

# Eligibility to Central Bank Liquidity and the Bankruptcy Rate

## Lessons from France 1826-1913<sup>1</sup>

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### Abstract

This paper uses a newly compiled dataset on local bankruptcy rates in 86 French districts between 1826 and 1913 to assess whether easier access to central bank refinancing helped to mitigate the consequences of negative liquidity shocks. Using an exogenous negative productivity shock on agriculture as an instrument for liquidity demand of the industrial and service sectors, we show that the adverse consequences of the shock for those two sectors were smoother in those districts in which agents had an easier access to central bank refinancing. We show evidence that allows ruling out that this result may have been the outcome of the central bank subsidizing insolvent agents by playing the role of a “bad bank”.

## 1. Motivation

Generally speaking monetary policy is thought of as adjusting the nominal interest rate level. In periods of financial stress, however, the operational framework of monetary policy, which - while technically important - is normally considered the domain of the front office and risk managers and gets little attention by academic economists or the general public, can move to the forefront. Among these operational aspects are in particular the questions, who can get refinancing at the central bank and what are the assets that the central bank is willing to buy or willing to lend against (Bindseil 2009, Chailloux et al. 2008). Since 2007 and in particular after policy rates had reached levels where they could no longer decline any significantly further, the interest of policy makers at the central banks of the major industrial countries has to a significant extent shifted towards the choice of eligible counterparties and assets eligible for refinancing (Borio and Disyatat 2009).

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This paper aims to assess the effects of changes in eligibility on the performance of the real economy. We do so by a historic case study, looking at the eligibility rules of the French central bank and its impact on the bankruptcy rate in the 19<sup>th</sup> century. The reasons to go for a historic example are twofold. First, central banks like continuity and big adjustments in eligibility rules are rare. Second, the identification of the effects of being eligible vs. not being eligible is difficult empirically. Eligibility is often tied to economic criteria (e.g. being a bank, having a certain rating) and is thus potentially endogenous to the economic effects that should be assessed. Changes in eligibility rules in turn are often the result of financial stress and thus again linked to the economic outcome we would like to analyze. In the case of the French central bank eligibility was not only based on economic but also geographic conditions, which are arguably exogenous. Richardson and Troost (2009) used a similar identification strategy, when they looked at banks located in the same state but on the two sides of the frontier between the Federal reserve districts of Atlanta and St. Louis in order to compare the effects of the different monetary policies practiced by the two regional Feds. The present paper looks at a uniform monetary policy but differences in eligibility.

The response is that eligibility did matter. Bankruptcy rates in districts with access to the Banque de France were lower than in districts without. And there is considerable evidence that the positive effect of the Banque de France came without costs – the central bank apparently only provided liquidity to agents that ultimately turned out to be solvent. Our empirical exercise thus contributes also the debate on the optimal form of liquidity provision in periods of financial stress.<sup>2</sup> Some authors have argued that central banks should only care about the aggregate liquidity supply, leaving the distribution of liquidity to the market (Goodfriend, King 1988, Bordo 1990, Schwartz 1992). Other authors like Repullo (2000) have argued that the same information asymmetries that justify the existence of banks in the first place also render their loan portfolios illiquid and might lead the interbank market to fail in periods of financial stress. During financial panics healthy banks may also be tempted to manipulate their lending behavior for strategic purposes (Acharya, Gromb and Yorulmazer, 2012). In all these cases it might be preferable to offer each and every bank direct access to the central bank (Calomiris 1994, Flannery 1996, Freixas et al. 2000).

Eligibility is a subject of high relevance. In the recent financial crisis eligibility has become a key policy instrument on both sides of the Atlantic. Before 2007 the traditionally restrictive Fed had operated with a very small number of counterparties, some twenty primary dealers, accepting only treasuries as collateral. In response to the tensions in financial markets the Fed decided to broaden access significantly in 2008, both by creating new facilities for a much larger group of counterparties as well as by accepting a significantly larger set of assets as collateral in lending operations (Cechetti 2009). For historical reasons the Eurosystem had from the beginning of the common monetary policy

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<sup>2</sup> Inspired by the specific features of the operational framework of the US Fed, the debate has been framed in terms of discount window lending vs. open market operations. Its conclusion however can also be rephrased under the more general heading of eligibility.

in 1999 operated with a large number of counterparties and a broad definition of eligible collateral that includes not only public and private securities but also non-marketable assets like credit claims (Chailloux et al. 2008). Nevertheless, during the crisis the Eurosystem considered it several times necessary to further enlarge the collateral pool by lowering quality requirements (ECB 2009, 2011). Both the Fed and the Eurosystem implemented these measures not as substitutes but rather as complements to the more traditional interest rate policy, as policy makers feared that changes in the interest rate alone would not be transmitted to the real economy because of stress in interbank markets and market failure in the financial markets more generally.

While it is clear that the limitations and motivations for the Banque de France then and central banks today differ in many important respects, the economy we analyze in our paper has a number of interesting features. First, the Banque de France operated with standing facilities, i.e. it fully accommodated liquidity demand at the set interest rate and given the fulfillment of quality requirements. This is very similar to the current framework of the Eurosystem operating with a fixed rate full allotment policy. Second, being eligible or not was the main distinctive feature of agents (and assets) while otherwise a single interest rate and uniform rules for the implementation of monetary policy applied for the entire French territory. This is similar to the current understanding of a level playing field, where central banks should not discriminate between counterparties as soon as they are eligible for central bank operations. Finally, fiscal policy was passive in 19<sup>th</sup> century France, not smoothing out the regional income shocks we will look at through interregional transfers. Again, the parallels to the limited fiscal federalism in the Euro area are evident.

The paper is organized as follows. Section 2 gives an outline of the argument and the design of the empirical exercise. Sections 3 to 6 then provide the historic background in more detail. Section 3 starts by explaining the rules for access to the Banque de France during the 19<sup>th</sup> century while section 4 gives an overview of the evolution of central bank access in 19<sup>th</sup> century France. Section 5 presents the extensive effort of data collection and construction that underlies the empirical exercise. Based on archives and published documents we have assembled a dataset on the year-by-year evolution of the bankruptcy rate, our measure for the effects of liquidity shocks, as well as on the banking sector and the central bank for each of 86 French districts (*départements*) between 1826 and 1913. Section 6 presents the productivity shock we study and demonstrate that it was transmitted to the local economy. In section 7 the resulting panel dataset is used to demonstrate that the broadening of access to the Banque de France did in fact help mitigate the adverse liquidity shock we analyze and stabilized the economy without causing losses to the central bank. Section 8 concludes.

## 2. Does a broader access to the central bank matter? Empirical challenges, research design and some first evidence

As argued above, the main challenge in evaluating the benefits of broadened eligibility to central bank refinancing facilities is empirical. A proper assessment requires the identification of a measure for the impact of the central bank on economic activity and of a real shock that increased liquidity demand by the private agents. It also requires the existence of two well defined groups, one eligible for central bank refinancing and the other not, that are set exogeneously and independently of the liquidity shock analyzed, as well as the possibility to rule out endogeneity and reverse causality of the liquidity shock to central bank measures.

The specific eligibility rules of the 19<sup>th</sup> century Banque de France (but very much standard for other central banks of the time) fulfill the criterion of exogeneity to liquidity shocks. At the time only enterprises and people living in a city or town where the Banque de France was represented could obtain central bank loans. Also for bills of exchange to be eligible at the BdF discount window the payee had to live in a *place bancable*, i.e. again a town that was part of the network of the Banque de France. While between 1817 and 1835 the Banque de France operated in Paris only, it extended its services over the following decades to the entire territory by creating a dense network of branches, auxiliary branches and designated towns where the bank would execute payment services, so that by 1913 almost 600 cities and towns counted as *places bancables*. The geographical extension meant that the number of eligible counterparties rose significantly and that an increasing share of bills became acceptable for central bank rediscounting. This peculiar design of central bank access allows comparing the impact of liquidity shocks for regions that only differed with respect to their access to the central bank.<sup>3</sup> As will be seen in section 4, the extension of the network was driven by a combination of political and economic factors that was unrelated to economic crises or specific liquidity shocks and can thus be treated as exogenous to the question at hand. Therefore, if a given liquidity shock had a smaller impact in districts served by the BdF this could be attributed to the privilege of having direct central bank access.<sup>4</sup>

Next a measure for real economic activity that is strongly affected by liquidity shocks is needed. The idea here is that by creating additional liquidity a central bank can help firms that are fundamentally solvent but temporarily illiquid. The definition of a bankruptcy (*faillite*) in French law has a number of convenient features for the question at hand. In particular, the opening of a

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<sup>3</sup> There is of course the possibility to obtain central bank liquidity indirectly. In case the central bank was not present in some district, firms located in this district and hit by a liquidity shock on the aggregate district level could have relied on intermediaries or firms active outside the district. However, when the central bank extended the extent of its monetary policy operations to a new district it must have reduced the transaction cost of arranging the furnishing of liquidity – compared to the previous situation with intermediaries between the central bank and the agents.

<sup>4</sup> We would also like to exclude that different outcomes can be attributed to other aspects of central bank policy, like e.g. quantitative restrictions in refinancing or the application of different interest rates in different regions. Those conditions are fulfilled for the 19<sup>th</sup> century Banque de France.

bankruptcy procedure is tied to illiquidity and not to insolvency directly. According to both the law and the jurisprudence the role of the procedure consisted in protecting the equality of the creditors of the creditors when it was unable to pay one of its creditor. In this context a bankruptcy procedure consists in screening the value of the assets, in ascertaining the effectiveness of the liabilities (so as to avoid some creditors to be spoilt by made-up claims) and in deciding on whether the business must be discontinued (in which case the monetary value of the assets was shared between the creditors) or whether the firm had to continue in operation. In order to limit as much as possible anti-competitive or political interference into business, the law strove to use a trigger for the bankruptcy procedure that could not be easily manipulated by one of the parties concerned. To this end it was decided that bankruptcy procedure may be opened only following the recognition that the firm was unable to meet a payment obligation. Legal scholars were clear that the state of insolvency in itself could never be a motive to the opening of a bankruptcy procedure and that insolvency could only be the result of a proper screening of a firm during such a procedure (Percerou, 1935).<sup>5</sup> This reasoning had the implication that no judge can force an insolvent – but liquid – firm to file for bankruptcy. As a result the number of bankruptcy procedures opened during a year in a given district can be used as a direct measure of the ability of firms to meet their payment obligations. An additional convenient feature of the law was that not all businesses or agents were allowed to file for bankruptcy. Only traders (*commerçants*, i.e. those who sell goods or services on the market for profit purposes) qualified for the bankruptcy procedure, while workers and other non-traders were excluded as well as farmers.<sup>6</sup> This comes in handy below, when we use an income shock to the agricultural sector to assess the effects of central bank liquidity support. Also importantly did neither the definition of bankruptcy nor the scope of businesses to which the law applied change during the 19<sup>th</sup> century. Finally, bankruptcy figures can be reconstructed on a district level allowing to compare its behaviour in districts with and without access to the Banque de France.

The empirical test therefore consists in the computation of panel regressions of the bankruptcy rate as the measure of liquidity stress on some cause for liquidity stress (called shock), a measure of the eligibility of agents to the central bank and the interacted variables of the liquidity shock times the measure of eligibility. Formally our regressions follow the baseline specification:

$$BR_{it} = \alpha Shock_{it} + \beta Elig_{it} + \gamma Shock * Elig_{it} + t_t + d_i + t_t * d_i + \varepsilon_{it} \quad (1)$$

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<sup>5</sup> Article 437 alinea 1 of the 1807 commercial code enacted that: « Any trader that cease paying is in a state of bankruptcy » (« Tout commerçant qui cesse ses paiements est en état de faillite »). The legal scholar Percerou (1935, p. 207-8) commented that « la faillite en France se constate par l'impossibilité de payer. Elle se distingue de la déconfiture des non-commerçants (i.e. exerçant une profession civile) ». Percerou added in paragraph 181 that « pour savoir si la faillite doit être ouverte, on n'a pas à examiner si le commerçant est solvable ou non, mais uniquement si de fait il paye ou ne paye pas »

<sup>6</sup> Notice that this did not imply that payment obligation were not enforced with those agents but rather than frustrated creditors have to ask the debt repayment using another judicial procedure (Percerou, 1935, p. 207-8).

Where  $BR_{it}$  is a measure of the liquidity stress faced by firms in district  $i$  during year  $t$ ,  $Shock_{it}$  measured the shock that hurt the firms' liquidity in district  $i$  during year  $t$  and  $Elig_{it}$  is a measure of agents' access to the central bank refinancing facility in district  $i$  during year  $t$ . In order to account for structural determinants and the secular evolution in the bankruptcy rates the regressions include districts and year fixed effects and trends specific for each district.

This leaves the search for a liquidity shock. A typical aggregate shock that central banks address and that directly impact agents' liquidity is a financial crisis. Table 1 studies the reaction of the bankruptcy rate during the major 19<sup>th</sup> century financial crises episodes by comparing the average bankruptcy rate two years before and two years after the burst of financial crisis, distinguishing between district in which the Banque de France was active and those in which it was not. As expected the occurrence of a crisis increased the bankruptcy rate but the increase is in most cases greater in those districts, in which the central bank was not (yet) active.

**Table 1: Comparison of the average bankruptcy rate in districts with and without a central bank, two-year before and after the burst of a crisis**

| Bankruptcy rate                        |                | 1857 crisis | Var    | 1866 crisis | Var     |
|--|----------------|-------------|--------|-------------|---------|
| <b>Districts with a bank branch</b>    | 2 years before | 0.256%      |        | 0.223%      |         |
|  | 1 year after   | 0.260%      | +1.71% | 0.241%      | +8.38%  |
| <b>Districts without a bank branch</b> | 2 years before | 0.187%      |        | 0.165%      |         |
|  | 1 year after   | 0.198%      | +6.29% | 0.194%      | +17.63% |

Source: Authors' computations

As interesting as this measure can be, it suffers from several drawbacks. First, we don't know whether all districts were hit by the shock to the same extent. For instance the shock might have been greater in financial centers, i.e. those cities and regions that typically also received a branch by the Banque de France first. In this case, the test would be biased against finding a positive effect of access to the Banque de France. However, the shock might also potentially be related to some policy of the central bank before the crisis, in which case the positive effect of central bank access might be overestimated. It could be the case, e.g., that when taking decisions prior to the crisis, agents were anticipating the (future) relief provided by the central bank, leading to moral hazard, increased risk taking and ex-ante increase in the bankruptcy rate, thus provoking the financial crisis in the first place. Secondly, another classic problem in the study of financial crises is that it cannot be excluded that the central bank deviated from the classical lender of last resort doctrine (lend only against good collateral) and chose to refinance insolvent firms or to accept bad collateral. If this were the case, the central bank would have acted as a bad bank. Together moral hazard before the crisis and the taking-over of losses by the central bank after the crisis might bias the bankruptcy rate upwards before and

downwards after the crisis, leading us the wrong conclusion that the presence of the central bank had the effect of mitigating the increase in the bankruptcy rate during the crisis.

We therefore tried to identify a shock that should not be affected by these issues of reverse causality and omitted variables. Also the shock to be studied to be real, i.e. it is not purely driven by changes in expectations, and indirect, i.e. we do not want to study a situation in which the central bank helps those that were at the origin of the shock but rather those that suffered from some real shock in another economic sector that is out of the reach of the central bank. This way, the central bank should not have an incentive to act as a bad bank. Finally the shock should be ideally independent of the agents' action, i.e. the past action of agents should not have been the cause of the shock. All these criteria apply to an agricultural disease that hit the French economy between the 1860s and the 1890s, phylloxera.<sup>7</sup> Phylloxera is an insect that attacks the roots of vines and leads to a rapid loss in production. The use of this shock allows to rule out moral hazard, something that could not be excluded with financial shocks. Phylloxera arrived on French territory in 1863. Since no effective treatment was available before 1890 the spread of phylloxera was exogenous to farmers' actions. There is no potential reverse causality as the spread of phylloxera was not influenced by the agents' bankruptcy decisions. The gradual spread of the disease over the territory helps the identification of the effects of central bank access, as it can be excluded that the observed change in the bankruptcy rate is due to some other shock that hit the economy at the same time. Moreover, phylloxera affected so many districts that it can be taken as a proxy for a local (aggregate) liquidity shock. Postel-vinay (1989) proposes a detailed case-study of the dramatic consequence of this bug on the South of France economy. In addition, the shock hit primarily farmers that were not subject to the bankruptcy law. The farmers were also not eligible to the Banque de France. Because the central bank was not allowed to lend to the agricultural sector, it cannot took any action to alter the transmission of the agricultural shock to the rest of the economy. This means that our results are not explained by a differential implementation of the monetary policy operations. However, the decline in agricultural production was transmitted in the form of lower demand to the rest of the economy, thus constituting only a temporary shock to the agents that were allowed to file for bankruptcy and to ask central bank relief. The following sections 3, 4, 5 and 6 explain these elements of the empirical exercise in more detail. The regression results follow in section 7.

### **3. Eligibility rules in 19<sup>th</sup> century central bank operations**

During the entire 19<sup>th</sup> century the bill of exchange was the main instrument used by agents to obtain refinancing from the central bank. The operation involved agents in need for cash to ask for the

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<sup>7</sup> Phylloxera has been used to assess the effects of a large productivity shock before. Banerjee, Duflo, Postel-vinay and Watts (2010) shows that the bug triggered significant long-run health impact while Bignon, Caroli and Galbiati (2011) that it contributed to increase the criminal activity.

*escompte* (discount) of a bill by the Banque de France, which meant that the bank bought the claim at its nominal value deduction made of a discount that was determined by the residual maturity of the bill and the discount rate. By discounting, i.e. buying the bill, the central bank became the payee and it will be paid at due date by the drawee named on the bill at an address that was also specified on the bill. The discount rate was set by the Bank and applied, according to the 1808 decree that organized the statute of the bank, indiscriminately in any of the places where the bank had an office. This provision forbade the bank to adjust the discount rate to local conditions. Alternatively, central bank money could also be obtained through collateralized lending called *avances sur métaux précieux ou titres*, i.e. a loan on collateral, either gold or silver or securities. During the period under study, discounting was by far a much more important activity than collateralized lending. Discounting represented on average 91% of central bank operations during the period 1826-1913.

The preference for discounting was to a large extent due to the safety of the asset. Bills were favoured by the law having organized the transfer of the ownership of bills very carefully. Each transfer of a bill (i.e. each act of discounting) left the previous owners with a joint liability vis-à-vis the purchaser of the bill (the discounter). Indeed each purchaser of a bill signed the bill, which was an acknowledgement of his commitment to pay the bill in case of default by the drawee. The exercise of this clause of joint-liability clause was quick and relatively easy. It required only the protestation of the bill, i.e. the ascertainment of the default by a bailiff, a notary or two witnesses at the moment the bills fell due. For example the simple absence of the payer in due time at the scheduled place sufficed for the payee to protest the bill, which instantly allowed him to invoke the guarantee of the last endorser, asking him to pay in lieu of the initial payer. If this person also failed, and if the bill was endorsed by another person, the joint liability clause again applied, and so on up to the drawer of the bill.<sup>8</sup> The incentives created by the joint liability must have lead discounters to carefully scrutinize the quality of the bills they decided to guarantee, i.e. to refuse the discounting of the bill whenever they doubted of the solvency of the payer.<sup>9</sup>

Access to the facilities for discount and advances was both broad and restricted at the same time. In contrast to nowadays, everybody fulfilling some minimum criteria could obtain funds from the Banque de France (Cameron, 1967, p. 121). The main formal restriction was the requirement for the account holder to have an address in a town where the Banque de France operated a branch.<sup>10</sup> Between 1817 and 1835 that meant living in Paris. The rule didn't change over the century. But after 1836 when the Banque de France started to open branches outside Paris, the number of people who

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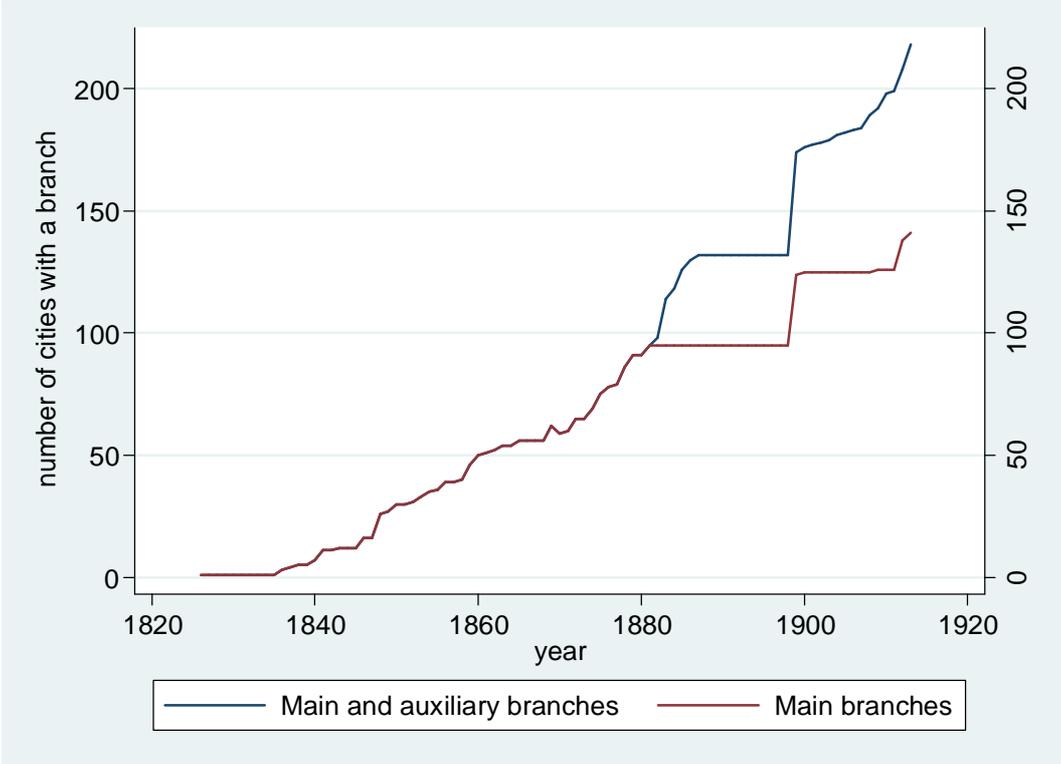
<sup>8</sup> Dalloz (1830, p. 128).

<sup>9</sup> We are not aware of any study on the diffusion of bills among the population of traders, and especially on the degree to which its use spread out in local community in 19<sup>th</sup> century France, although the increase of the ratio of circulating bills to GDP may indicate the broadening of the number of people involved in the discount of bills. Moreover Roulleau (1913) signaled that a declining average value of the circulating bills, which he interpreted as a greater diffusion of the bills as a tool for short-term finance.

<sup>10</sup> Exceptions were made for important receivers-general in the provinces (Gille 1959 p 86).

could access its services increased significantly.<sup>11</sup> By 1913 the inhabitants of 218 towns had the possibility to open an account at the BdF and thereby access to the discount and the Lombard facility (see figure 1). In 1913 86,200 persons had taken this opportunity (Lescure, 2003, p. 139). The eligibility of counterparties depended thus to a large extent on a geographic criterion.

**Figure 1: The number of branches operated by the bank of France, 1826-1913**



Source: Jobst (2010)

The same was true for which bills were considered eligible. A bill was a claim whose payment has to be collected at the payer’s doors. Because bills were held to maturity, the central bank was only willing to accept bills payable in places in which it could actually claim the payment without the need for another intermediary. This required either the payee to keep an account with the Banque de France or an officer of the bank had to be sent and collect the payment. In both cases the bank had to be physically present. As long as the only office of the bank was in Paris, that meant that that only bills payable in Paris were discounted by the bank.<sup>12</sup> While other eligibility criteria of bills were gradually loosened, particularly in the later decades of the 19<sup>th</sup> century, the domiciliation requirement for bills to be payable in a city where the Banque de France was represented was upheld.<sup>13</sup> Indeed as the payment

<sup>11</sup> The extension of the network of branches by the Banque de France followed a first attempt made during the Napoleonic period (see Pruneaux, 2009 for details).  
<sup>12</sup> This constraint was further reinforced by the government when it enacted in 1808 that the bank was only allowed to discount bills payable in Paris, or later a town where the Bank was represented (a *bankable place*, i.e. a branch or a designated town in which the bank send its collectors to cash in the bills).  
<sup>13</sup> At the beginning of the Banque de France operation, bills also had to fulfil other criteria concerning a minimum and a maximum maturity, a minimum amount and the number and quality of signatures. According to Article IX of the Statuts fondamentaux from 1808 bills had to have a term of at most three months and to carry the signatures of at least three merchants or bankers “of notable solvency”. The requirement of a third signature

technology of bills did not change over the 19<sup>th</sup> century, nor did the domiciliation criterion. Hence opening a branch in a city was not only allowing more agents to become a counterparty of the bank but also made more bills eligible, thereby extending the volume of assets against which central bank money could be obtained. By 1913 almost 600 cities and towns counted as *places bankables*.

Even though bills were per construction relatively safe assets, another consequence of the outright purchase of bills was the need to monitor default risk if the discounted bills ended up being unpaid. As a privately owned company traded on the stock exchange, the Banque de France had a keen interest to minimize its exposition to default so as to protect profitability. It was also by law required to only discount bills that were endorsed by at least three persons who were notoriously solvent.<sup>14</sup> In order to ascertain the quality of bills bought, the management delegated the screening of the solvency of its counterparties to discount committees that decided the acceptance or not of bills presented. The discount committees typically comprised persons nominated by some of the shareholders of the bank and some of its regents.<sup>15</sup> The watchdog of the discount committee was the Portfolio committee – composed of board member of the bank. It was in charge of examining the legality of the decisions of the discount committees, notably the fulfilment of the clause that forbade the bank to lend to bankrupted agents.<sup>16</sup> Finally any decision of the bank was ultimately monitored by three shareholders (*censeurs*) in charge of overseeing the bank's activities. The *censeurs* were elected by the shareholders and were in charge of choosing the member of the discount committee and approving the issue of the banknotes.<sup>17</sup> This governance structure was complemented by a special body of bank employees – the *inspection* – in charge of the monitoring of the activity of the branches operated by the bank outside Paris.

To sum up this historical tour into 19<sup>th</sup> century central eligibility and collateral policy, the geographical extension of the operation of the central bank meant that the number of eligible

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implied that a commercial bill would have to be discounted already once before becoming eligible to the BdF, i.e. de facto to be held by a banker or merchant. Together with the minimum amount this rule restricted credit to a small group of bankers and merchants at least in the first decades of the bank's operation. Over the century eligibility requirements were gradually loosened. From 1833 onwards, e.g. the third signature normally required could be replaced by pledging government debt (Cameron, 1967, p. 123), after 1869 all securities eligible for advances (Décret du 13 janvier 1869 par extension de l'article 12 des statuts et de l'article 3 de la loi du 30 juin 1840). In 1898 certificates for warehoused agricultural produce (warrants) were admitted to discount (Ramon 1929 p. 416). The minimum amount for bills was gradually lowered from XX francs in 1800 to 5 francs in 1898 (Ramon 1929 p. 416). A similar loosening can be observed for advances on collateral, where also the minimum amount of loans was lowered over time and the range of eligible collateral extended from only gold and silver at the beginning to include securities issued by the central government, then by the city of Paris, government-guaranteed railroads, mortgage-backed bonds (Société du Crédit Foncier), local governments etc. by the end of the 19th century (Ramon 1929 pp. 277, 311, 403).

<sup>14</sup> Article 11 of the Decree dated 01/16/1808 : “ La Banque, soit à Paris, soit dans les comptoirs et succursales, n'admet à l'escompte que des effets de commerce à ordre, timbrés et garantis par trois signatures au moins, notoirement solvables”, [http://www.banque-france.fr/fileadmin/user\\_upload/banque\\_de\\_france/histoire/textes/lois-comptoirs.pdf](http://www.banque-france.fr/fileadmin/user_upload/banque_de_france/histoire/textes/lois-comptoirs.pdf)

<sup>15</sup> This is true for the Paris office but also for each branch (see article 35 and 36 of the decree dated 09/08/1808).

<sup>16</sup> Articles 58 and 59 of the Statutes, *ibid*.

<sup>17</sup> Article 46 of the statutes, *ibid*.

counterparties rose significantly and that an increasing share of bills became acceptable for central bank rediscounting. This peculiar design of central bank access allows comparing the impact of liquidity shocks for regions that only differed with respect to their access to the central bank. The next section describes the gradual extension of the branch network. This allows ruling out the endogeneity of the eligibility policy of the central to the liquidity shock that we study in the paper. Indeed, we claim in the next section that neither the timing of the opening, nor the constraints faced by the bank in terms of branch opening fit with the spread of the phylloxera onto the French vineyards.

#### **4. Rationales for and constraints on the development of the bank branches**

Historians explain the development of branches by the Banque de France as the outcome of both political and competitive pressures from merchants and political elites of the main French cities outside Paris. Indeed, technically the bank possessed a monopoly of note issue only in Paris and those cities in which it maintained branches (Cameron, 1967, p. 126). This rule provided the government, politicians and local merchants with a strong argument to either convince the bank to open branches in the provinces or to allow competitors to enter. After the Napoleonic period, which is outside of the scope of this study, four main episodes in the history of the branches can be distinguished.<sup>18</sup> All of them were flavoured with political interferences in the decision making process of the bank. Each was linked to the discussion and negotiations on the renewal of the privilege of notes issuance.

The period between 1817 and 1848 was one characterized by multiple banks of issue. Indeed following the demise of the Empire in 1815, the Banque de France closed its regional branches, which had been set up mainly for political reasons.<sup>19</sup> The bank considered that branches were unprofitable and difficult to manage and preferred to restrict its activity to Paris. The economic and political elites of the major French commercial cities were unhappy with this situation and pushed for the creation of local banks of issue (*banques départementales*), arguing that the cities known for hosting markets of regional importance needed banks of issue to cater to their regional financial needs.

The local banks of issue were launched following an intense lobbying for the necessary royal approval and were supported by the neutrality of the Banque de France, which was always consulted on the matter (Gille, 1970). Nine banks succeeded to secure the privilege and were thereby created, three in 1817 and 1818 and six more in the second half of the 1830s.<sup>20</sup> Each enjoyed the monopoly of

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<sup>18</sup> The episodes of importance were the end of the 1830's- beginning of the 1840's, then the period of the Second Empire, the third took place during the 1870's with the passing of the law on branches and the last period of opening was linked to the renewal of the privilege in 1897.

<sup>19</sup> Plessis 1998 (1967), p. 83; Ramon 1929 p.123, 129-130.

<sup>20</sup> Bordeaux (1818), Nantes (1818), Rouen (1819), Marseilles and Lyons (1835), Lille (1836), Le Havre (1837), Toulouse and Orléans (1838) Marseilles (1840). See Kindleberger (1993, p. 105-106). Gille (1970) described the birth and operation of four of those banks, Le Havre, Lille, Lyons, Marseilles and the demise of the project proposed by Dijon. Cameron (1967, p. 125) mentioned that the Banque de France impeded the creation of nine issuing banks.

notes issue in the city where it operated. After some initial hesitancy, the Banque de France considered this movement as threatening its business model.<sup>21</sup> For example one of two deputy governor of the bank de France argued in an executive meeting dated February 1836 that “Soon there will be nothing left of the monopoly of the Bank (...) If the Bank does not wish to be completely disinherited in the *départements* [districts], it must be hasten to take steps to occupy the cities of the second order, in default of those of the first, in order to merit its title of *Bank of France*, and to preserve, in view of the approaching renewal of its charter, a facility which might otherwise be compromised”.<sup>22</sup>

Faced with mounting and increasingly fierce competition, the bank switch strategy and decided to open new branches itself – first in Reims in 1836– and to lobby the government and legislature to make the opening of new independent banks of issue more complicated. A law in 1840 tilted the balances between monopoly vs. multiplicity of issuing banks decidedly in favour of the Banque de France. As a result fifteen branches, each in a different city, were opened in the eight years that followed, while no new independent local bank was founded after 1840. The revolution and financial crisis of 1848 hastened the process and in an emergency measure all local issuing banks were merged with the Banque de France. The era of the local banks of issue came to a close (Ramon, 1929 p. 230).<sup>23</sup>

The granting in 1848 of a de facto monopoly of banknotes issuance over the whole territory left however the Bank still hesitant when it came to opening new branches, mainly for reasons of governance of the local branch and risk management of the portfolio of a profit-maximizing institution. But the competitive threat from the banking sector remained an important stimulus to pursue the opening of new branches. During the twenty years of the second Empire (1852-1870), the Banque de France faced two main challengers. First the Pereire brothers were very active in attempting to influence the emperor to secure privilege for their own banking businesses (Cameron, 1961, p. 138-44). After having tried to issue their own interest-bearing banknotes in the 1850s, they attempted in 1860 to breach the note issuing monopoly of the Banque de France by taking over the Bank of Savoy, which according to the treaty that incorporated the territory of Savoy into France had retained its note issuing privilege. The outcome of this intense fight was losing battles by the Pereire but an extended branching by the central bank.

By the 1860s, the profit and position of the Banque de France were threatened by the rise of national deposit branch banks like the Crédit Lyonnais or the Société Générale. Relying on extended branch networks those national deposit banks collected significant amounts of deposits that they employed in the discount business. As they hardly ever rediscounted their bill portfolio at the bank of France, this development severely hit the core income generating business area of the bank (Lescure, 2003, p. 136-7). This brought about another reconsideration of the merits of branching as a generator

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<sup>21</sup> Ramon 1929, p. 175-6; Cameron, 1967, p. 104, 123-7

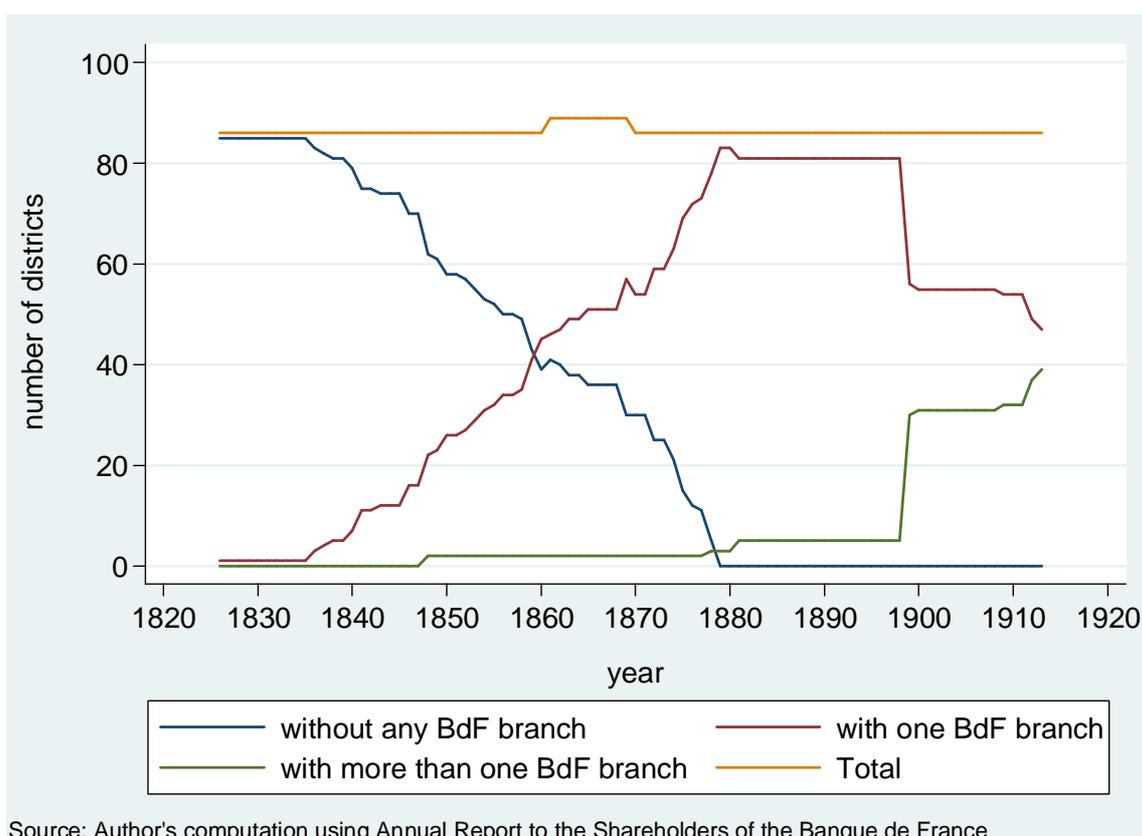
<sup>22</sup> Procès verbaux du Conseil general, vol. 20, fol. 220, 25 February 1836, cited in Cameron (1967, p. 104)

<sup>23</sup> except for one short episode in 1860 with the incorporation of the Savoy and the coming of the bank of Savoy

of additional discount business. The bank's directors reacted by supporting smaller regional and local banks, that refinanced their bill portfolios at the Bank, and by encouraging non-bank clients to use the Bank's lending facilities (Plessis 1985, Nishimura 1995 p. 547). As competition for good bills was fiercest in the larger cities, establishing a presence in more remote places was a way to increase business.

However, except during the early 1850s, the opening of new branches followed an uneven evolution. While a constant political pressure – lobbying from the local elites – and competitive threat from banking persisted during the second half of the century, an important driver were the recurring (re)negotiations with the government and parliament on the occasion of the expiration and necessary renewal of the statutes and of the monopoly rights granted therein. Every renewal of the privileges gave rise for political demands to extend services both at existing branches and through the creation of new branches. Besides 1840, renewal was granted in 1857, in 1897 and in 1911. In 1873 a law decided to activate the clause contained in a law passed in 1857 to force the Banque de France to operate at least one branch in each district by the beginning of 1877 (Plessis, 1985, p. 199-201). The two decades spanning in the 1860s and 1870s and the years post-1897 were then characterized by an intense activity of branching and it is fair to say that the chronology fits well the political-financial nexus. To the external pressure came, according to Lescure (2003), the ethos of a new generation of bank officials with a republican background who came to dominate the bank in the 1880s striving for the decentralization, diversification and democratization of the Bank's operations. In these years the BdF not only expands geographically, but implements significant simplifications in the access to its discount, Lombard and giro facilities (*ibid* p. 138). Being the bank of the general public, not only of the other banks, becomes the objective by the 1900s, at least if we believe the public declarations of governor Pallain (1897-1920). In the end more and more regions and cities enjoyed a direct access to central bank refinancing facilities. By 1879 there is at least one branch per district and over the course of the century more and more districts benefit from more than one branch (figure 2).

**Figure 2: Number of districts with no, one, and more than one BdF branch offices**



Source: Author's computation using Annual Report to the Shareholders of the Banque de France

The history (timing) of the branches opening was thus the outcome of a bargain triggered by the discussions on or threats to the monopoly of the note issue. At the same time the Banque de France was a profit maximizing firm and there is not a single branch that made losses during the period, except during the very first years of operation. But even then the losses were not the result of poor management but the consequence of the huge costs of setting-up a branch. In the 1890s the Bank estimated those costs to be about 160.000 Francs, and the annual operating costs at 36.000 Francs for a small branch (*succursale*), at a time when the hourly wage of a qualified blue collar rarely exceeded 1 franc.<sup>24</sup>

A new branch was always opened with long-term concerns in mind – profitability, regional economic development, political pressure – but never to address an acute crisis. Doing so would have been potentially very costly – the BdF never closed a branch office once opened and so the long-term viability of the office was primordial. The opening of a branch office also typically required a lead time of one year. Before the opening a new office the Bank sent an inspector on-site who would assess the likely volume and risk characteristics of the local demand for (re)discounting.<sup>25</sup> As soon as a positive decision was taken, a building had to be found, a director and staff to be recruited and the

<sup>24</sup> BdF archives collection of parliamentary papers concerning the “Renouvellement du privilège de la Banque de France 1892-1897” CD V 1892/1649. Hourly wage is from INSEE (1946, p. \*222-3).

<sup>25</sup> BdF archives 1069199101/30 “Transformations de bureaux auxiliaires en succursales (1895-1912), études préliminaires” and “Création de bureaux auxiliaires (1907-1912), études préliminaires”.

members of the committee that examines the bills submitted (*comité de censure*) be nominated. The sluggish process of creating new branch offices thus makes for a fundamental difference with swift ad hoc extensions of the eligibility to central bank facilities in the recent crisis. It allows discarding a possible endogeneity between liquidity shocks and the decision by the Bank to open a branch office and thus provides the basis for the empirical analysis.

## 5. Data

Our dataset comprises observations on the economic and demographic evolution of the French districts during the period between 1826 and 1913. During the 19<sup>th</sup> century France was composed of less than 90 districts whose size was on average about the size of a U.S. county. Two main changes in frontier made our panel slightly unbalanced. First, in 1860 France incorporated three new districts with the annexation of the Kingdom of Savoy. Second, the war with Prussia in 1870 ended with the loss of two districts of Alsace and of half of the Meurthe district and half of the Moselle district. The remaining part of the last two districts were merged into a newly formed district, Meurthe-et-Moselle. A remaining part of the district Haut-Rhin that stays French is named Territoire de Belfort.

This paper is the first to assemble annual data at the district level on the number of bankruptcies, the number of firms, and the amount of bills discounted by the branches of the Banque of France. We also have recorded for each year of the sample the number of branches of both of the central bank and of the two main national deposit banks, the Crédit Lyonnais and the Société Générale. We have used data collected by Banerjee, Duflo, Postel Vinay and Watts (2010) on the years of presence of the phylloxera in each district and on the variables of wine cultivation and wine production. We also have used data collected by Bignon, Caroli and Galbiati on the surface and population of each district.

The yearly numbers on newly opened bankruptcies were gathered in the National Archives for the 1820-1850 period and from the yearly *Compte général de la justice civile et commerciale* between 1850-1913.<sup>26</sup> Only very few corrections to these data were necessary since the scope of business units that may potentially go bankrupt did not change during the 19th century, nor did the definition of the bankruptcy, i.e. the fact that the manager of this unit is not able to meet its payment obligations. The number of firms operating during a year in given district was estimated using the statistics on the French business tax, the *patentes* that were paid by any type of businesses selling goods or services on the market. This included (among others) the shopkeepers but also the wholesalers, the various types of factories, craftsmen, banking and insurance firms. The agricultural sector was exempted from its payment and hence farmers were not counted among the firms. In the regressions the Territory of

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<sup>26</sup> The bankruptcy procedure encompassed any type of trader (i.e. any independent business such as wholesaler, shopkeeper, trader, insurer, banker or manufacturer that regularly earn revenue from the selling of products and/or services) but no firms operated in the agricultural sector.

Belfort is merged with Haute Saone, as bankruptcy figures from Haute Saone refer also to the Belfort.<sup>27</sup>

Statistics on the central bank activity were taken from the Annual Report to the General Assembly of the Shareholders. A typical report indicated whether a branch of the bank was active or not during the year of the report. It also provides with the volumes of bills of exchanges discounted during that year by each particular branch.

Data on wine production and phylloxera come from Galet (1957). A year before the phylloxera aphid was first spotted in the Gard district, wine was produced in 79 out of the 89 French districts. Three districts had to be dropped because some data was missing for them, leaving 86 districts in the sample. The share of wine in agricultural production was then greater than 15% in 40 districts. The only non-wine producing districts were located in the Normandy and the North of France. All the others produced at least some wine. The shock of the phylloxera attack on the other sector of the local economy may also vary according to the share of wine in the district GDP. To this end we use Delafortrie and Morice (1959) to compute the share in the local GDP of the wine production during the year just before the phylloxera appeared. Galet (1957) gives no information on the presence of the phylloxera in two districts, the Ardèche and the Creuse. They were therefore dropped from the regression analysis.

Data on population in each district were taken from Bignon, Caroli and Galbiatti (2011). They use census record to know the population at census dates (approximately every five years) and interpolated the data in between census dates. Because of the population losses caused by the 1870 war, the population between 1867 and 1869 were extrapolated using the growth rate of the population between the 1861 and the 1866 census. Data for 1870 and 1871 were dropped.

## **6. Phylloxera Vastatrix, the bug that shocked the French economy**

The phylloxera vastatrix (or the devastator of vines) is a near microscopic insect that started to affect French vineyards in the 1860s (Gale, 2011, p. 18). The yellow aphid sinks its pointed snout into the roots and sucks out the sap. Its saliva infects the root at the attacked points preventing the wound from healing. This way the phylloxera not only causes the yield to fall to zero but kills the plants themselves in a short time. The approximate time between the arrival of the pest and the death of the plant is about a year (Pouget, 1990).

The effects of the aphid were first noticed in 1863 near the Rhone river in the South of France, and soon thereafter in the Bordeaux region. Yet it took a long time to understand why the vines were

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<sup>27</sup> Bignon (2011) presents in details the corrections that had to be implemented to render the series consistent over time.

dying and even longer what could be done about it. The insect was first identified as linked to the symptoms in 1868, after the study of a dead vineyard near the Rhône by the botany professor Jules E. Planchon. After that identification, the scientific debate raged seven years period before the scientific community agreed that the bug was the cause – and not just a consequence – of the vines' disease. Academics tried various treatments to fight the pest but none of those trials proved helpful for winegrowers to be able to resist the disease (Pouget, 1990). It is only in 1890 that the cure to the aphid was found and popularized. The solution implied to invent grafting European vines onto phylloxera-resistant American roots.

The aphid spread gradually over the territory, though its speed of destruction was not uniform across time and space. For example of the 88,000 hectares of vines still fertile in 1871 in the Gard – the district that was first attacked in 1863 – 15,000 were still left in 1879. During the same period the neighbouring Hérault district saw the plummeting of its stocks of vines from 220,000 ha to 90,000 (Lachiver, 1988, p. 416).

In economic terms the aphid was especially destructive. Indeed in a mostly agricultural country, wine production represents 6.4% of the pre-aphid 1862 GDP (Bignon, Caroli and Galbiati, 2011). In 1870 eight out of 37.6 million of people lived directly of the vines (Millardet, 1877, p. 82) and 17% of the workforce was involved in wine production (Gale, 2011, p. 15). The arrival of phylloxera then caused a brutal reduction of wine-growers revenues as the yield of an attacked vineyard was down to zero in a very short time after the beginning of the attack. The average yield per hectare dropped from an average of 24.5 hectoliters between 1870-75 and to 15.2 between 1885-90. The total of the surface of vines destroyed amounted to 1.22 million of hectares between 1873 and 1900, or 51% of the surface under cultivation (Loubère, 1978, p. 165). This 38% drop of the productivity of vines at the level of the French economy corresponds to a 43.5% decline of the total quantity of wines produced. Price increases did not compensate the fall in quantity (Banerjee et al. 2010). As a result the revenues derived from wine production had dropped to 2.75% in 1890.<sup>28</sup>

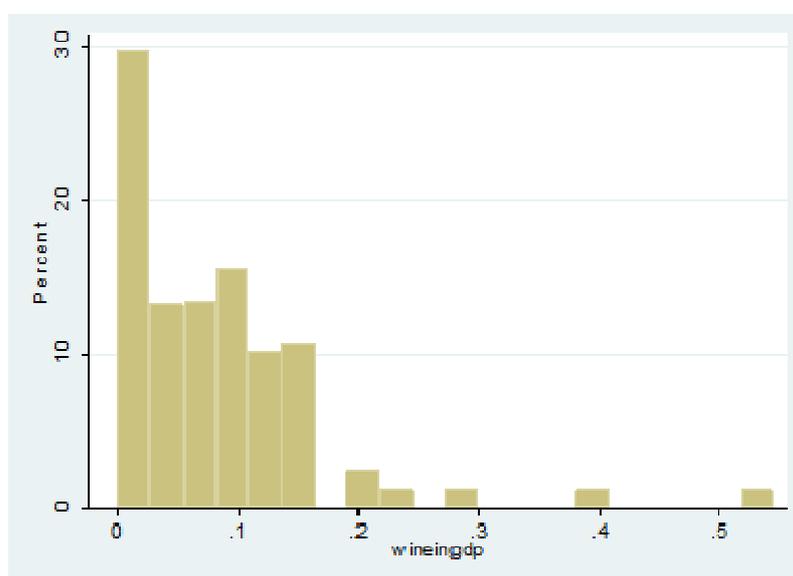
The impact of the aphid onto the local economy were said to have been sometimes disastrous (Postel-Vinay, 1989). However, its real impact varied a lot across districts, as some of them did not grow any vines while in others wine production could reach up to 54% of the local GDP. Figure 3 shows the distribution of the shares of wine production in percentage of the district GDP in 1862 and shows the different extent of the shock that the phylloxera must have created on the local economy. On average wine represented 8.1% of local GDP and 9.2% in wine-producing districts. As a consequence, the phylloxera pest had a strong impact on real income, at least in a number of districts.

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<sup>28</sup> The share of wine production in GDP was computed using the volumes and producer price of wine as published by the office of national statistics (INSEE, 1946, p. \*90) and the GDP figures published by Toutain (1987).

The shock induced by the phylloxera shock did not impact consumers' budget markedly. Indeed the increase of the farm-gate price of wine was not accompanied by an increase in the consumption price.<sup>29</sup> The price of wine in Paris was pretty stable during the whole period.<sup>30</sup> Three main reasons explain this stability of consumer price. First wine imports increased sharply, mostly from Spain, Italy and Portugal. Second the practice of vine cultivation spread rapidly in the (phylloxera free) French colonies in North-Africa, notably Algeria. Third various wine adulteration techniques were allowed to maintain the total quantity of alcoholic beverages created from the pressing of grapes. The second wines (called the *piquette*) made by adding sugar to the cakes that remained after the first pressing were commonly sold on the market in the 1880s while they had tended to be given to wine workers before or after the phylloxera period as part of an in-kind benefits.

**Figure 3: The share of wine production in the district GDP in 1862**



Sources: Authors computations using Galet (1957) and Delafortrie and Morice (1959).

The impact of this huge shock on the agricultural sector was smoothed neither by fiscal nor monetary policy. According to the legal statutes of the central bank, it was forbidden to lend against any assets that had been originated in the agricultural sector.<sup>31</sup> Hence both the victims of the aphid and the banks that could have financed them were constrained in their ability to find cash to smooth the losses created by the aphid. The fiscal policy was also of little help when it came to compensate for the losses of the wine growers. The yearly expenses in the state budget are estimated to 1 million of Francs a year at the apex of the disease in the 1880s. This represents 0.01% of the estimated value of the destruction triggered by the aphid (Loubère, 1978, p. 172). And much of this money was not

<sup>29</sup> Simpson (2011, p.).

<sup>30</sup> Index de prix de détail du vin à Paris.

<sup>31</sup> It is only in 1898 that the law was amended to allow the Banque de France to lend against bills of exchanges issued by farmers or any agricultural firms.

channeled to wine growers but to support academic research on phylloxera. Moreover no welfare program such as unemployment benefits existed to smooth the revenues losses (Bignon et al. , 2011).

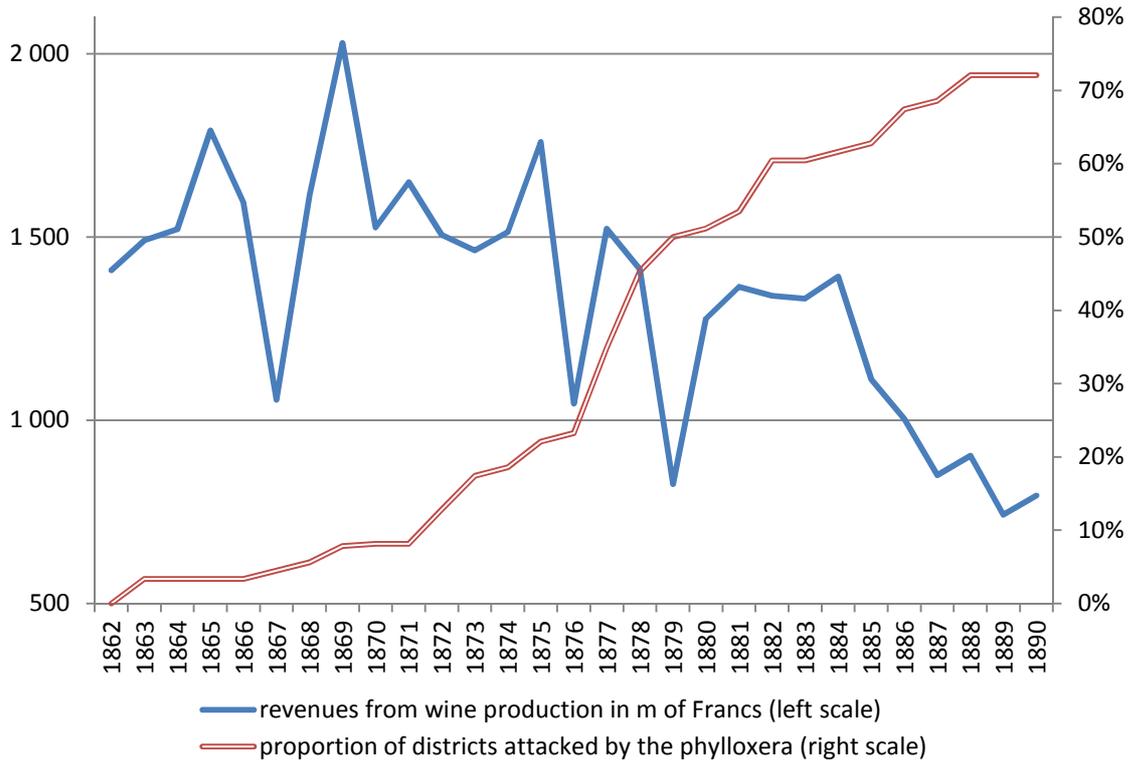
The length of the episode (from 1863 to 1890) made it quite impossible for the farmers to have savings big enough to pay for the losses without any decrease of the demand they addressed to the other economic sectors. It is also very unlikely that the farmers were able to increase their saving in anticipation of losses induced by the arrival of the phylloxera. This would have required a clear understanding of how the disease spread and on its cause, an issue that was not settled before 1875 (Gale, 2011, chapter 1). Yet the final agreement that the aphid caused the disease did not make the French wiser in using the spread of the insect over the territory as a signal of future losses. Some was argued that the disease would be confined by nature to some regions, while other simply denied its existence, arguing that “It cannot happen here, we take good care of the vines”. Gale (2011, p. 52) describes vividly the denials of the Burgundy villagers to the first spotting of the aphid in one of vineyard in 1876 and how the presence of the disease was only recognized by some when the whole vineyard was destroyed in 1879. Loubère (1978, p. 158) argued that such a blindness could have resulted from the policy of uprooting the diseased vines as a mean to safeguard those still intact.

We conclude from this examination that the shock created by phylloxera on the French economy must have been transmitted to the other sectors of the economy. This transmission should have decreased the other sectors revenues, and this negative income shock has to be considered as a pure negative liquidity shock.<sup>32</sup> One measure of the importance of the shock suffered by agriculture is by looking at the revenues from wine production and compared those to the proportion of districts in which the aphid was spotted in at least one vineyard. Figure 4 displays such a comparison and shows a negative correlation between both variables.

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<sup>32</sup> This negative liquidity shock could have impacted the local economy either directly or indirectly. Indeed the fall of wine-growers' revenues could have triggered a fall in their demand to the other sectors. But it could also have been that the collapse of some banks in the most attained regions – a phenomenon described by Postel-Vinay (1989) – could have restricted the quantity of credit available to the other sectors of the economy. The data does not exist to test for the importance of each of those channels.

**Figure 4: Revenues from wine production and the spread of the phylloxera, 1862 – 1890**



Source: Authors from INSEE (1946, p. \*90) and Galet (1957).

A more formal test of the relationship between the spread of the phylloxera and the economy is given by the study of the impact of the phylloxera on the bankruptcy rate in the districts hit by the phylloxera. As outlined above, one of the advantages of using the bankruptcy rate is that farmers or any other agricultural firms could not file for bankruptcy, they can only collapse (*tomber en déconfiture*) in which case the creditor have to sue the agents using the seizure procedure. Hence the dependant variable is a pure measure of the *indirect* impact of the shock on the local economy restricted to the services and industrial sectors. We compute a panel regression of the local bankruptcy rate on a variable measuring the size of the income shock triggered by the phylloxera:

$$BR_{it} = \alpha Phylloxera_{it} + t_t + d_i + \varepsilon_{it} \quad (1)$$

Where  $BR_{it}$  represents the bankruptcy rate in district  $i$  during year  $t$ . To account for heterogeneous unobservable characteristics we include in any regressions time and district fixed effects, represented respectively by the variables  $t_t$  and  $d_i$  and  $\varepsilon_{it}$  is the error term. Time-specific trend for each district are also included in all regressions.  $Phylloxera_{it}$  measures the impact of the shock created by the bug on the economy of district  $i$  during year  $t$ . Its size is the product of an indicator of the presence of the phylloxera in the district with the share of the wine production in the local GDP in 1862. The time it took for the bug to spread into each district varies across districts and time. Hence no single lag-structure can account for it. This uncertainty leads us to use three alternative variables to measure the impact of the phylloxera. The first variable is constructed using Galet (1957)

that gives the disease years. We set this indicator to 1 in any year the aphid destroyed vines in the district and 1890 and we set it to 0 otherwise. We multiply this dummy variable by the share (labelled  $wg$ ) of wine production in the GDP in 1862. We label this variable as  $ga\_wg$ . The second variable –  $p_{it}wg$  – is the product of  $wg$  with a dummy variable  $p_{it}$  that is set to 1 in any year during the period comprised between the first year the aphid was spotted and wine production had fallen below its the pre-phylloxera level and 1890. Here we directly follow Banerjee et al. (2010). The idea of this specification is that it may take considerable time between the first appearance of the phylloxera and it having a significant impact on wine production. In constructing the third variable, we also follow Banerjee et al. (2010) and computed  $pl_{it}wg$  by multiplying  $p_{it}wg$  with the loss in wine production in year  $t$  compared to the reference year, i.e. the last year before the phylloxera hurt a district.

Table 2 displays the results of the regression analysis. All the residuals are clustered at the district level. The results show that the shock created by the phylloxera increased significantly the bankruptcy rate of firms of the services and industry. This is always true when the time-trend is common and when district-specific time trends are included, except with the  $ga\_wg$  variable that is positive but non-significant. One explanation for this non-significance is the fact this variable consider that the phylloxera shocks the district economy right from its arrival in the first vineyard, which, given the history of the spread of the aphid is clearly a very strong assumption. Indeed historians noted that it takes some time for the aphid to destroy a significant proportion of a district vineyards.<sup>33</sup> Overall our results are consistent with our claim that, once the aphid spread in a district, the absence of a proper and sufficiently cheap treatment to prevent the vines from dying constituted a negative shock to the productive assets of farmers that was transmitted to the other sectors.

**Table 2 : Regression analysis of the impact of the phylloxera on the bankruptcies of the services and industrial sectors of the same district.**

|  | (1)        | (2)        | (3)        |
|--|------------|------------|------------|
| -----  |            |            |            |
| Independent variable: Bankruptcy rate in % at district level |            |            |            |
| -----  |            |            |            |
| Galet  | 0.0533     |            |            |
|  | 0.0702     |            |            |
| $p_{ij}$   |            | 0.1023*    |            |
|  |            | 0.0603     |            |
| $pl_{ij}$  |            |            | 0.2815**   |
|  |            |            | 0.1401     |
| Trend  | 0.00340*** | 0.00338*** | 0.00338*** |
|  | 0.00002    | 0.00002    | 0.00002    |
| -----  |            |            |            |
| N  | 7363       | 7363       | 7363       |
| r2   | 0.474      | 0.475      | 0.476      |
| -----  |            |            |            |

All specifications include year and district fixed effects and district specific time trends. Residuals are clustered at the district level.

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

<sup>33</sup> This interpretation is even more likely if one notes that the only differences between  $ga\_wg$  and  $p\_wg$  is the starting year of the epidemics in a district.

## 7. Phylloxera, the *Banque de France* and the bankruptcy rate

The arrival of phylloxera had a clear impact on the local economy. Did it also affect the activity of the Banque de France? Section 4 has already argued that the decision of the Banque de France to create new branch offices was driven by long-term, structural considerations and not by short-term developments, let alone in response to a negative shock on the local level. However, this does not mean that the Banque de France would not feel the repercussions of economic stress in the districts hit by phylloxera. By design the Banque de France stood ready to lend to (or more precisely to buy bills from) all solvent eligible counterparties if they required so. Bills originated by farmers were excluded from BdF discounting. But if the arrival of phylloxera really hit the other sectors in the economy as its impact on bankruptcies outside the agricultural sector suggests, it should also be possible to identify an effect of phylloxera on Banque de France discounting.

Table 3 gives the result of a regression of the annual volume of BdF discounting on the district level. As in table 2 we use again three different measures for the shock exercised by phylloxera: a dummy variable that becomes one as soon as phylloxera arrives (Galet), a dummy variable that becomes one as soon as phylloxera arrives and the production falls below its pre-phylloxera level (pij) and pij weighted by the actual decline in production relative to the pre-phylloxera level (plij). In order to account for the varying importance of wine for the local economy the three shock measures are weighted by the share of the wine production in the district GDP. Two variables control for the size of BdF operations in the district, namely the number of full branch offices and the number of smaller auxiliary offices. As in the previous regression in table 2 we include district and time fixed effects to account for structural differences between districts and temporary shocks on the national level. Also included are district specific time trends that capture difference in the secular economic development of the districts.

As can be seen in table 3, all variables have the expected sign. The volume of discounting increases over time (trend positive and significant) and increases when new branch offices are opened (the coefficient on auxiliary offices is also positive but no significant). The arrival of phylloxera increases the demand for discounting at the BdF in all three specifications; in the specification that arguably captures the shock to the best extent (plij) the coefficient is statistically significant at the 5% level. In the other specifications the coefficients are not significant or are only marginally so at the 10% level. This is not too surprising. The effect of phylloxera on discounting goes both ways. While phylloxera acts as a liquidity shock for the non-agricultural sectors, increasing the demand for some sort of bridge financing, it will also depress in the medium term economic activity and income at the district level, thereby decreasing the demand for money and finally demand at the BdF discount window. In real world France the liquidity shock was apparently sufficiently strong to make the coefficient on the shock variable overall larger than zero – strong evidence that the Banque de France provided liquidity support in the districts affected by phylloxera.

**Table 3: The impact of phylloxera on Banque de France discounting**

|   | (1)               | (2)               | (3)                |
|---|-------------------|-------------------|--------------------|
| Independent variable: Annual volume discounted by the BdF per département in million francs |                   |                   |                    |
| Galet   | 58.00*<br>(34.18) |                   |                    |
| pij   |                   | 56.72<br>(36.05)  |                    |
| plij  |                   |                   | 34.87**<br>(16.58) |
| # BdF branches  | 44.98*<br>(22.90) | 44.11*<br>(22.55) | 42.92*<br>(22.48)  |
| # BdF auxiliary offices   | 35.56<br>(28.33)  | 35.21<br>(28.25)  | 34.99<br>(28.24)   |
| Trend   | 0.63***<br>(0.12) | 0.61***<br>(0.11) | 0.47***<br>(0.02)  |
| N   | 4502              | 4502              | 4502               |
| r2  | 0.820             | 0.820             | 0.820              |

The variables measuring the shock Galet, pij and plij are weighted by the share of wine production in the district GDP.

All specifications include year and district fixed effects and district specific time trends.

Residuals are clustered at the district level.

Standard errors in parentheses. Significance levels: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Which allows us to turn to the central empirical question of the paper – did access to BdF rediscounting facilities soften the impact of phylloxera on the district bankruptcy rate? Table 4 gives the results from several specifications using the three different measures for phylloxera described above and three different variables accounting for the impact of the Banque de France. As eligibility as counterparty is tied to the presence or not of a BdF branch, the first set of estimates uses simply the number of branches within the district. The other two measures adjust for the size of the district (larger districts needing more branches to have the same degree of access to the BdF) and for the population of the district (more densely populated districts having more cities needing more branches to have the same degree of access to the BdF). Neither of the measures is clearly superior to the others and so all three are reported. As before district and time fixed effects as well as district specific time trends are included to control for the many other determinants of the bankruptcy rate that cannot be captured by the explaining variables included.

The key variable of interest is the interaction between the shock and access to the BdF. If the BdF had a positive impact in the districts affected by phylloxera the interaction term should be negative, implying a lower bankruptcy rate than if fewer access to the BdF had been available. As can be seen in table 4 the interaction term always has the negative sign as predicted, where in most specifications the coefficient is also strongly statistically significant. Access to the Banque de France indeed prevented to some extent the agricultural crisis to spill over on solvent but liquidity-constrained firms in the rest of the local economy. Also interesting are the coefficients on the shock variable. In comparison to the specifications excluding a variable for BdF branching as reported in table 2, taking

account of the presence or not of the BdF increases the significance level of the shock variable, in particular if the *plij* variable is used for measuring the shock. This implies that distinguishing between districts with access to the BdF and districts without such access helps to better identify the impact of phylloxera on the local bankruptcy rate. Finally, the coefficient on the BdF branches is negative and sometimes significant, but there are no a priori reasons to expect a positive or a negative relation between BdF branching on the long-term evolution of the bankruptcy rate.

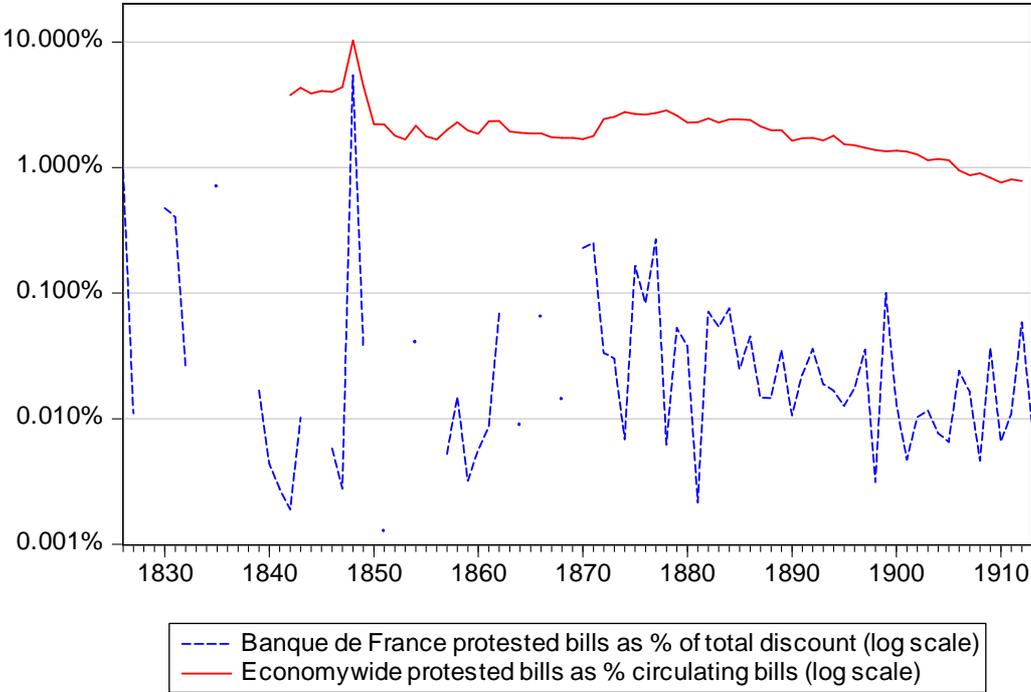
Table 5 repeats the exercise including in addition to the trend and fixed effects some control variables that might provide extra explanatory power for the bankruptcy rate. The number of firms per 1000 inhabitants and population density both capture economic development and differences in the economic structure between districts. The coefficients on both variables are always significant; the negative signs implying that districts with more economic and entrepreneurial activity were also those with *ceteris paribus* lower bankruptcy rate. The variable *farmsize\*shock* was included in order to account for regional variation in the structure of winegrowing that might lead to a different impact of phylloxera on regional income and liquidity, e.g. because smaller farms have less outside resources available or – quite contrary – because smaller farms are more diversified. In any case, the coefficient is never statistically significant. Finally we include the number of commercial bank branches in the district. As laid out in section 4, commercial banks, most notably the *Crédit Lyonnais* and the *Société Générale*, created extensive branch networks starting in the 1860s. It could be argued that these branch networks could substitute for a missing *Banque de France* branch by equally providing lending to a local economy hit by a liquidity shock. The coefficient on the interaction term between commercial bank branching and phylloxera is surprisingly positive (implying a higher bankruptcy rate when a commercial bank was present), even if almost never statistically significant. Apparently commercial bank branches were no suitable substitute for a *succursale* of the *Banque de France*.

The inclusion of these additional explanatory variables does not fundamentally alter the results from the simple baseline estimations in table 4. In particular the shock variable and the interaction between shock and BdF keep their signs and change their significance levels only marginally. This confirms the hypothesis of the positive effect of extended eligibility when the economy is hit by liquidity shocks.

This outcome was achieved while the *Banque de France* was not acting as a bad bank, i.e. it did neither buy troubled bills nor did it discount many bills that ended up experiencing default. To measure the risk taken by the bank in its discount policy, Bignon (2011) had collected the amount of protested bills discounted by the bank of France, i.e. of bills for which the payer did not pay in due time. Figure 5 plots the percentage of the bank portfolio and compared it to the percentage of protested bills at the economy-wide level. Inspection of the graph reveals that the proportion of protested bills stand at 0.15% during the period between 1820 and 1913. This level was much lower than the ratio at

the economy-wide level, which averaged at 2.18% during the period from 1842 to 1912. To us, this shows that the bank rests on sound practices in terms of risk management.

**Figure 5: Protested bills as percentage of the total of the portfolio of the Banque de France and of the stamped bills issued in the economy.**



Source: Bignon (2011).

### 8. Conclusions

The present article provides an empirical analysis on the effects of broadening the access to central bank financing using the example of France in the 19<sup>th</sup> century. Our goal was quantitative, trying to study whether a widening of the eligibility criteria helped stabilizing economies hit by temporary negative liquidity shocks. The empirical results show that this may have been the case. The empirical analysis is based on a newly assembled dataset tracing the economic evolution of all French districts during the period from 1826 to 1913. The local bankruptcy data is complemented by qualitative and quantitative material on the details on the monetary policy framework documenting the determinants of the eligibility and collateral policy of the French central bank. In the 19<sup>th</sup> century only enterprises and people living in a city or town where the Banque de France was represented could obtain central bank loans. This feature of the framework of the Banque de France allows circumventing the empirical challenges of assessing the impact of eligibility by exploiting the geographical dimension of central bank access in France, as we can argue that the opening of branches by the central bank was never endogenous to the various shocks that hit the local economy, but rather

the outcome of a negotiation between the government and a private maximizing monopoly in search for the renewal of its privilege of banknote issuance.

To assess the importance of central bank eligibility for economic agents hit by a liquidity shock, we relied on the consequences of a shock to agricultural productivity on the bankruptcy rate in the industrial and the service sectors, phylloxera. The arrival and spread of phylloxera increased the bankruptcy rate of the firms of those sectors and the volume of bills discounted by the Banque de France in the affected districts. However, as the empirical results show, the impact of the shock was smaller when the agents in the affected region had access to liquidity through the central bank. Decreasing the transaction cost of accessing liquidity in times of a higher need for liquidity then had a positive impact on local firms. At the same time, the Banque de France did not act as a “bad bank”, taking over worthless assets. Lending by the central bank followed strict rules and the Banque de France never discounted bills of bad quality. The spread of the phylloxera coincided indeed with a secular decline in the proportion of defaulted bills in the portfolio of the Banque de France.

The fact that the extension of eligibility via the creation of new branch offices was not driven by stress in the financial sector but is due to structural reasons of course also implies that the positive results of the extension of eligibility were not the result of an explicit policy by the bank. The argument however adds a new channel through which central bank branching might have affected the real economy. Jobst (2010) has documented the European-wide phenomenon of central bank branching during the 19<sup>th</sup> century. For some countries there is evidence that central bank branching led to a convergence of regional interest rates.<sup>34</sup> As eligibility was in many countries tied to residency, i.e. a geographic criterion, the smoothing effect in the case of liquidity shocks might be well observable in other European countries as well. More generally, eligibility of counterparties and also assets deserves more attention in historical research, in particular given the importance eligibility has acquired in recent years. If there is any lesson to draw from this past experience in terms of today’s monetary policy, our results support the emphasis put carefully choosing the counterparties and assets that should be eligible at the central banks.

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<sup>34</sup> See Good (1977) on Austria and Ohnuki (2007) and Mitchener and Ohnuki (2009) on early 20th century Japan. Bodenhorn (2000), however, is sceptical on the integration effect of the Second Bank of the United States.

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**Table 4. Regression results simple specification**

| Dependent variable: District bankruptcy rate in % |                        |                 |                  |              |                 |                  |                           |                 |                  |
|---|------------------------|-----------------|------------------|--------------|-----------------|------------------|---------------------------|-----------------|------------------|
| BdF variable:                                     | Number of BdF branches |                 |                  | Branches/km2 |                 |                  | Branches/1000 inhabitants |                 |                  |
| Shock variable:                                   | Galet                  | p <sub>ij</sub> | p <sub>lij</sub> | Galet        | p <sub>ij</sub> | p <sub>lij</sub> | Galet                     | p <sub>ij</sub> | p <sub>lij</sub> |
|   | (1)                    | (2)             | (3)              | (4)          | (5)             | (6)              | (7)                       | (8)             | (9)              |
| Shock   | 0.082                  | 0.178           | 0.660***         | 0.060        | 0.135           | 0.533**          | 0.151**                   | 0.241***        | 0.722***         |
|   | 0.094                  | 0.115           | 0.229            | 0.082        | 0.103           | 0.224            | 0.071                     | 0.083           | 0.257            |
| BdF   | -0.016*                | -0.016          | -0.015           | -0.103***    | -0.103***       | -0.103***        | -1.729                    | -1.574          | -1.798           |
|   | 0.009                  | 0.009           | 0.009            | 0.022        | 0.023           | 0.023            | 3.585                     | 3.602           | 3.506            |
| BdF*shock   | -0.103*                | -0.152**        | -0.445***        | -0.500       | -0.708*         | -2.125***        | -62.882***                | -82.289***      | -203.427***      |
|   | 0.061                  | 0.064           | 0.111            | 0.401        | 0.425           | 0.806            | 18.784                    | 20.197          | 60.980           |
| Trend   | 0.0029***              | 0.0029***       | 0.0029***        | 0.0030***    | 0.0030***       | 0.0030***        | 0.0028***                 | 0.0028***       | 0.0028***        |
|   | 0.0002                 | 0.0002          | 0.0002           | 0.0002       | 0.0002          | 0.0002           | 0.0002                    | 0.0002          | 0.0002           |
| N   | 7363                   | 7363            | 7363             | 7363         | 7363            | 7363             | 7191                      | 7191            | 7191             |
| r <sup>2</sup>                                    | 0.545                  | 0.545           | 0.546            | 0.547        | 0.547           | 0.548            | 0.542                     | 0.543           | 0.543            |

All specifications include year and district fixed effects and district specific time trends. Residuals are clustered at the district level.

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01

**Table 5. Regression results including additional controls**

Dependent variable: District bankruptcy rate in %

| Shock variable:            | Number of Bdf branches |                        |                         | Branches/km2 |                        |                         | Branches/1000 inhabitants |                        |                         |
|----------------------------|------------------------|------------------------|-------------------------|--------------|------------------------|-------------------------|---------------------------|------------------------|-------------------------|
|                            | Galet<br>(1)           | p <sub>ij</sub><br>(2) | p <sub>lij</sub><br>(3) | Galet<br>(4) | p <sub>ij</sub><br>(5) | p <sub>lij</sub><br>(6) | Galet<br>(7)              | p <sub>ij</sub><br>(8) | p <sub>lij</sub><br>(9) |
| Shock                      | 0.354*                 | 0.423*                 | 1.225***                | 0.253        | 0.294*                 | 0.972**                 | 0.227                     | 0.254*                 | 1.021**                 |
|                            | 0.208                  | 0.222                  | 0.388                   | 0.162        | 0.170                  | 0.388                   | 0.147                     | 0.148                  | 0.410                   |
| Bdf                        | -0.017*                | -0.016*                | -0.016*                 | -0.127***    | -0.125***              | -0.128***               | -2.102                    | -1.912                 | -2.326                  |
|                            | 0.009                  | 0.009                  | 0.009                   | 0.029        | 0.029                  | 0.029                   | 3.570                     | 3.571                  | 3.467                   |
| Bdf*shock                  | -0.284*                | -0.372**               | -0.764**                | -1.324*      | -1.813**               | -2.895                  | -80.911**                 | -110.102***            | -220.966*               |
|                            | 0.143                  | 0.160                  | 0.364                   | 0.694        | 0.784                  | 1.864                   | 34.920                    | 38.842                 | 120.087                 |
| Firms per 1000 inhabitants | -2.837**               | -2.974**               | -2.838**                | -2.673*      | -2.798**               | -2.618*                 | -2.820**                  | -2.913**               | -2.731*                 |
|                            | 1.420                  | 1.391                  | 1.359                   | 1.403        | 1.367                  | 1.377                   | 1.411                     | 1.363                  | 1.387                   |
| Population density         | -0.00010***            | -0.00010***            | -0.00010***             | 0.00007      | 0.00007                | 0.00007                 | -0.00011***               | -0.00011***            | -0.00011***             |
|                            | 0.00003                | 0.00003                | 0.00003                 | 0.00005      | 0.00005                | 0.00005                 | 0.00003                   | 0.00003                | 0.00003                 |
| Branches of CL/SG per km2  | -0.014                 | -0.014                 | -0.011                  | -0.017       | -0.017                 | -0.015                  | -0.012                    | -0.012                 | -0.010                  |
|                            | 0.014                  | 0.014                  | 0.013                   | 0.013        | 0.013                  | 0.013                   | 0.013                     | 0.013                  | 0.012                   |
| CL/SG*shock                | 0.283                  | 0.358                  | 0.824*                  | 0.239        | 0.299                  | 0.602                   | 0.167                     | 0.161                  | 0.512                   |
|                            | 0.185                  | 0.226                  | 0.477                   | 0.162        | 0.203                  | 0.461                   | 0.117                     | 0.148                  | 0.413                   |
| Farmsize*shock             | -0.019                 | -0.015                 | -0.086                  | -0.013       | -0.007                 | -0.088                  | -0.008                    | 0.005                  | -0.075                  |
|                            | 0.019                  | 0.024                  | 0.061                   | 0.020        | 0.025                  | 0.068                   | 0.022                     | 0.028                  | 0.072                   |
| Trend                      | 0.0041***              | 0.0042***              | 0.0041***               | 0.0042***    | 0.0043***              | 0.0041***               | 0.0039***                 | 0.0040***              | 0.0039***               |
|                            | 0.0005                 | 0.0005                 | 0.0005                  | 0.0005       | 0.0005                 | 0.0005                  | 0.0005                    | 0.0005                 | 0.0005                  |
| N                          | 6968                   | 6968                   | 6968                    | 6968         | 6968                   | 6968                    | 6968                      | 6968                   | 6968                    |
| r2                         | 0.545                  | 0.545                  | 0.547                   | 0.548        | 0.548                  | 0.549                   | 0.544                     | 0.544                  | 0.545                   |

All specifications include year and district fixed effects and district specific time trends. Residuals are clustered at the district level.

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01