO density and the growth rate of bank branches. The third and fourth columns for each rolling window present the results

[24] The *Crédit Agricole* was a network of cooperative banks -created after the First World war - financing agricultural activities, while the *Crédit Foncier* was a semi-public corporation specialized in mortgage-based real-estate credit created in 1852. During the interwar, mortgage credit was no longer granted by notaries and the *Crédit Foncier* was the main most important institution in this activity (Hoffman et al., 2019). Total credit granted by the *Crédit Agricole* was still tiny compared to those by commercial banks (Baubeau et al., 2021).

Table 4: Summary of control variables

Group	Variables	Justification
Economic preconditions	Shares of 3 sectors (out of 4) in total income (1924): wages, farming profits industrial-commercial profits.	Differences in sectoral composition of activity by department
Banking preconditions	bank branches/GDP (1924)	Pre-crisis banking development
	log (nb of banks) in 1924	Bank concentration
Financial conditions	Interest rate CA	Only interest rate available at department level (agricultural loans)
	Δ CA loans	Agricultural credit (by specialized institutions)
	Δ CF loans	Mortgage credit (by specialized institutions)
	Δ CE deposits	Control for 'paradox of thrift' (rise in savings accounts not driven by flight-to-safety, see Degorce and Monnet (2020)
Early adoption	Share of protestants (1872)	Control for non-random determinants of adoption of CEO in the 19th century, see Lepetit (1986)
	Urbanization rate (1872)	Control for non-random determinants of adoption of CEO in the 19th century, see Lepetit (1986)

Notes: CE denotes savings institutions (*Caisses d'épargne*), CF the *Crédit Foncier* specialized in mortgage credit, and CA the *Crédit Agricole* specialized in agricultural credit.

of the second stage equation (equation (1)). Column (3) shows the results when we do not add any control variable. In Column (4), we add controls.

Columns (2) and (6) show that the instrument is strong: the Cragg-Donald Wald F statistic of the first-stage regression is 17.58 in the 1929-1931 rolling window, and rises to 23 for the 1930-1932 span. Coefficients are highly statistically significant and show a strong relationship between the growth rate of bank branches and CEO density: being a one percent more CEO-dense department is correlated with a 1.09% drop in bank branches during the 1929-1931 period and with a 0.78% drop over the 1930-1932 period.

Columns (3) and (7) provide the result of the second-stage equation, without controls. A 1% drop in the growth rate of bank branches, instrumented by CEO pre-crisis density, causes a 0.54% decrease in local GDP growth over the first period and a 0.7% decline over the second period. In columns (4) and (8), we add controls. The results are still statistically significant and the coefficient is larger: a 1% drop in the instrumented growth rate of bank branches causes a 0.83% decrease in local GDP growth over the period 1929-1931 and a 1.13% decline over the period 1930-1932. A detailed look at the controls (in Appendix, Table 12) reveals that the control variable that is mostly driving upwards our coefficient of interest is the measure of pre-crisis banking development (nb of banks branches/GDP). Controlling for this variable is important because departments with higher pre-crisis CEO density were also those with higher banking development (although the growth rates of banks and CEO were unrelated during the interwar), see section 6.

In Appendix B we report different specifications. First, we run regressions over two-year rolling windows to explain the growth rate of bank branches from one year to the other. Secondly, we run the model over the whole 1929-1932 period. These different specifications provide similar conclusions about the strength of our instrumental variable and the causal effect of bank runs on GDP growth. In the next paragraph, we present our main robustness checks.

Table 5: Main Results

	1929 - 1931				1930 - 1932			
	OLS Coef./SE (1)	First Stage Coef./SE (2)	Second Stage Coef./SE (3)	Second Stage Coef./SE (4)	OLS Coef./SE (5)	First Stage Coef./SE (6)	Second Stage Coef./SE (7)	Second Stage Coef./SE (8)
Branches growth	0.114**		0.544***	0.834*	0.275***		0.697***	1.127**
	(0.04)		(0.14)	(0.38)	(0.05)		(0.14)	(0.42)
CEO density 1924		-1.090***				-0.782***		
		(0.26)				(0.16)		
Constant	-0.018	0.220**	-0.001	1.170	0.010	0.132**	0.032*	3.121
	(0.01)	(0.07)	(0.02)	(2.96)	(0.01)	(0.04)	(0.02)	(2.26)
Econ Precond's	No	No	No	Yes	No	No	No	Yes
Banking Precond's	No	No	No	Yes	No	No	No	Yes
Financial Cond's	No	No	No	Yes	No	No	No	Yes
Early Adoption	No	No	No	Yes	No	No	No	Yes
F statistics		17.576				23.008		
Observations	85	85	85	85	85	85	85	85

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table presents our main results. Columns (1) through (4) provide the results obtained running the regressions over the time span 1929-1931. Columns (5) through (8) provide the results obtained over the span 1930-1932. Columns (1) and (5) provide the estimates of the equation $\Delta Y_i = c + \alpha \Delta B_i + \epsilon$ obtained through OLS (robust standard errors in parenthesis). Δ Y_i is the growth rate of real GDP for all departments (i) and ΔB_i is the growth rate of bank branches. Columns (2) and (6) provide the results of the first stage, namely equation (2) in the following two-equation system:

$$(1)\Delta Y_i = c + \alpha \Delta B_i^* + \beta \Delta X_i + \gamma Z_{i,1924} + \sigma W_{i,1872} + \epsilon$$

$$(2)\Delta B_i = k + u\frac{C_{i,1924}}{P_{i,1924}} + v\Delta X_i + \mu Z_{i,1924} + \nu W_{i,1872} + e.$$

Columns (3) and (7) provide the results of equation (1), the second stage, where we do not add any control variable. ΔB_i^* is the growth rate of bank branches instrumented by CEO pre-crisis density. In Columns (4) and (8), we control for economic preconditions, banking preconditions, financial conditions, and CEO early adoption measures.

5.4 Main robustness checks

This presentation of robustness checks focuses on the second period of Table 5 (1930-1932) because it is the one that is most likely to capture the effects of both crises. But the conclusions are similar if we focus on the first period (1929-1931).

For a start, we exclude branches of bankrupt banks from our calculations. Not all banks that experienced a bank run failed (see Figure 13 in the Appendix) . Some of them reduced their activity both in terms of deposits and credit, and consequently closed only a part of their branches. It was particularly easy to close a branch during this period because of the lack of regulations. Excluding banks that eventually failed allows us to exclude the potential wealth effect due to the creditors' losses (Ashcraft, 2005). This way, we isolate more precisely the real effect of bank runs from potential wider effects associated with bank failures. Columns (1) and (2) of table 6 provide the results for our IV estimates, without controls and with controls. The coefficients are slightly lower (3/4) with respect to the main results shown in 5. Over the period 1930-1932, a 1% drop in the growth rate of local banking activity causes a decrease in local GDP growth of 0.61% without controls, and of 0.82% with controls.

Second, we run our regression with data in nominal terms instead of real terms. Data concerned are GDP, deposits in CEO, as well as loans provided by *Crédit Foncier* and *Crédit Agricole*. The main reason for this check is to take into account potential heterogeneity of prices at the department level. Moreover, measurement of prices was not precise in the interwar France. Therefore, one could be worried by the use of prices as deflator. The results of these estimates, provided in Columns (3) and (4) of Table 6, barely change with respect to using real terms.

Third, we change the date of the instrument. Our preferred measure of CEO density is the number of accounts in CEO in 1924. In table 7 we show that our results hold when changing the pre-crisis date of CEO density. We present the results for 1865, 65 years before the crisis, and 1929, the last year before the runs.[25] It is worth noting that the Cragg-Donald Wald F statistics of the first stage remains high (around ten) even when using CEO density in 1865 as an instrument. In the specification using the CEO density in 1929 as an instrument, the coefficients of the first

[25] 1865 is the first year for which we have information on CEO accounts after CEO were set up in all French departments. In Appendix B we show the results for 1921 and 1926 too, in order to cover the whole 1920s decade.

and second stage equations are similar to those obtained using our preferred 1924 CEO density measure. In Appendix B we show that this is true for other CEO density measures computed throughout the 1920s.

Fourth, in Table 8, we estimate our regressions by changing the numerator and the denominator of the instrument. At the numerator, we use total deposits with CEO instead of the number of accounts. At the denominator, we substitute population with GDP. Dividing by GDP instead of population decreases the magnitude of the effect (columns (1) and (2)), but the estimates remain statistically significant and in line with our standard estimations.

Fifth, we change the instrument and use the density of all CE instead of focusing only on CEO. We therefore use the total number of CEO and CNE accounts per capita in 1924 as an instrument. As discussed in Section 3, CEOs were more heterogeneously distributed than CNE, and are therefore expected to be the main driver of our effect. The estimates including CNE accounts shown in Columns (2) and (3) of Table 9 are less significant and their magnitude is lower. Moreover, the first-stage results provided in column (1) show that the instrument is not correlated with the growth rate of bank branches. This important result confirms that only CEO could be associated with a different intensity of bank runs across departments.

Finally, we use the number of CEO branches per capita as a measure of CEO density, instead of the number of CEO accounts per capita. Even if the two measures are correlated, they are not perfectly so. We expect that the number of branches per capita is not as suited to test our main hypothesis because what mattered at the beginning of the run was the intensive margin (the ability to transfer money to an already existing account) rather than the extensive margin (ability to open a new account). We empirically confirm this conjecture in columns (5) and (6) of Table 9. Our point estimate (0.791) is lower and less statistically significant in the specification without controls (column 5), and loses its statistical significance when adding controls (column 6).

Table 6: Robustness checks : exclusion of bankrupt banks branches; nominal values.

	No bankrupt banks		Nominal values	
	Second-stage Coef./SE	Second-stage Coef./SE	Second-stage Coef./SE	Second-stage Coef./SE
	(1)	(2)	(3)	(4)
Branches Growth	0.607***	0.824*	0.696***	1.127**
	(0.14)	(0.33)	(0.14)	(0.42)
Constant	-0.061**	5.509	-0.106***	3.001
	(0.02)	(2.86)	(0.02)	(2.26)
Econ Precond's	No	Yes	No	Yes
Banking Precond's	No	Yes	No	Yes
Financial Cond's	No	Yes	No	Yes
Early Adoption	No	Yes	No	Yes
Observations	85	85	85	85

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table shows results from estimating

$$(1)\Delta Y_i = c + \alpha \Delta B_i^* + \beta \Delta X_i + \gamma Z_{i,1924} + \sigma W_{i,1872} + \epsilon$$

$$(2)\Delta B_i = k + u\frac{C_{i,1924}}{P_{i,1924}} + v\Delta X_i + \mu Z_{i,1924} + \nu W_{i,1872} + e.$$

where Δ Y_i is the growth rate of real GDP for all departments (i) between 1930 and 1932 and ΔB_i^* is the growth rate of bank branches instrumented by CEO pre-crisis density (over the same time span). In Columns (1) and (2), we compute the total number of branches by adding those that were closed because the bank went bankrupt. This way, we only consider the decline of branches owned by banks that remained open. In Columns (3) and (4), the growth rate of GDP is calculated in nominal (non-deflated) terms. Columns (1) and (3) show the second-stage estimates computed without adding controls. In columns (2) and (4) we control for economic preconditions, banking preconditions, financial conditions, and CEO early adoption measures.

Table 7: Robustness checks: CEO densities in 1865 and 1929 as instruments

	CEO density in 1865			CEO density in 1929		
	First-stage Coef./SE	Second-stage Coef./SE	Second-stage Coef./SE	First-stage Coef./SE	Second-stage Coef./SE	Second-stage Coef./SE
	(1)	(2)	(3)	(4)	(5)	(6)
Branches growth		0.750***	0.906*		0.696***	1.072**
		(0.21)	(0.43)		(0.13)	(0.37)
CEO density, 1865	-2.701**					
	(0.86)					
CEO density, 1929				-0.785***		
				(0.16)		
Constant	0.046	0.035	2.718	0.139**	0.032*	3.032
	(0.04)	(0.02)	(1.89)	(0.04)	(0.02)	(2.12)
Econ Precond's	No	No	Yes	No	No	Yes
Banking Precond's	No	No	Yes	No	No	Yes
Financial Cond's	No	No	Yes	No	No	Yes
Early Adoption	No	No	Yes	No	No	Yes
F statistics	9.968			24.035		
Observations	85	85	85	85	85	85

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table shows results from estimating

$$(1)\Delta Y_i = c + \alpha \Delta B_i^* + \beta \Delta X_i + \gamma Z_{i,1924} + \sigma W_{i,1872} + \epsilon$$

$$(2)\Delta B_i = k + u\frac{C_{i,1924}}{P_{i,1924}} + v\Delta X_i + \mu Z_{i,1924} + \nu W_{i,1872} + e.$$

where Δ Y_i is the growth rate of real GDP for all departments (i) between 1930 and 1932 and ΔB_i^* is the growth rate of bank branches instrumented by CEO pre-crisis density (over the same time span). In Columns (1) through (3), we compute the instrument as the ratio of number of CEO accounts per capita in 1865. In Columns (4) through (6), we compute the instrument as the ratio of number of CEO accounts per capita in 1929. Columns (1) and (4) provide the results of the first stage. Columns (2) and (5) show the second-stage estimates computed without adding controls. In columns (3) and (6) we control for economic preconditions, banking preconditions, financial conditions, and CEO early adoption measures.

Table 8: Robustness checks: Different definitions of CEO density

	CEO Deposits on GDP		CEO Deposits per capita		CEO Accounts on GDP	
	Second-stage Coef./SE	Second-stage Coef./SE	Second-stage Coef./SE	Second-stage Coef./SE	Second-stage Coef./SE	Second-stage Coef./SE
	(1)	(2)	(3)	(4)	(5)	(6)
Branches growth	0.520*	0.817*	0.716***	1.135**	0.505*	0.859*
	(0.23)	(0.32)	(0.14)	(0.40)	(0.25)	(0.36)
Constant	0.023	2.407	0.033*	3.153	0.022	2.473
	(0.02)	(1.74)	(0.02)	(2.26)	(0.02)	(1.84)
Econ Precond's	No	Yes	No	Yes	No	Yes
Banking Precond's	No	Yes	No	Yes	No	Yes
Financial Cond's	No	Yes	No	Yes	No	Yes
Early Adoption	No	Yes	No	Yes	No	Yes
Observations	85	85	85	85	85	85

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table shows results from estimating

$$(1)\Delta Y_i = c + \alpha \Delta B_i^* + \beta \Delta X_i + \gamma Z_{i,1924} + \sigma W_{i,1872} + \epsilon$$

$$(2)\Delta B_i = k + u\frac{C_{i,1924}}{P_{i,1924}} + v\Delta X_i + \mu Z_{i,1924} + \nu W_{i,1872} + e.$$

where Δ Y_i is the growth rate of real GDP for all departments (i) between 1930 and 1932 and ΔB_i^* is the growth rate of bank branches instrumented by CEO pre-crisis density (over the same time span). In Columns (1) and (2), we compute the instrument as the ratio of total amount of CEO deposits on GDP. In Columns (3) and (4), we compute the instrument as the ratio of total amount of CEO deposits per capita. In Columns (5) and (6) we compute the instrument as the ratio of number of CEO accounts on GDP. Columns (1), (3), and (5) show the second-stage estimates computed without adding controls. In columns (2), (4), and (6), we control for economic preconditions, banking preconditions, financial conditions, and CEO early adoption measures.

Table 9: Robustness checks: Different definitions of CE densities

	CNE + CEO accounts per capita			CEO branches per capita		
	First-Stage Coef./SE	Second-Stage Coef./SE	Second-Stage Coef./SE	First-Stage Coef./SE	Second Stage Coef./SE	Second Stage Coef./SE
	(1)	(2)	(3)	(4)	(5)	(6)
CE accounts per capita 1924	-0.000*					
	(0.00)					
CEO branches per capita 1924				-0.916**		
				(0.30)		
Branches growth		0.859**	0.849*		0.791*	1.974
		(0.29)	(0.37)		(0.35)	(2.40)
Constant	0.029	0.041	2.608	-0.008	0.037	4.750
	(0.05)	(0.02)	(1.75)	(0.03)	(0.02)	(5.92)
Economic precond's	No	No	Yes	No	No	Yes
Banking precond's	No	No	Yes	No	No	Yes
Financial Cond's	No	No	Yes	No	No	Yes
Early Adoption	No	No	Yes	No	No	Yes
F statistics	5.850			9.375		
Observations	85	85	85	85	85	85

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table shows results from estimating

$$(1)\Delta Y_i = c + \alpha \Delta B_i^* + \beta \Delta X_i + \gamma Z_{i,1924} + \sigma W_{i,1872} + \epsilon$$

$$(2)\Delta B_i = k + u\frac{C_{i,1924}}{P_{i,1924}} + v\Delta X_i + \mu Z_{i,1924} + \nu W_{i,1872} + e.$$

where Δ Y_i is the growth rate of real GDP for all departments (i) between 1930 and 1932 and ΔB_i^* is the growth rate of bank branches instrumented by CEO pre-crisis density (over the same time span). In Columns (1) through (3), we compute the instrument as the ratio of number of all CE accounts (CEO and CNE) per capita. In Columns (4) through (6), we compute the instrument as the ratio of number of CEO branches per capita. Columns (1) and (4) provide the results of the first stage. Columns (2) and (5) show the second-stage estimates computed without adding controls. In columns (3) and (6) we control for economic preconditions, banking preconditions, financial conditions, and CEO early adoption measures.

6 Assessing the instrument

In this section we first provide additional evidence that the instrument is strong (i.e. predicts the evolution of bank branches during the crisis well) and relevant (i.e. predicts bank runs only during the banking crisis). Then we discuss the exclusion restriction, providing evidence that pre-crisis CEO density affects GDP growth during the crisis only through the probability of bank runs.

6.1 Instrument Strength and Relevance

Panel (a) in Figure 5, section 5, represents the first-stage of our 2SLS approach. It shows that the departments in which there was a higher density of CEO before the crisis were those that experienced a larger decrease in banking activity during the crisis. The instrument therefore negatively correlates with the change in number of branches during the crisis. The strength of the instrument is confirmed by the outcomes of the first-stage regressions of our 2SLS approach. Table 10 provides the estimates of these regressions. Contrary to Table 5, we now display all first-stage estimations with all controls. The instrument is strong indeed: over the time spans 1929-1931 and 1930-1932 the coefficients are high in magnitude and statistically significant, and remain so even after controlling for all possible observable confounders.

Table 10: First Stage Regressions

	1929 - 1931			1930 - 1932		
	No Controls Coef./SE	Early Adoption Coef./SE	All Controls Coef./SE	No Controls Coef./SE	Early Adoption Coef./SE	All Controls Coef./SE
CEO density 1924	-1.090***	-1.041***	-0.727*	-0.782***	-0.768***	-0.425*
	(0.26)	(0.27)	(0.34)	(0.16)	(0.17)	(0.19)
Protest. share 19th		0.001	0.002		0.000	0.000
		(0.00)	(0.00)		(0.00)	(0.00)
Urban share 19th		-0.001	-0.000		-0.000	-0.001
		(0.00)	(0.00)		(0.00)	(0.00)
Constant	0.220**	0.254**	2.509	0.132**	0.143*	-0.493
	(0.07)	(0.09)	(3.94)	(0.04)	(0.06)	(2.29)
Econ Precond's	No	No	Yes	No	No	Yes
Banking Precond's	No	No	Yes	No	No	Yes
Financial Cond's	No	No	Yes	No	No	Yes
Adjusted R2	0.165	0.152	0.195	0.208	0.189	0.317
F statistics	17.576	6.005	2.452	23.008	7.542	3.789
Observations	85	85	85	85	85	85

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table shows results from estimating

$$\Delta B_i = k + u\frac{C_{i,1924}}{P_{i,1924}} + v\Delta X_i + \mu Z_{i,1924} + \nu W_{i,1872} + e.$$

where ΔB_i is the growth rate of bank branches. $\frac{C_{i,1924}}{P_{i,1924}}$ is the ratio of CEO accounts per capita in 1924. Columns (1) and (4) provide the results without adding controls. In Columns (2) and (5) we control for two factors potentially correlated with early CE adoption at the department level, namely the share of protestants in 1872 and the share of urban population by department in the same year. In Columns (3) and (6) we also control for economic preconditions, banking preconditions, and financial conditions.

Panel (b) in Figure 5, in section 5, provides evidence on the relevance of our instrument. It shows that pre-crisis CEO density is not correlated with the rate of growth of bank branches before the crisis. Figure 7 shows the same result on a year-on-year basis, from 1926 to 1933. Before 1930, the instrument is not statistically significant. It is only a valid instrument from 1930 through 1932, that is during the bank runs period. After 1932, the instrument loses statistical significance again.

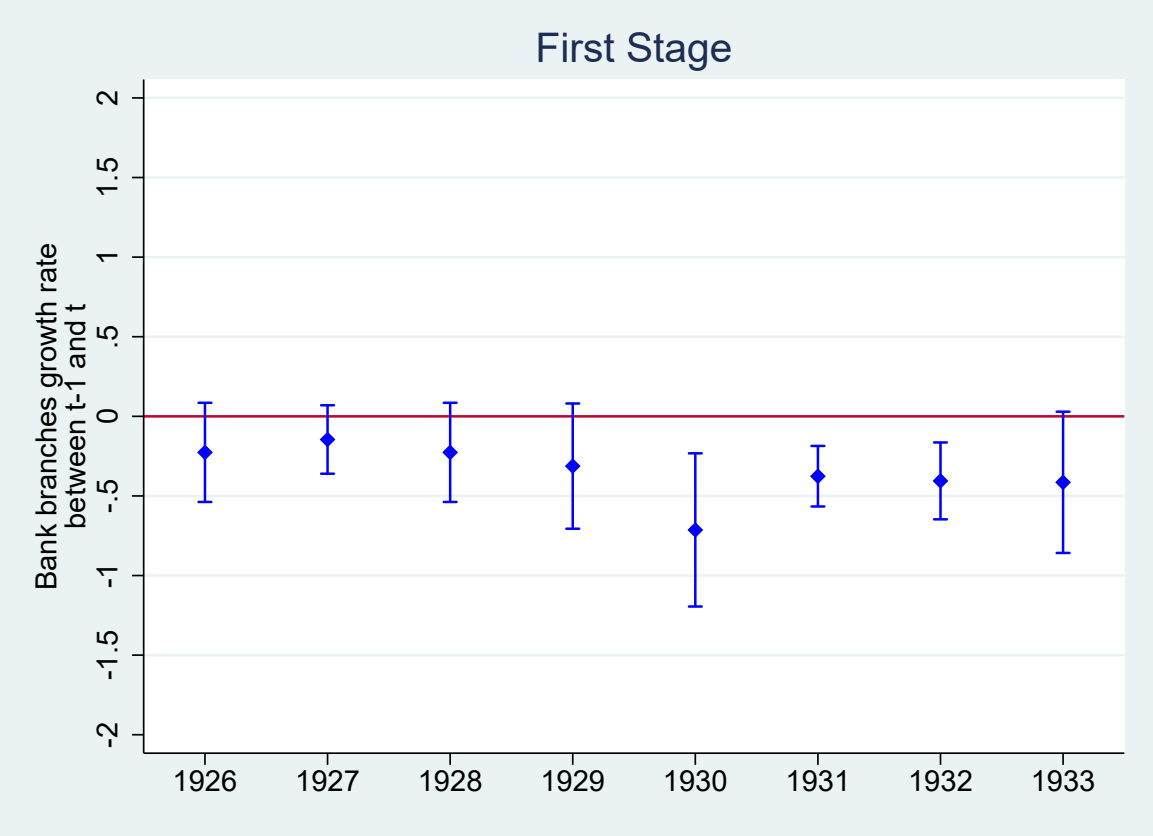


Figure 7: Coefficients of the first stage estimation, per year

6.2 Instrument Validity: exclusion restriction

The effect of pre-crisis CEO density on output growth during the crisis must only work through the flight-to-safety mechanism (i.e. effect on banks). To satisfy the exclusion restriction, we need to be sure that no other channels exists through which pre-crisis CEO density can impact future economic growth.

Firstly, we have to rule out the possibility that CEO were associated with a lower level of banking development before the crisis. Because of higher credit constraints, these departments

could be more affected by the economic crisis, for a given change in bank branches.

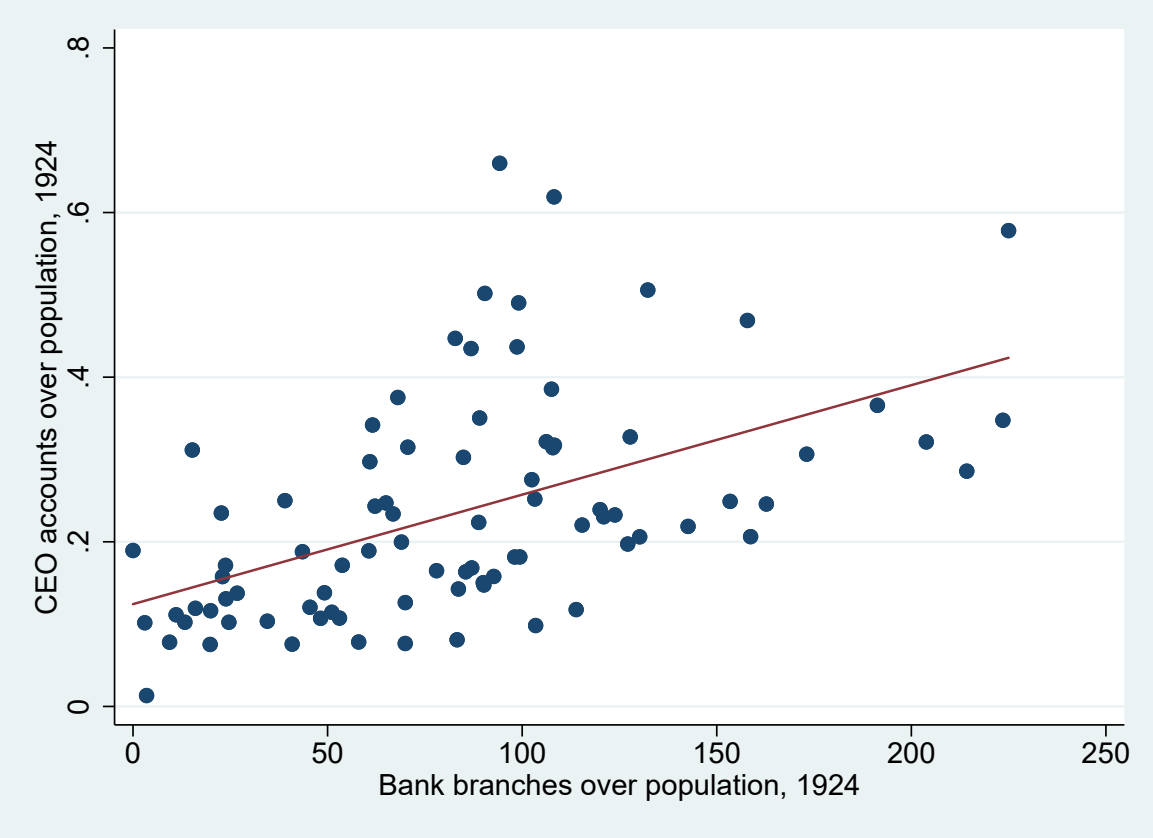


Figure 8: Pre-crisis density of banks and CEO at the department level. Sources: for bank branches, our computation on Annuaire Favre, 1924; for CEO, Rapport au Président de la République sur les Caisses d'Epargne Ordinaires, 1924.

Figure 8 plots the density of CEO and the density of banks in 1924. It shows that banks and CEO were not substitute before the crisis. The correlation is positive. Until the panic, CEO and banks were complements, rather than substitutes. The panic triggered the change in their relationships. This positive relationship between the density of banks and CE before the crisis nevertheless raises another issue, as the two are also correlated to the level of economic activity. To this we now turn our attention.

More developed departments, with higher levels of economic activity, more banks and more CEO, could already be experiencing lower growth rates before the crisis. We must exclude this catch-up convergence scenario in order to satisfy the exclusion restriction. Said differently, we must show that the pre-crisis rate of growth of real GDP by *département* is not negatively correlated with the pre-crisis density of CEO by *département*. Figure 9 shows that this was not the

case, as there is no significant correlation between the two variables.

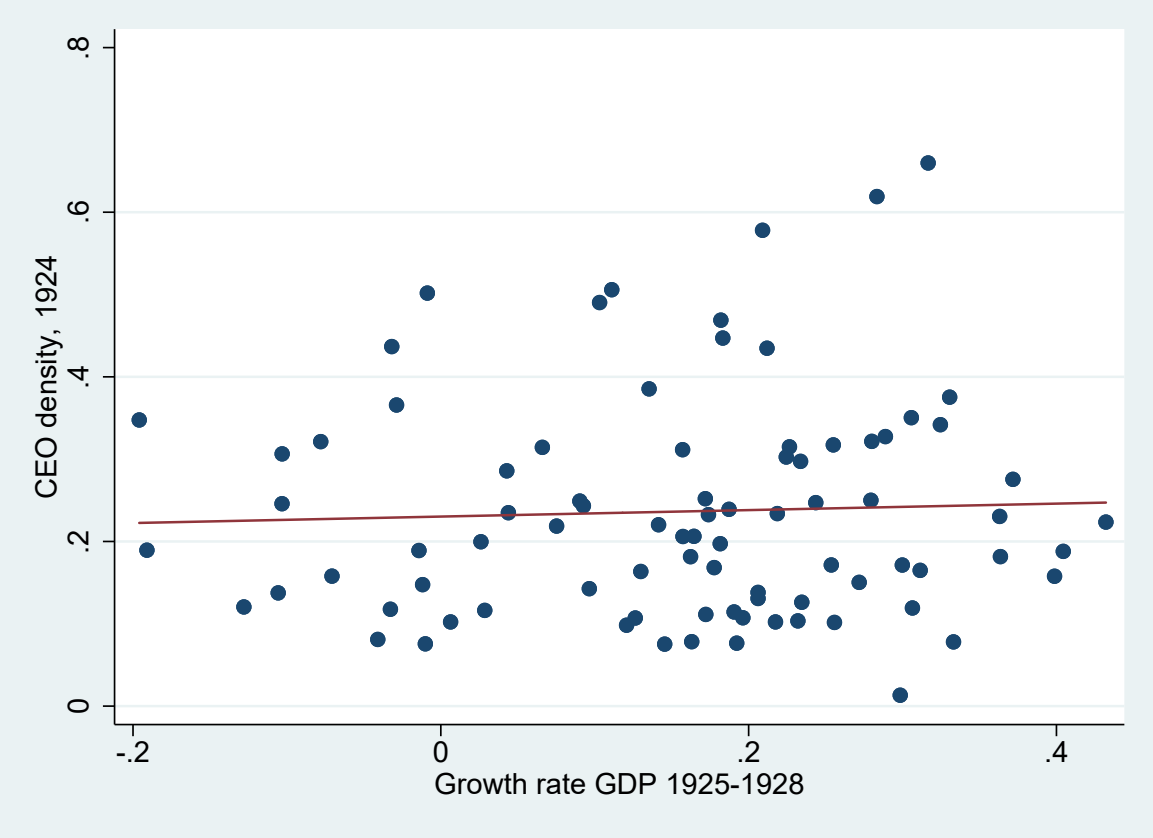


Figure 9: Pre-crisis rate of growth of economic activity index and CEO density by département. Sources: see text.

We must now rule out the possibility that CEO activity was already increasing before the crisis in departments experiencing a decline in bank activity and in GDP. Figure 10 shows that the pre-crisis rate of growth of CEO accounts is neither significantly correlated with the pre-crisis growth of real GDP, nor with the pre-crisis growth of bank branches.

We have shown in Section 3 that a high density of CEO in a department can be explained by early CEO settlement in the 19th century. According to historians of CEO, their geographical heterogeneity was not linked to economic development(Christen-Lécuyer 2004, Lepetit 1986). Nonetheless, they note that early adoption of CEOs can be partially attributed to two factors: urbanization rate, and high share of protestants in the department (Lepetit, 1986). One potential violation of the exclusion restriction could occur if the severity of the 1930s crisis was associated with these two factors. Although it would be unlikely, we had controlled for these potential channels in the estimations in the previous sections. We used data in 1872 because this is the only

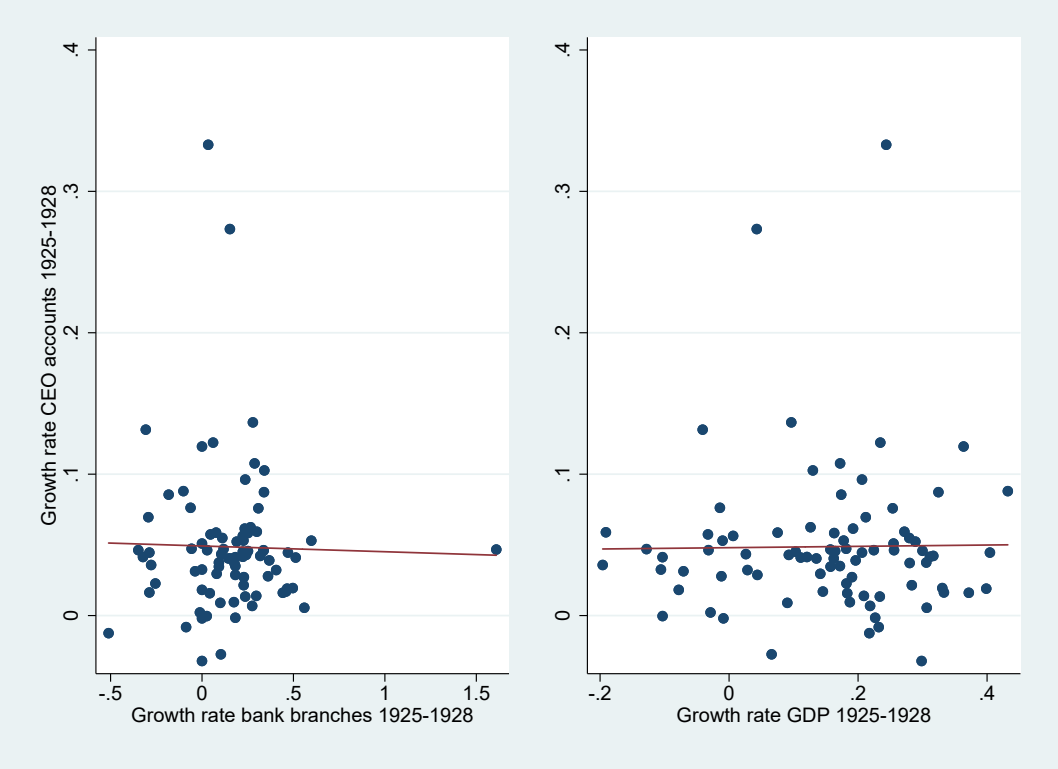


Figure 10: Pre-crisis rate of growth of CEO accounts, of GDP, and of bank branches, by department. Sources: see text

year for which data on religion is available and it is close to the establishment of CEO. Using interwar values of the urbanization rate would not change the results. These two controls are not statistically significant and have no impact on the sign and the magnitude of the instrument coefficient in the first-stage regression, as shown in Columns 2 and 5 of Table 10.

7 Conclusion

Do bank runs create real economic damages, rather than simply reflecting the bad shape of the banking system? This article has examined the causal effect of bank runs on real economic activity at the onset of the French Great Depression (1930-1931) thanks to a key and original feature of these banking crises. Depositors withdrew their funds from commercial banks – then unregulated – and deposited them in government-backed savings institutions (*Caisses d'épargne* or CE). CE were not allowed to lend, so alternative sources of bank credit were cut at the local level.

Our identification is based on the hypothesis that probability of bank runs at the local level

increases with the number of accounts per capita in CEO (a subset of CE). Because CEO deposits were as liquid as bank deposits and earned a higher rate of interest (but CEO did not provide credit and payment services), people who already had a CEO account had incentives to withdraw their deposits from banks as soon as uncertainty emerged at the national level. We thus use pre-crisis density of CEO to instrument the regional decline in banking activity. A 1% decrease in bank branches reduced income by about 1%. Since, on average, bank branches decreased by 3.5% a year between 1930 and 1932 while real GDP decreased by 9% a year, the decrease in bank branches driven by bank runs might explain about a third of the total decrease in real GDP.

In addition to studying the real effects of bank distress, our study shows how competition between unregulated and safer financial institutions affects financial stability. This conclusion holds important lessons for banking theory, current banking regulation and the debate on digital central bank currency (CBDC).

This paper thus provides insight on what would happen if economic agents transfer suddenly their funds from unsafe shadow banks to safe financial institutions. These safe institutions could be either highly regulated banks or even central banks if CBDC eventually exist. Runs caused by the possibility for economic agents to deposit their money in the central bank have been identified as one of the main risk of the CBDC (Juks 2018, Bindseil 2020, Fernández-Villaverde et al. 2020) but this hypothesis was lacking empirical support. Our paper shows that this risk is not just a theoretical curiosity.

Moreover, our study provides two specific insights for the design of CBDC. On one hand, we show that ceilings applied to CE deposit accounts greatly mattered during a crisis: the French parliamentary decision to increase the ceiling in March 1931 probably worsened the severity of the second wave of bank runs. On the other hand, our evidence reveals that the interest rate differential between safe institutions and banks did not matter in the pre-crisis period, but certainly contributed to exacerbating the flight-to-safety when the bank runs started. Depositors accepted a lower interest rate on their risky bank deposits in normal times because banks provided other additional services (credit relationship, investment expertise, means of payment) and they rushed on safe savings account only during the crisis. In other words, the spread between interest rates has different implications during a systemic crisis as risk is perceived differently. Taken together,

the respective roles played by interest rates and safe account ceilings in interwar France suggest that ceilings on the safer CE accounts could have been the most effective way to limit the flight-to-safety. French banks paid a high price when this ceiling was increased in the midst of the crisis. Hence, by contrast to the interwar French experience, a proper design of CBDC including a binding ceiling could limit the risk of runs on the rest of the financial system.

Our findings do not imply that the potential cost of CBDC exceeds their potential benefit. In the same way as French savings institutions increased access to thrift and financial services in the 19th century, CBDC may increase financial inclusion and even bank lending, as argued by Andolfatto (2020). What really matters for aggregate welfare is the design of safe accounts. And a proper design requires a good understanding of potential risks.

8 Appendix A

8.1 List of data sources

- Departemental GDP data: total amount of the tax base for impôts cédulaires ("schedular taxes") from "*Renseignements statistiques relatifs aux contributions directes et aux taxes assimilées*", published by *Ministère des finances, Direction générale des contributions directes* and "*Bulletins de statistique et legislation comparée*", published by the *Ministère des finances*, *sub anno* (see sect. 8.3 for details);

- Bank branches: *Annuaire des Banques et des Banquiers* (Yearbook of Banks and bankers)" also called "*Annuaire Favre*", *sub anno* (see sect. 8.4 for details);

- Banks balance sheets and aggregate deposit and credit series: "The Album", Crédit Agricole Archives (see Baubeau et al. 2021 for details);

- Deposits and number of accounts of the *Caisses d'Epargne Ordinaires* (CEO), by department: "*Rapport à M. le Président de la République sur les opération des Caisses d'épargne Ordinaires*", *sub anno*;

- Deposits and number of accounts of the *Caisses Nationales d'Epargne* (CNE) , by department: "*Rapport à M. le Président de la République sur les opération de la Caisse Nationale d'Epargne*", *sub anno*;

- Series of total deposits and total number of accounts at the national level, for *Caisses d'Epargne Ordinaires* (CEO) and *Caisses Nationales d'Epargne* (CNE): Institut National de la Statistique et des Etudes Economiques (INSEE), *Annuaire Statistique de la France, Résumé rétrospectif* (Statistical Yearbook, Retrospective summary), 1966;

- Crédit Foncier loans, Crédit Agricole loans, Crédit Agricole interest rates, by department: Statistique Générale de la France (SGF), *Annuaires Statistiques* (Statistical Yearbooks), *sub anno*;

- Consumer Production Index: Institut National de la Statistique et des Etudes Economiques (INSEE), *Annuaire Statistique de la France, Résumé rétrospectif* (Statistical Yearbook, Retrospective summary), 1966;

- Population, by department: Statistique Générale de la France (SGF), *Annuaires Statistiques* (Statistical Yearbooks), *sub anno*;

- Sectoral activity: total amount of the tax base for the four "schedular taxes" ("*impôts cédulaires*") from "*Renseignements statistiques relatifs aux contributions directes et aux taxes assimilées*" and "*Bulletins de statistique et legislation comparée*", *sub anno* ;

- Urban population share and protestant population share: *Données Historiques de la Statistique Générale de France (SGF), 1800-1925. Recensements de 1851 à 1921. Recensement de 1872* (1872 census), avalaible on the website of the Institut Nationale de Statistique et d'Etudes Economiques (INSEE) at https://www.insee.fr/fr/statistiques/2653233?sommaire=2591397 (access on November 2019), Table T13. Data from Statistique Générale de la France (SGF), Statistique de la France, Résultats généraux du recensement de 1872 (Paris, 1873).

8.2 Additional information and checks on data

The *départements* are French administrative divisions established in 1790, in the aftermath of the French revolution. In the interwar period, France had 90 *départements*. We exclude from our sample the three *départements* conquered by Germany in 1871 and shifted from Germany to France after the First World War (Haut-Rhin, Bas-Rhin and Moselle), as well as the Seine department where Paris was located. Our sample is thus composed by 86 deparments representing 85 observations. For historical reasons, the geographical area of Territoire de Belfort department is very limited. This is why data on the of the Territoire de Belfort department were aggregated to data on the adjacent Haute-Saône department in the annual reports on CE by *Ministère du Commerce et de l'Industrie*.

We exclude the three shifting departments (Haut-Rhin, Bas-Rhin and Moselle) because of the peculiar institutional features of the saving institutions located on these territories. These in-

stitutional features were inherited from the German rules, more liberal than the French ones, and confirmed by the French government upon request of the saving institutions themselves. Next to the CEO and CNE, a third type of saving institution, the *Caisses d'épargne à garantie communale* (saving institutions under municipal guarantee) were widespread among urban centres of these departments. Guaranteed by the Municipality of the territory where they were located (and not by the State), these saving institutions enjoyed a large autonomy on the asset side as well as on the fixation of interest and ceilings on the deposits. Moreover, the CEO located in these departments enjoyed a more liberal regime than the others (Coupry 1935).

Furthermore, we exclude the Seine department where Paris was located for reasons of data limitation on bank branches. We collect data on bank branches from the *Annuaire des Banques et des Banquiers* (Yearbook of Banks and Bankers), also known as *Annuaire Favre*. We have not been able to find in the Parisian libraries and archives nor in the other main French libraries the volumes of the yearbooks published in 1932 and 1934 (with data on 1931 and 1933) devoted to this department.

8.3 Departmental economic activity

To proxy departmental GDP, we create a new measure of economic activity at the department level by using tax data. More precisely, we aggregate by department and by year four categories of taxable incomes encompassing most of the economic activity. These incomes represent the tax base of the four *impôts cédulaires*("schedular taxes") created by the law of July 31, 1917 to complete the 1914 fiscal reform. The first category is represented by remunerations, wages, pensions, and life annuities, (the incomes of working and retired employees); the second category is represented by industrial and commercial profits; the third and fourth are, respectively, farm profits and "noncommercial" profits. The latter applied to the mixed incomes of self-employed workers. The *impôts cédulaires* were levied separately on each category so that the sources publish the taxable incomes per each category and per department.

To test whether our proxy captures the relative distribution of value-added across departments, we compare our estimates with precise measures of added value elaborated by Combes

et al. (2011) for a single year (1930). Data by Combes et al. (2011) cover three sectors: agriculture, manufacturing, and services. They are elaborated starting mainly from sectoral surveys in 1930 as well as census data. According to Toutain and Breton 1997, the sources mobilized are complete and comprehensive.

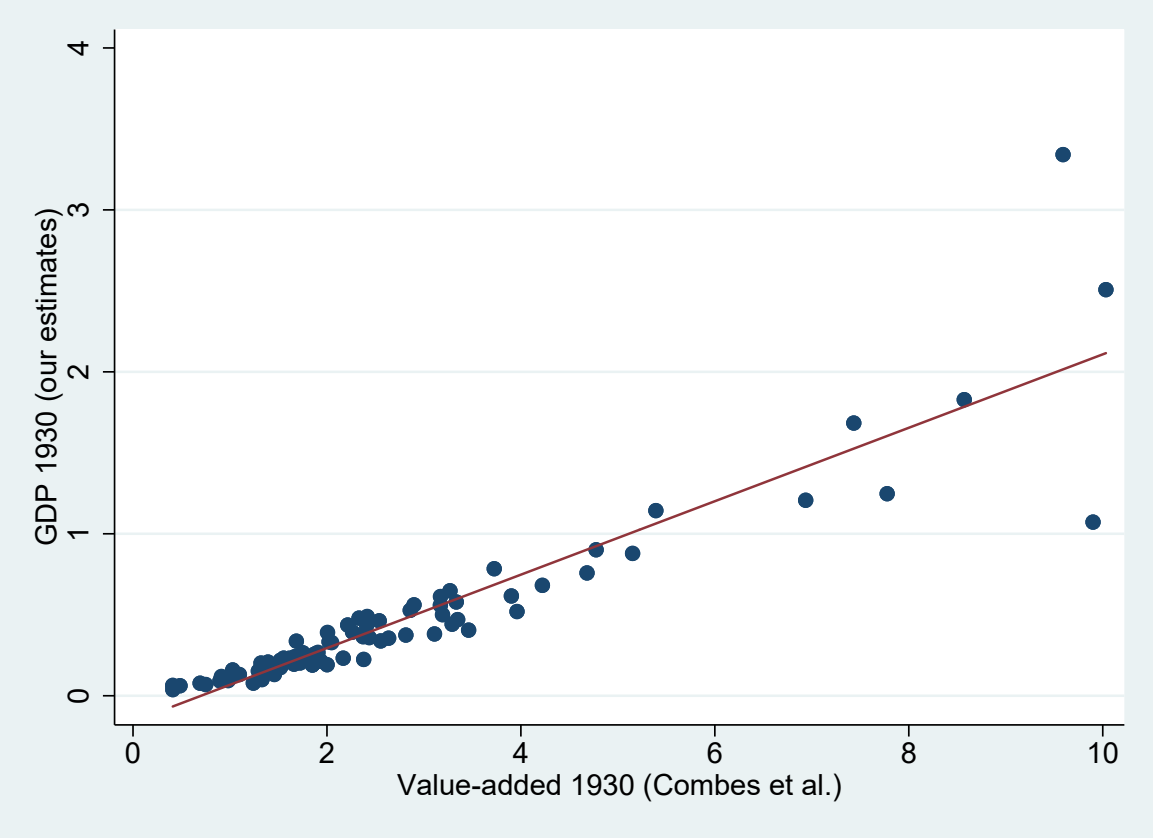


Figure 11: GDP and value-added measure by department, 1930. Sources: Combes et al. (2011) for value-added estimates, authors' elaboration on fiscal data (see text) for GDP.

Figure 11 plots the value-added estimates by Combes et al. (2011) for each department (on the x axis) against our proxy for economic activity (on the y axis). In order to improve the readability of the other departments, we exclude from this figure (but not from the estimations) two *départements*: the "Seine" (where Paris is located), and the "Nord" (an industrial department at the Belgian frontier hosting the city of Lille). Without being outliers, the high values associated to the two departments would squeeze the others. The two series are highly correlated. The little difference between the two series can be explained by the fact that Combes et al. (2011) include the public sector in their estimates, whereas our measure of economic activity does not.

Finally, we deflate our series of economic activity by using the Consumer Production Index,

published on the *Annuaire Statistique de la France, Résumé rétrospectif* (1966), by the INSEE. This is a national index and thus does not affect the distribution of income across departments. We use real (deflated) taxable incomes because other main variables in the estimations (number of bank branches and density of CE accounts) are expressed in real terms.

8.4 Departmental Banking activity

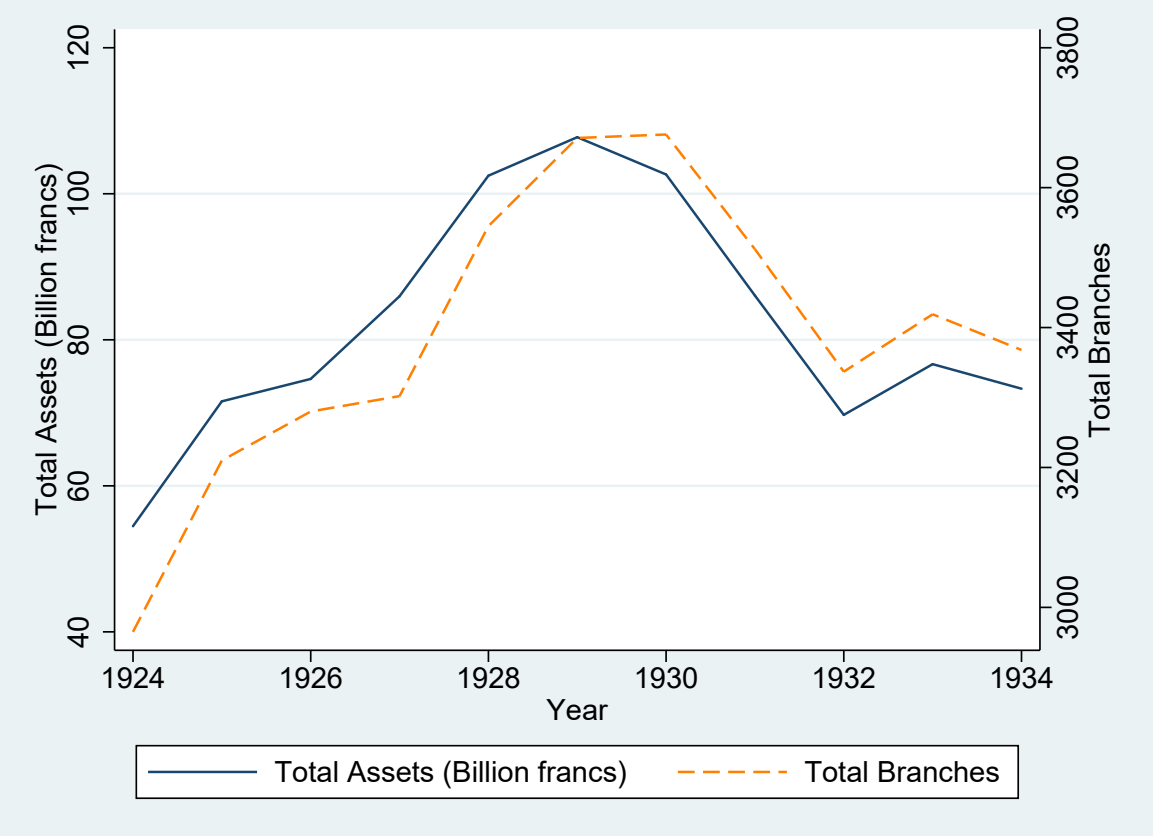


Figure 12: Evolution of bank assets and bank branches, 1924-1934. Sources: Baubeau et al. (2021) for the sum of bank assets. *Annuaire Favre* for the sum of bank branches.

In the absence of data on banking activity at the department level for France in the interwar, we use the variation in the number of bank branches by department as a proxy. A bank could open a branch in a municipality if it expects profitable business; the bank can close a branch if it does no longer generate revenues or if it is subject to a run. The number of bank branches by year and by department is calculated using the "*Annuaire des Banques et des Banquiers* (Yearbook of Banks and bankers)" also called "*Annuaire Favre*" from the name of the editor. These yearbooks published lists of all bankers and bank branches in France, per municipality. To the extent of our

knowledge, they are the most complete sources on bank branches for the interwar France. After entering these lists, we aggregate bank branches at department level. By doing so, we match the banks names and attribute a unique identifier to each of them to track individual banks over time. The annual reports published by the *Ministère du Commerce et de l'Indstrie* on CE aggregate data on the Territoire de Befort and Haute-Saône departments. We aggregate then the branches of these two departments. We restrict our sample to banks as defined in Baubeau et al. 2021: public limited companies receiving deposits and discounting commercial paper.

Figure 12 plots two time series: the solid line represents the total assets of French banks (left-hand axis), and the dotted line represents the total number of bank branches over the period 1924 to 1934. The figure has two main features. Firstly, it shows that the two series evolve together, thus implying that the number of branches is a good proxy for banking activity. Secondly, while total assets start declining in 1930, the number of branches follows in 1931, with a one-year delay.

We assume this is due to some measurement issue in the branches by the yearbook, particularly for 1930. Banks' balance sheets are closed at December 31st. Our source for bank branches of the year t is published in the March of the year $t+1$. The target of the yearbook is to publish data on branches that refer to the end of the year t. To do so, the persons in charge of the yearbook collect information from correspondents and subscribers such as the banks themselves, business people, journalists, public administrations.

Information should have been received by the persons in charge of the yearbook between the last months of the year t and the very beginning of the $t+1$ to make the yearbook ready for publication in March. First, there was probably some delay between the actual closure of a branch, on the on hand, and its administrative and legal closure on the other, so that for example banks could have send information based on the branches' formal network more than on current one. Second, closures could have taken place after the communication of information to the persons in charge of the yearbook, particularly if the closures took place at the end of the year; possible rectifications could have reached the persons in charge of yearbook too late to be taken into account for the publication; for example, a bank could have sent information on the state of its branches' network in November and have decided closures in December.

These issues could be particularly important when crises hit the banking system at the very

end of the year as in 1930. Indeed, the editor introduced in the 1931 edition of the yearbook a "Very Important warning" (*Avertissement très important"*) to the reader, where he alerts that update of the yearbook proved to be very difficult for the events of the year 1930 (*Annuaire des banques et des banquiers*, 1931, p. 13).

Moreover, the two waves of bank failures straddle over two calendar years. In order to fully capture the closure of bank branches due to these two waves, we present the estimates over two-year rolling windows (December 1929 to December 1931 and December 1930 to December 1932), to take into account two branches' growth rate, instead that one over two consecutive years. In a robustness check, we base our estimates on a single growth rate of bank branches computed over two-years rolling windows. The results of the robustness check are coherent with main estimates.

Our proxy captures entirely the decline in banking activity due to banking failures, but only in part the decline in banking activity due to banks which faced deposits withdrawals and had to downsize their branches but eventually did not fail. In other words, our measure of banking activity may underestimate the actual decrease in deposits and credit experienced by banks that did not fail. In a robustness check, we consider separately banks that failed and those that did not.

Figure 13 shows aggregate deposits by group of banks, at the national level. "Bankrupt" denote banks that failed. "Resilient" denotes the sum deposits in banks whose deposits increased or remained stable between 1929 and 1931. "Distress" denotes banks whose deposits declined between 1929 and 1931 but did not fail. Our proxy, based on branches, captures the whole decline in deposits due to bankrupt banks, but only a part of the decline due to distressed banks.

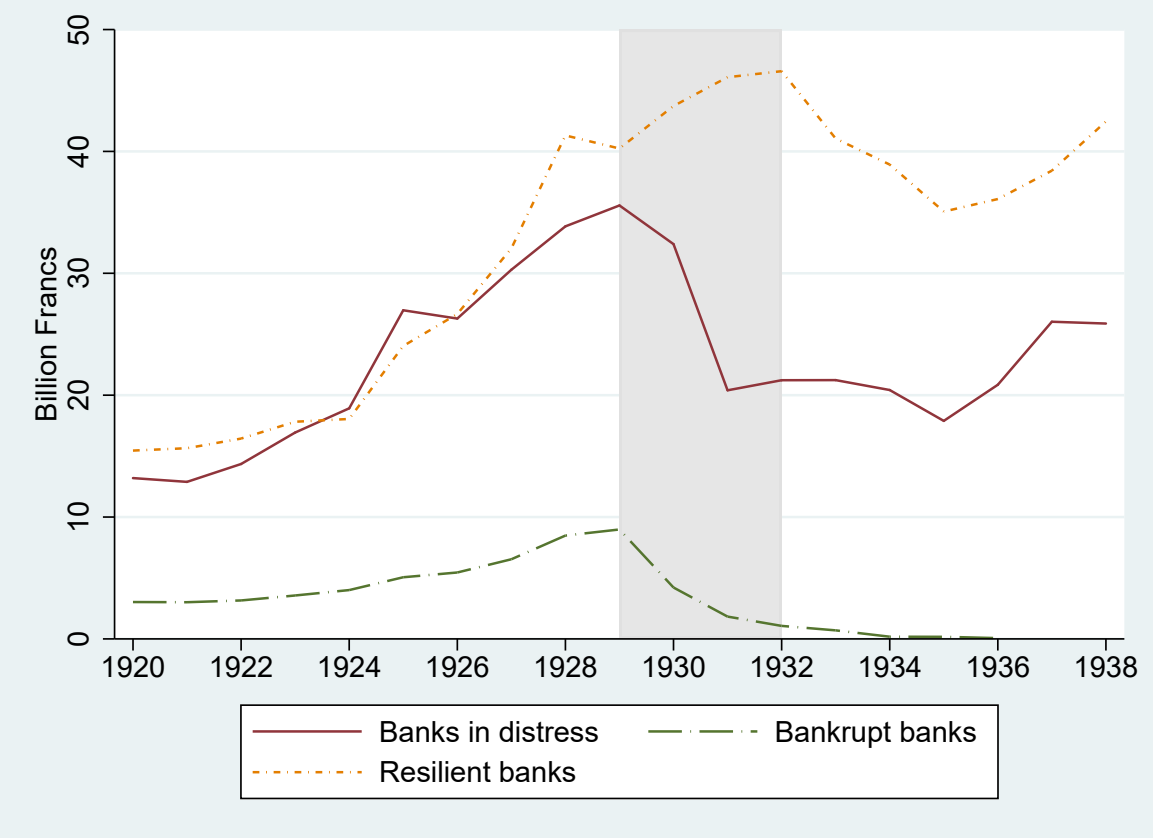


Figure 13: Aggregate deposits in resilient, distressed, and bankrupted banks. Distressed are banks whose deposits declined in 1929-1931 but which did not fail. Resilient are banks whose deposits increased or remained stable during 1929-1931. Bankrupt are banks which failed during the crisis (1930-1934). Source: Baubeau, Monnet, Riva, and Ungaro (2021).

8.5 *Caisses d'épargne*

To study CEO density and run robustness checks, We collected the total number of open accounts (*"nombre de livrets"*) and total amount of deposits for both types of CE, the CEO and the CNE, at the end of each year and for every department in our sample, from the Annual reports published by the supervisory body of the two types of CE, the *Ministère du commerce et de l'industrie* (Ministry of Trade and Industry): the *Rapport à M. Le Président de la République sur les Opéraitons des Caisses d'Epargne Ordinaires* and the *Rapports à M. Le Président de la République sur les opérations de la Caisse Nationale d'Epargne*.

As a benchmark for our estimations, we therefore use the number of CEO accounts per capita. It is a better proxy for CEO density than the per capita amount of deposits. The latter could be inflated by the presence in a department of a number of wealthy individuals hav-

ing reached the ceiling of the CEO accounts. What we capture with our benchmark variable is whether depositors had already an account in a CEO and were ready to transfer immediately their bank deposits to their CE account, the more pertinent variable for our study. Table 1 in Sect. 3 shows that the volume of nominal deposits in CEO increased by 66% between the end of 1929 and the end of 1932, while the increase in the number of accounts was only 14%. However, in a robustness check, we show that our results are not modified if we include CNE in the estimations or if we use alternative measures of CEO density, such as amount of deposits per capita, amount of deposits over GDP or number of accounts over GDP.

9 Appendix B

In this section, we provide the results of alternative specifications with respect to those provided in the Section 5. The aim is to show that our results are robust to alternative windows to compute the growth rate of bank branches. First, we run regressions using the growth rate of bank branches from one year to the other (Figure 14). We thus have a separate coefficient for the GDP growth rate in 1930, 1931 and 1932. Second, we present the estimates obtained running the model over the whole 1929-1932 period (in Table 11). These alternative specifications provide results similar to our benchmark model.

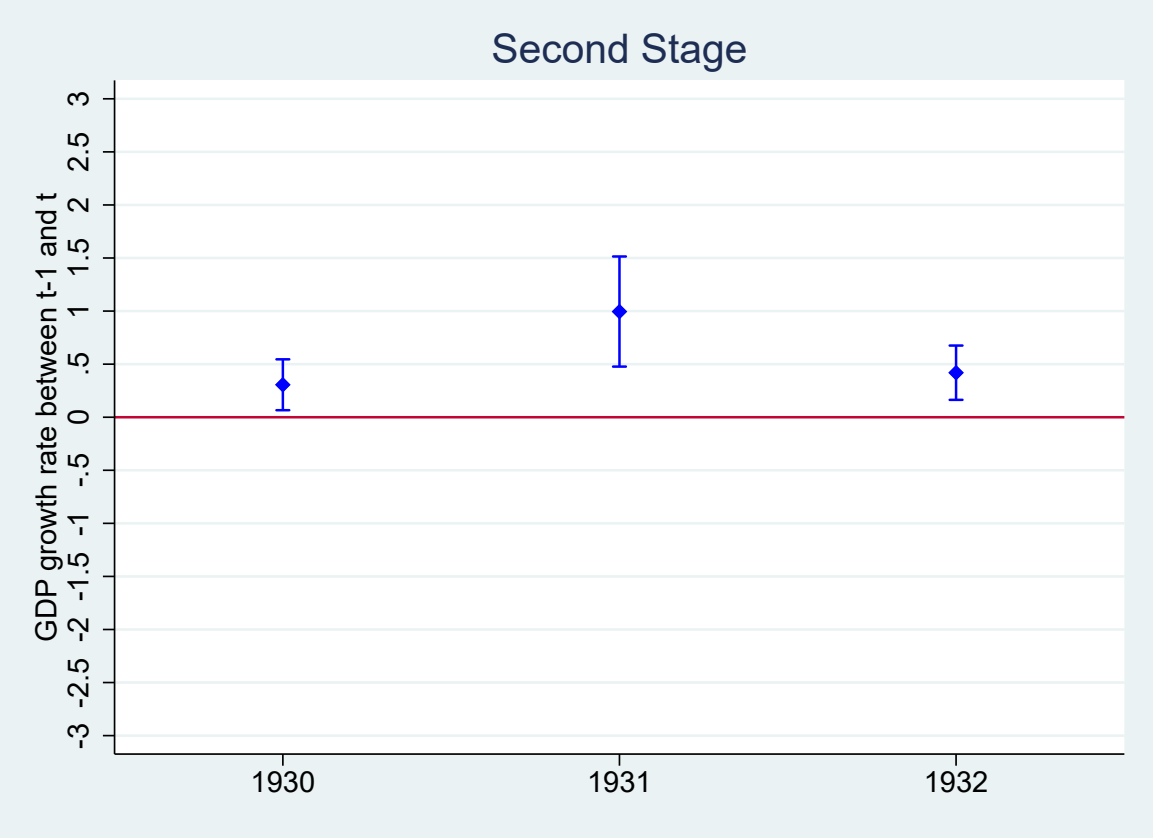


Figure 14: The effect of the change in banking activity, instrumented by CEO density, on GDP growth rate.

Table 11: Growth rates 1929-1932

	OLS Coef./SE	First Stage Coef./SE	Second Stage Coef./SE	Second Stage Coef./SE
Branches growth	0.176***		0.510***	0.766*
	(0.04)		(0.11)	(0.34)
CEO density 1924		-1.495***		
		(0.30)		
Constant	0.039*	0.286***	0.061**	4.756
	(0.02)	(0.08)	(0.02)	(3.25)
Econ Precond's	No	No	No	Yes
Banking Precond's	No	No	No	Yes
Financial Cond's	No	No	No	Yes
Early Adoption	No	No	No	Yes
F statistics		24.804		
Observations	85	85	85	85

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table shows results obtained running the regressions over the time span 1929-1932. Column (1) provides the estimates of the equation $\Delta Y_i = c + \alpha \Delta B_i + \epsilon$ obtained through OLS (robust standard errors in parenthesis). Δ Y_i is the growth rate of real GDP for all departments (i) and ΔB_i is the growth rate of bank branches. Column (2) provides the results of the first stage, namely equation (2) in the following two-equation system:

$$(1)\Delta Y_i = \quad c + \alpha \Delta B_i^* + \beta \Delta X_i + \gamma Z_{i,1924} + \sigma W_{i,1872} + \epsilon$$

$$(2)\Delta B_i = \quad k + u\frac{C_{i,1924}}{P_{i,1924}} + v\Delta X_i + \mu Z_{i,1924} + \nu W_{i,1872} + e.$$

Column (3) provides the results of equation (1), the second stage, where we do not add any control variable. ΔB_i^* is the growth rate of bank branches instrumented by CEO pre-crisis density. In Column (4), we control for economic preconditions, banking preconditions, financial conditions, and CEO early adoption measures.

Table 12: Controls added separately

	No Controls Coef./SE	Banking pre Coef./SE	Alternative credit Coef./SE	CEO deposits Coef./SE	GDP 1924 Coef./SE	Sector specializ Coef./SE	Early adoption Coef./SE	All controls Coef./SE
Branches growth	0.697***	0.839***	0.693***	0.699***	0.859***	0.777***	0.718***	1.127**
	(0.14)	(0.23)	(0.14)	(0.15)	(0.14)	(0.15)	(0.15)	(0.42)
Share big 4 1924		-0.003						-0.006
		(0.00)						(0.00)
Bank Concentr 1924		-0.000						-0.012
		(0.03)						(0.05)
Financial Devel 1924		0.185						0.157
		(0.10)						(0.17)
CréFon credit growth			0.052					0.298
			(0.14)					(0.24)
CA credit growth			0.005					-0.055
			(0.03)					(0.06)
CA interest rate			-0.006					-0.044
			(0.02)					(0.03)
CEO deposits growth				-0.009				-0.119
				(0.18)				(0.29)
GDP 1924					-0.009			-0.011*
					(0.00)			(0.00)
Industrial reve 1924						-0.029		-0.031
						(0.02)		(0.02)
Farming share 1924						-0.030		-0.028
						(0.02)		(0.02)
Wages share 1924						-0.028		-0.025
						(0.02)		(0.02)
Protest. share 19th							0.001	0.001
							(0.00)	(0.00)
Urban share 19th							0.000	0.002
							(0.00)	(0.00)
Constant	0.032*	0.125	0.035	0.037	0.044**	2.808	0.009	3.121
	(0.02)	(0.15)	(0.11)	(0.09)	(0.02)	(1.63)	(0.03)	(2.26)
Observations	85	85	85	85	85	85	85	85

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 13: Instruments: CEO densities in 1921 and 1926

	CEO density in 1921			CEO density in 1926		
	First-stage Coef./SE	Second-stage Coef./SE	Second-stage Coef./SE	First-stage Coef./SE	Second-stage Coef./SE	Second-stage Coef./SE
CEO density, 1921	-0.834***					
	(0.17)					
CEO density, 1926				-0.814***		
				(0.17)		
Branches growth		0.669***	0.973**		0.698***	1.066**
		(0.13)	(0.30)		(0.14)	(0.36)
Constant	0.144**	0.031*	2.845	0.136**	0.032*	3.022
	(0.05)	(0.02)	(1.91)	(0.05)	(0.02)	(2.11)
Econ Precond's	No	No	Yes	No	No	Yes
Banking Precond's	No	No	Yes	No	No	Yes
Financial Cond's	No	No	Yes	No	No	Yes
Early Adoption	No	No	Yes	No	No	Yes
F statistics	25.271			22.448		
Observations	85	85	85	85	85	85

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table shows results from estimating

$$(1)\Delta Y_i = c + \alpha \Delta B_i^* + \beta \Delta X_i + \gamma Z_{i,1924} + \sigma W_{i,1872} + \epsilon$$

$$(2)\Delta B_i = k + u\frac{C_{i,1924}}{P_{i,1924}} + v\Delta X_i + \mu Z_{i,1924} + \nu W_{i,1872} + e.$$

where Δ Y_i is the growth rate of real GDP for all departments (i) between 1930 and 1932 and ΔB_i is the growth rate of bank branches instrumented by CEO pre-crisis density (over the same time span). In Columns (1) through (3), we compute the instrument as the ratio of number of CEO accounts per capita in 1921. In Columns (4) through (6), we compute the instrument as the ratio of number of CEO accounts per capita in 1926. Columns (1) and (4) provide the results of the first stage. Columns (2) and (5) show the second-stage estimates computed without adding controls. In columns (3) and (6) we control for economic preconditions, banking preconditions, financial conditions, and CEO early adoption measures.

References

Rapports à M. le Président de la république sur la Caisse Nationale d'Epargne, Ministère du commerce et de l'industrie.

Rapports à M. le Président de la république sur les caisses d'épargne, Ministère du commerce et de l'industrie, 1865 et 1920-1938.

Acharya, V. V. and N. Mora (2015). A crisis of banks as liquidity providers. *The journal of Finance 70*(1), 1–43.

Ajam, M. *Bulletin de la Société d'économie politique*.

Allen, F. and D. Gale (1998). Optimal financial crises. *The journal of finance 53*(4), 1245–1284.

Andolfatto, D. (2020, 09). Assessing the Impact of Central Bank Digital Currency on Private Banks. *The Economic Journal 131*(634), 525–540.

Ashcraft, A. B. (2005, December). Are banks really special? new evidence from the fdic-induced failure of healthy banks. *American Economic Review 95*(5), 1712–1730.

Auer, R., G. Cornelli, J. Frost, et al. (2020). Rise of the central bank digital currencies: drivers, approaches and technologies.

Baubeau, P., E. Monnet, A. Riva, and S. Ungaro (2021). Flight-to-safety and the credit crunch: A new history of the banking crisis in france during the great depression. *Economic History Review 74*(1), 223–250.

Bayer, C., R. Lütticke, L. Pham-Dao, and V. Tjaden (2019). Precautionary savings, illiquid assets, and the aggregate consequences of shocks to household income risk. *Econometrica 87*(1), 255–290.

Bemanke, B. and H. James (1991). The gold standard, deflation, and financial crisis in the great depression: An international comparison. In *Financial markets and financial crises*, pp. 33–68. University of Chicago Press.

Benmelech, E., C. Frydman, and D. Papanikolaou (2019). Financial frictions and employment during the great depression. *Journal of Financial Economics 133*(3), 541–563.

Bernanke, B. (1983). Nonmonetary effects of the financial crisis in propagation of the great depression. *American Economic Review 73*(3), 257–76.

Bernanke, B. S., M. Gertler, and S. Gilchrist (1996). The flight to quality and the financial accelerator. *Review of Economics and Statistics 78*(1), 1–15.

Bernanke, B. S., C. S. Lown, and B. M. Friedman (1991). The credit crunch. *Brookings papers on economic activity 1991*(2), 205–247.

Besson, E. (1922). *Traité pratique des impôts cédulaires et de l'impôt général sur le revenu*. Librairie Dalloz.

Bindseil, U. (2020). Tiered cbdc and the financial system. *ECB Working Paper* (w26859).

Blickle, K., M. K. Brunnermeier, and S. Luck (2020). Micro-evidence from a system-wide financial meltdown: The german crisis of 1931. *Available at SSRN 3436140*.

Bonin, H. (1999). Les caisses d'épargne françaises (1914–1945). In C. d'Epargne d'Alsace and U. des Sciences Humaines de Strasbourg (Eds.), *L'histoire des caisses d'épargne européennes*, pp. 105—-75. Editions de L'Epargne.

Bonin, H. (2000). *Les banques françaises de l'entre-deux-guerres (1919-1935)*, Volume 3. Paris: Plage.

Bonin, H. (2017). Épargne et crises politiques en france. les mouvements de panique dans les caisses d'épargne au xxe siècle. *Le mouvement social 259*(1), 123–126.

Bordo, M. D. and A. T. Levin (2019). Improving the monetary regime: The case for us digital cash. *Cato J. 39*, 383.

Boulle, R. (1938). *Les grands établissements de crédit devant la crise*. Librairie du recueil Sirey.

Bouvier, J. (1984). The french banks, inflation and the economic crisis, 1919-1939. *Journal of European Economic History 13*(2), 29–80.

Braggion, F., N. Dwarkasing, and L. Moore (2017). Nothing special about banks: Competition and bank lending in britain, 1885–1925. *The Review of Financial Studies 30*(10), 3502–3537.

Bun, M. J., V. Sarafidis, et al. (2015). Dynamic panel data models. *The Oxford handbook of panel data*, 76–110.

Calomiris, C. and J. R. Mason (1997). Contagion and bank failures during the great depression: The june 1932 chicago banking panic. *American Economic Review 87*(5), 863–83.

Calomiris, C. and B. Wilson (2004). Bank capital and portfolio management: The 1930s "capital crunch" and the scramble to shed risk, joumal ofbusiness, university of chicago press, 77 (2).

Calomiris, C. W. and G. Gorton (1991). The origins of banking panics: models, facts, and bank regulation. In *Financial markets and financial crises*, pp. 109–174. University of Chicago Press.

Calomiris, C. W. and J. R. Mason (2003a). Consequences of bank distress during the great depression. *American Economic Review 93*(3), 937–947.

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

Chari, V. V. and R. Jagannathan (1988). Banking panics, information, and rational expectations equilibrium. *The Journal of Finance 43*(3), 749–761.

Chodorow-Reich, G. (2014). The employment effects of credit market disruptions: Firm-level evidence from the 2008–9 financial crisis. *The Quarterly Journal of Economics 129*(1), 1–59.

Christen-Lécuyer, C. (2004). *Histoire sociale et culturelle des caisses d'épargne en France: 1818-1881*. Economica.

Christen-Lécuyer, C. (2000). *Le Mouvement social* (191), 98–101.

Combes, P.-P., M. Lafourcade, J.-F. Thisse, and J.-C. Toutain (2011). The rise and fall of spatial inequalities in france: A long-run perspective. *Explorations in Economic History 48*(2), 243–271.

Coupry, H. (1935). *Contribution à l'histoire des caisses d'épargne ordinaires en France*. Imprimerie moderne.

Darres, H. (1933). *Université de Lille. Faculté de droit. Concurrence des caisses d'épargne et des banques de dépôts. Thèse pour le doctorat en droit soutenue... par Darres (Henri)...* G. Sautai.

Degorce, V. and E. Monnet (2020). The great depression as a saving glut. *CEPR Discussion Paper* (DP15287).

Dell'Ariccia, G., E. Detragiache, and R. Rajan (2008). The real effect of banking crises. *Journal of Financial Intermediation 17*(1), 89–112.

Denuc, J. (1937). Eléments statistiques sur l'épargne en france depuis 1928. *Bulletin de la Statistique générale de la France 26*.

Diamond, D. W. and P. H. Dybvig (1983). Bank runs, deposit insurance, and liquidity. *Journal of political economy 91*(3), 401–419.

Diamond, D. W. and R. G. Rajan (2005). Liquidity shortages and banking crises. *The Journal of finance 60*(2), 615–647.

Eichengreen, B. (1992). Golden fetters: The gold standard and the great depression, 1919 1939.

Fernández-Villaverde, J., D. Sanches, L. Schilling, and H. Uhlig (2020). Central bank digital currency: Central banking for all? *NBER Working Paper* (w26753).

Fisher, I. (1933). The debt-deflation theory of great depressions. *Econometrica: Journal of the Econometric Society*, 337–357.

Freixas, X., B. M. Parigi, and J.-C. Rochet (2000). Systemic risk, interbank relations, and liquidity provision by the central bank. *Journal of money, credit and banking*, 611–638.

Friedman, M. and A. J. Schwartz (2008). *A monetary history of the United States, 1867-1960*. Princeton University Press.

Frydman, C., E. Hilt, and L. Y. Zhou (2015). Economic effects of runs on early "shadow banks": Trust companies and the impact of the panic of 1907. *Journal of Political Economy 123*(4), 902–940.

Goldstein, I. and A. Pauzner (2005). Demand–deposit contracts and the probability of bank runs. *The Journal of Finance 60*(3), 1293–1327.

Gorton, G. (1985). Bank suspension of convertibility. *Journal of monetary Economics 15*(2), 177–193.

Gorton, G. (1988). Banking panics and business cycles. *Oxford economic papers 40*(4), 751–781.

Gorton, G., T. Laarits, and T. Muir (2019). 1930: First modern crisis. *NBER Working Paper* (w25452).

Gorton, G. and G. Pennacchi (1990). Financial intermediaries and liquidity creation. *The Journal of Finance 45*(1), 49–71.

Guerrieri, V. and G. Lorenzoni (2009). Liquidity and trading dynamics. *Econometrica 77*(6), 1751–1790.

Guex, S. (1999). Les origines du secret bancaire suisse et son rôle dans la politique de la confédération au sortir de la seconde guerre mondiale. *Genèses*, 4–27.

Hoffman, P. T., G. Postel-Vinay, and J.-L. Rosenthal (2019). *Dark Matter Credit: The Development of Peer-to-Peer Lending and Banking in France*. Princeton University Press.

Ivashina, V. and D. Scharfstein (2010). Bank lending during the financial crisis of 2008. *Journal of Financial economics 97*(3), 319–338.

Iyer, R. and M. Puri (2012, June). Understanding bank runs: The importance of depositor-bank relationships and networks. *American Economic Review 102*(4), 1414–45.

Iyer, R., M. Puri, and N. Ryan (2016). A tale of two runs: Depositor responses to bank solvency risk. *The Journal of Finance 71*(6), 2687–2726.

Juks, R. (2018). When a central bank digital currency meets private money: The effects of an e-krona on banks. *Sveriges Riksbank Economic Review* (3), 79–99.

Kashyap, A. K. and J. C. Stein (2000). What do a million observations on banks say about the transmission of monetary policy? *American Economic Review 90*(3), 407–428.

Keister, T. and V. Narasiman (2016). Expectations vs. fundamentals-driven bank runs: When should bailouts be permitted? *Review of Economic Dynamics 21*, 89–104.

Kelly, M. and C. Ó Gráda (2000). Market contagion: Evidence from the panics of 1854 and 1857. *American Economic Review 90*(5), 1110–1124.

Khwaja, A. I. and A. Mian (2008, September). Tracing the impact of bank liquidity shocks: Evidence from an emerging market. *American Economic Review 98*(4), 1413–42.

Laufenburger, H. (1940). Les banques françaises; enquête sur les changements de structure du crédit et de la banque. *Paris, Librairie du Recueil Sirey*.

Lepelletier, F. (1911). *Les caisses d'épargne*. J. Gabalda.

Lepetit, B. (1986). Reseau urbain et diffusion de l'innovation dans la france pre-industrielle: La creation des caisses d'epargne (1818–1848). *History of European Ideas 7*(4), 353–375.

Loriot, J. (1930). Les banques. *Revue d'économie politique 44*(3), 538–556.

Loriot, J. (1932). Les banques. *Revue d'économie politique 46*(3), 658–672.

Martin, M. (2002). *La presse régionale: des affiches aux grands quotidiens*. Fayard.

Meltzer, A. H. (2003). *A History of the Federal Reserve, Volume 1*. University of Chicago Press.

Mian, A. and A. Sufi (2011). House prices, home equity-based borrowing, and the us household leverage crisis. *American Economic Review 101*(5), 2132–56.

Mian, A. and A. Sufi (2014). What explains the 2007–2009 drop in employment? *Econometrica 82*(6), 2197–2223.

Mitchener, K. J. and G. Richardson (2019). Network contagion and interbank amplification during the great depression. *Journal of Political Economy 127*(2), 465–507.

Mitchener, K. J. and G. Richardson (2020). Contagion of fear. *NBER Working Paper* (w26859).

Ó Gráda, C. and E. N. White (2003). The panics of 1854 and 1857: A view from the emigrant industrial savings bank. *The Journal of Economic History 63*(1), 213–240.

Peek, J. and E. S. Rosengren (1997). The international transmission of financial shocks: The case of japan. *The American Economic Review*, 495–505.

Peek, J. and E. S. Rosengren (2000). Collateral damage: Effects of the japanese bank crisis on real activity in the united states. *American Economic Review 90*(1), 30–45.

Piketty, T. (2001). *Les hauts revenus en France au XXe siècle*. Hachette.

Proettel, T. (2017). Path dependencies in european savings banks: The impact of the fundamental decisions from the beginning of the 19th century. *Vierteljahrschrift für Sozial-und Wirtschaftsgeschichte 104*(2), 177–202.

Richardson, G. (2007). The check is in the mail: Correspondent clearing and the collapse of the banking system, 1930 to 1933. *Journal of Economic History*, 643–671.

Rist, L. (1933). Les caisses d'épargne. *Revue d'économie politique 47*(3), 788–800.

Sauvy, A. (1984). Histoire économique de la france entre les deux guerres, volume 3, paris. *Economica*.

Schularick, M. and A. M. Taylor (2012). Credit booms gone bust: Monetary policy, leverage cycles, and financial crises, 1870-2008. *American Economic Review 102*(2), 1029–61.

Statistique de la France, A. (1966). Résumé rétrospectif. 1966. *Soixante-Douzième Volume, Nouvelle Série* (14).

Tournié, V. (2011). *Épargne et crises politiques en France. Les mouvements de panique dans les Caisses d'épargne au XXe siècle*. Economica.

Toutain, J.-C. and Y. Breton (1997). *La croissance française, 1789-1990: nouvelles estimations*. ISMEA.

Vergeot, J. (1932). Les caisses d'épargne. *Revue d'économie politique 46*(3), 724–735.

White, E. N. (1984). A reinterpretation of the banking crisis of 1930. *Journal of Economic history*, 119–138.

Ziebarth, N. L. (2013). Identifying the effects of bank failures from a natural experiment in mississippi during the great depression. *American Economic Journal: Macroeconomics 5*(1), 81–101.