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**Banking and development in France (1880-1913)**

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# Looking on English and German Banking in the French Mirror : Banking and Development in France (1880-1913)

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## Abstract

*This paper aim to prove positive correlations between local banking, industry, innovation, and growth in the French classical period (1880-1913). Empirical works on GDP per capita growth gives positive correlation with local banking indicator. The relation is all the more strong since local banking tied on non agricultural economies. Thus, we open the black box and give evidence of local banking connection with innovation. We set the proof through panel data analysis on a spacial basis. Regard to so called German and English banks performances, local knowledge is a key point of industrialization, at least in the French experience.*

## 1 Introduction

Assuming universal banks as a key component of German industrialization, Gerschenkron (1962) introduced a long lasting controversy on financial institutions and economic growth relationship. In his view, backward economies are all the more able to catch up richest countries since they adopt adapted centralized devices of development. German universal bank was thus the perfect intermediary as it might centralized and used information to launch industrial projects. As a matter of fact, because of academic inertias German and English banking are still used as ideal types of the "good" and the "bad" banking behavior of this time. From this point of view, so called German universal banks helped financing industrial investment while English "speculative" joint stock banks hampered industrial development. Also, the debate was not limited to European comparison as Calomiris (1995) reinforced the academic position of German banking structure, comparing spe-

cialized American banks performances "in the mirror of" so called German banking system.

However, some new contributions in economic history point out the academic overconfidence about German universal banks. New empirical works, see for instance Fohlin (1998 & 1999) and Edwards & Ogilvie (1996), gave evidence of the Gerschenkron's mistake, rejecting so called board representation advantages. Thus, German banks may not be as good as expected in industrial (large scale) funding. In the same time Capie & Collins (1999) elevated the English banking reputation. They showed for instance that joint stock banks were able to support their industrial clients in period of distress. The evolution of debates is therefore smoothing German advantage. Anyway, English and German banking structure were still different. As English banking composed of large banks while German one got more local influence, German advantage, if any, should come from information management (Cf. Guinnane 2001). Indeed, According to Stein (2002) local knowledge management is more difficult into large and national multi-branch banks. English banks were thus urged to supply "hard" short term credits while German banks might provided "soft" industrial loans<sup>1</sup>.

On this respect, as it is a composition of English and German bank type the French banking system of the classical period (1880-1913) might shed some lights on the debate. In one side local banks acted like universal banks as local statement and private knowledge helped them providing adequate services to their clients. Local banks were however subject to economic cycle and sectorial fluctuation. At the opposite, French deposit banks (Crédit Lyonnais, Société Générale & Comptoir d'Escompte de Paris) took advantage of economies of scale to provide diversified short run loans. On this respect, French deposit banks are often compared to English joint stock banks because of their high prudence and their large scale businesses. Comparing performances of both kind of banks should confirm or reject the Gerschenkron position. Results should also speak on the implication of tight connections between banks and industry in the process of economic development.

Thereby, this paper assesses economic effects of both French commercial bank types. The inquiry should tell more on effectiveness of each structure. We thus check for local banking and industrial activities correlations. We use to this end an indicator of industrial production growth in one hand and an indicator of innovation on the other. As we will see, causality is not a point of concern as we think of significant correlation might be usefully handled

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1. "hard and "soft" refer to microeconomics of banking literature. "hard" credits imply more quantitative information while "soft" credits entail private and hardly transferable information (see Petersen 2004 for examples and evidences).

to give evidence on local banking ability to promote economic development. Accuracy of results depend thus on local banking indicator we use and the control variables we add in the empirical framework. Hence, implementing the best econometric estimator is not the turning point of this work, we rather have to build the adequate model regard to the historical pattern of the French banking system.

We therefore built ratios comparing local and deposit banks market share and faced them to GDP growth and innovation variables. As systematic information on individual patent are lacking in the French system we estimated innovation through the tax on patents. This one get however the advantage to take account on patent's expected value, what is very important in such inquiry (Cf. Griliches 1990). We finally get a couple of outcomes : first, innovation and GDP growth are positively correlated with local banking. Second, the relation with the latter is all the more high since we look on industrial areas.

Consequently, local banks are more able than deposit banks to finance investment and innovation, models say. According to the expected causality a couple of interpretation is possibly at play. First, as innovative firms often need to invest, local banks knowledge helps providing funds to investment. Second, local banks knowledge gives credit availability and bring about firms' selection. This process keeps promising and innovating firms alive. Anyway, as long as innovation and investment are related to industry, local banks should promote GDP growth into industrial areas. This point is well corroborated by empirical facts. As a result, the French experience gives evidence of local banks superiority in the process of industrialization and lastly brings clues on the "Gerschenkron's debate".

Section 2 reminds local banking, innovation and growth literature. Section 3 deals with the French banking structure. Section 4 presents the empirical strategy. Section 5 provides sources and basic statistics. Section 6 gives the results. Section 7 brings interpretation. Section 8 adds some discussions. Section 9 concludes.

## 2 Related literature

The question we are speaking about here can basically be divided upon two different fields of research. The first one deals with credit constraints as a result of the bank size, the second one entails relationship banking and innovation.

Stein (2002) provides a key framework on the first point. According to the size of the bank, the information need to allocate assets between branches

differ. Higher the size, numerous are the intermediaries, higher transparent clients needing. Therefore small firms are less able to borrow to large banks. At the opposite, as they have local and private knowledge, small banks are better business partners. Here, the headquarter grabs information and takes decisions in the same time what prevent information inefficiencies. Empirical analyses give evidence of this point as hierarchical banks use more credit scoring and impersonal interactions (Cf. Berger & al. 2005 and Uchida & al. 2006).

A new set of literature is emerging about geographical and cultural distance. Distance from headquarters especially matters as information quality dwindles with it. For instance, Even though effects melt down with new communication technologies, physical distance in United States reduces banks ability to lend to small and opaque firms (Petersen & Rajan 2002). Also, for Berger & DeYoung (2006) the cost and profit efficiency of multi-branch banks wanes with physical distance from the parent bank. lastly, Alessandrini et al. (2006) find that small firms suffer from both cultural and physical distance on a sliding scale with the share of banks headquartered in the distant province.

On other hand, many works give evidence on credit constraints obstacle to innovation (see for instance Mohnen & Roller 2005). As innovations need investments to start projects, credit constraints hamper innovative businesses. Because of its industrial districts, the "third Italy" is thus the perfect topic on this point. For instance, Herrera & Minetti (2007) gives evidence of relationship banking ability to enhance product innovation probability in Italy. In the same way, Alessandrini & al. (2007) proves that opacity due to physical distance hinders innovation. All in all, innovation from small and medium size firms depends on credit access as the Italian examples said us.

### **3 The French banking structure**

Local banks, deposit banks and the Banque de France are the main actors of the French banking system. Local banks are of quite small size and provide "universal" services to their clients. Either limited to specific areas or specific sector of activities, local bank business is not diversified and subject to exogenous chocks. Even though some get few branches, this point is the main source of concern for them. Local banks often do business inside industrial districts and small business areas. Therefore, as they grab local and private knowledge they easily cope with information asymmetry (See Petersen & Rajan 1995, Boot 2001, Stein 2002 and Berger & al. 2005 for theoretical and empirical evidence). Though close to universal bank type, local banks

in France did not played the same (so called) role than large universal bank in Germany. Unlike German universal banks, French local banks were rarely involved in board representation and business direction. The common feature is rather the ability to reduce asymmetries by gathering information. In other words, universal banking activities might help pooling useful knowledge (into local areas and specific sectors) and granting higher return in industrial (long term) finance (Cf. Nishimura 1995 and Lescure & Plessis 2004 for empirical evidence on long term industrial credits in the French experience).

By 1880, the sum of local bank branches reach 91% of all commercial bank branches. This figure declines to reach 66% in 1910. Two facts triggered this outcome. First, many new bank branches were set up due to deposit bank expansion. Second, weak local banks collapsed by subsequent competition (Bazot 2010). All in all, local activities and local knowledges protected surviving local banks. Failing bankers were consequently those in line with deposit bank businesses.

by 1890 the French banking system is subject to deposit banks booming. All French areas get new deposit bank branches. For, instance, the Société Générale set up more than 400 branches along twenty years. Though quite smaller the figure turns to 200 branches in the Crédit Lyonnais' case. As suggested by the name, deposit banks grab massive deposits. Short term activities is therefore the consequence of this feature. Besides, unlike local banks, they are not close to their clients and get only basic information about them. This is also why deposit banks are highly prudent banking actors. As inquired by Lescure (2009) discounting safe bills is their main credit device. Unlike local banks, advance in account are rarely accepted and renewed. Somewhat like English joint stock banks, they are involved in commercial rather than industrial credits.

Basically, two different field of business are shared by the French banking actors. Industry is the one of local banks whereas deposit banks acted on commercial activities. Theoretically, local banks are thus probably more useful as capital accumulation spurs GDP growth, one might say. Though this point of view may be coherent, two questions remain. First, how to prove it? second, if it is true, why deposit bank "victory"?

We get some tracks on the second issue. Business interests of deposit banks are not tied with those of economic development. In other words, they make profits without doing business with 'leading growth' sectors. Furthermore, a couple of competition is at play in banking sector. Even though local banks are competitive in industrial "unsafe" credit, economies of scales give advantage to deposit banks in grabbing deposits and providing "safe" loans. Therefore, local banks profits decrease when backing on risks with safe credits. As local banks are not enough diversified, exogenous shocks are now

more able to kill them. In other hand, as local banks are proved to be more designed to spur growth, such theory might be the proof of market failure.

Let's lastly speak about the Banque de France. For a couple of reasons, the Banque is a turning point of the French banking system of that time. First, at the turn of the century, the Banque gets an early central banking position. By helping distressing firms and banks, it therefore turns to be countercyclical. Second, its network of branches brings about credit development nationwide (Bazot 2010). Though credit development is academically claimed to be positively related with economic growth, one might reject such arguments in this present case. Since local actors are used to transmit the Banque policy, as long as local banks are not prove to trigger economic development, benefits from credit development do not necessarily outweigh potential losses.

As some controversies depend on it, the economic effect of local banking is an important question. On this respect, the empirical strategy we will use now is of high importance.

## 4 Empirical strategy

Causal models in macroeconomics are quite difficult to implement as endogenous biases are often at play. Furthermore, instrumental variables are not systematically available, especially in historical inquiries. The empirical strategy is therefore the turning point of the demonstration. Good handling of correlation is sometime more accurate than poor causality as long as is the relation not driving by omitted variable bias. Also, regressions with multiple explicative variables are used to face this issue. Models are either panel or cross-section econometrics.

A nice empirical device need to compare and tell what bank type is the best promoter of economic development. Founding accurate indicator of economic development is therefore the first step. GDP per capita is traditionally used to this end but interpretations are often hampered by omitted variables. Nonetheless, good handling of results bring precision to correlations and help seizing useful information. Moreover, since innovation is now seen as central for economic development (Aghion & Howitt 1998) it is a variable of interest. This is all the more true since investment, innovation and industry are often interlocked in a same dynamics.

Producing adequate variables on relative banking size is the second step. The number of local bank branches compared to deposit bank branches is an easy ratio. Although useful in panel data regressions the late deposit bank boom makes it tricky to use in cross-sectional tests. In fact, many départements are devoid of deposit banks in 1880. We might nevertheless use



ending values of the ratio (those of 1911) but results might be uninterpretable. Anyway, other calculation are possibles. Given deposit banks business pattern, difference of local bank branches per capita divided by the one of deposit bank branches per capita from 1881 to 1911 is another nice ratio. Few reasons confirm this choice. First, the level of activity is controlled by the number of inhabitant. Second, the ratio helps seizing local legitimacy of local banks. If the figure of local bank branches is high in 1881 whereas their activities are close to the ones of deposit bank, the ratio should be negative. Indeed, such local banks should collapse as the number of deposit bank rises up. Third, higher the ratio higher the usefulness of local banking. As deposit bank branches rises up in every départements competition should tackling all unspecific local bank businesses. Even if GDP growth and innovation keep old local banks alive new local bank branches are set up as their are not tackled by deposit bank businesses. Nevertheless, as very negative ratio's figures might stem from convexity effect the ratio is quite imperfect. Even though business structure of the area is not opposed to local banking features so much the ratio is very negative as local bank branches dwindles whereas deposit bank branches increases slightly.

Therefore, in order to bring more evidence on results we must alternatively use other ratios and other devices. First, the difference in local bank branches per inhabitant minus the one of deposit bank branches per inhabitant from 1881 to 1911 divided by the number of bank branches per inhabitant in 1881 is an alternative ratio. We might used the mere time and banking type differences but high initial bank size figures should bring convexity in ratio's value. Then, features of the first banking structure ratio hold though corrected by the initial banking size. Also, the underlined bias of the first banking structure ratio is solved. As this new ratio helps more taking into account local and deposit bank substitution effect, it is thus more able to figure out the French banking structure of the period. Anyway similar results whatever the ratio at play should confirm the shape of conclusions<sup>2</sup>. Second, we might put in a same regression the difference along the period of local and deposit bank branches per inhabitant. Third, comparison of results whether we use local bank branches and total bank branches per inhabitant is another possibility. As we will see all these different strategies are useful in different part of this inquiry.

Producing models is the third step. Let's call 'GDP' the GDP per capita, 'NAP' the non-agricultural production per capita, 'INN' the indicator

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2. the second banking structure ratio is obviously better but we run out our tests with both ratios to bring more grounds to the conclusion

of innovation<sup>3</sup>, 'LOC' the figure of local bank branches, DEP the one of deposit bank branches, BK the one of all bank branches, POP the population. First models use cross section regressions to assess GDP per capita and non-agricultural production per capita growth according to the banking structure. We also use an interaction term as the conditional effect of local banking according to the size of industrial activities is the point of interest. Let's note  $g_1 = d_{t,t+1} \log(GDP)$ ,  $g_2 = d_{t,t+1} \log(NAP)$ ,  $BS_1 = \left( \frac{d_{t,t+1}(LOC/POP)}{d_{t,t+1}(DEP/POP)} \right)$ ,  $BS_2 = \frac{d_{t,t+1}(LOC/POP) - d_{t,t+1}(DEP/POP)}{BK_t/POP_t}$  and  $lNAP = \log(NAP) + 2.5$ . Hence, the models we test are :

$$g_{n,i} = \alpha BS_{k,i} + \gamma BS_{k,i} * lNAP_{i,t} + \lambda lNAP_{i,t} + \sum_j \beta_j CONT_{i,j,t} + \epsilon_i \quad (1)$$

With  $n=1,2$ ;  $k=1,2$ ;  $i$  the département index and  $j$  the control variables' index.

$$g_{n,i} = \sum_v (\alpha_v BT_{v,i} + \gamma_v BT_{v,i} * lNAP_{i,t}) + \lambda lNAP_{i,t} + \sum_j \beta_j CONT_{i,j,t} + \epsilon_i \quad (2)$$

With  $BT_v$  the banking type indicator such that  $BT_1 = d_{t,t+1} \left( \frac{LOC}{POP} \right)$  and  $BT_2 = d_{t,t+1} \left( \frac{DEP}{POP} \right)$  and  $v=1,2$ .

Whether local banking increases growth when join to industry comes with the interaction term<sup>4</sup>.

Second models use panel data to assess innovation according to banking structure. We therefore built three different tests :

$$INN_{i,t} = a \left( \frac{LOC}{DEP} \right)_{i,t} + \sum_j \beta_j CONT_{i,j,t} + T_t + u_i + \eta_{i,t} \quad (3)$$

$$INN_{i,t} = a \left( \frac{LOC}{POP} \right)_{i,t} + \sum_j \beta_j CONT_{i,j,t} + T_t + u_i + \eta_{i,t} \quad (4)$$

$$INN_{i,t} = a \left( \frac{BK}{POP} \right)_{i,t} + \sum_j \beta_j CONT_{i,j,t} + T_t + u_i + \eta_{i,t} \quad (5)$$

$T$  is a temporal dummy and  $u$  is the département dummy. The first model is explicative by itself. However, since the figure of deposit bank branches is sometime 0 in 1880 the following models give robustness to the results. Second

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3. Innovation is calculated by the patent tax as explain in the section 4 below.

4. NAP is not industry but non agricultural production, we simply assume here that industrial districts are those with high level of non-agricultural production per capita. This hypothesis is corroborated by historical and quantitative analyses (Cf. Combes & al. 2008 for evidence)

and third models need to be interpreted together. Indeed, information comes with comparison of results. For instance, local banking is good for innovation as long as  $a$  is positive and significant in (4) but not significant in (5).

What are control variables of the models? Traditionally, control variables are used to solve the omitted variable bias. We thus put inside the first set of regressions : the log of initial value of credit development, GDP per capita, enterprise per capita, bank branches per capita and population density. As the evolution of banking figures correlated with the one of credit development we add credit development growth variable as well. Control variables of the second set of regressions are : firms' average size and the share of non agricultural production<sup>5</sup>. This choice is motivated by supposedly high relation between industry, firm size and innovation.

Now, let's present sources and basic statistical figures to bring more grounds to the empirical strategy.

## 5 Sources and basic statistics

Innovation's indicator is the first point of concern. We use to this end the amount of the patent tax divided by the urban population. The tax gets three main features. Annuities are constant so patent's owners pay 100F per year of protection. The sum of annuities depends on the period of protection. As the patent is protected for five, ten or fifteen years, related tax are 500F, 1000F and 1500F. The patent is granted as long as the tax is paid and the tax must be paid in advance. Lastly, if the patent sold, the remaining amount of tax is totally paid in the département of the depositor. What are the consequences of this system? First, as 100F is an important amount in XIXth century France, patents are of high value and the tax is thus relevant to worth innovations. Second, as soon as patents are worthless owners stop pay in for it. In other words, as long as the expected profit of using the patent is positive, the tax is paid. The tax helps thus taking account on patents value. Third, the tax rules out cycles and shocks. Lastly, as innovations are often made inside urban center, urban population is the perfect denominator.

Let's add two points. First, the département of Paris is withdrawn. Foreign patents bias motivated this choice as foreigners must legally deposit their patents in Paris. The tax is consequently composed by almost 2000 patents each year. Second, according to Lamoreaux & Sokoloff (2001) several inventors might deposit their patents in other areas. As we use fixed effect in

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5. note we can not use credit development as data is lacking from 1891 to 1911. Furthermore, population appears in calculation of innovation's indicator. Control variables with population are thus tricky to use. We however use them to check on outcomes' robustness.

the econometric model, we just assume the phenomenon constant over time. This point is not really concerning anyway as no room for "market innovation" rose up in France. As Khan & Sokoloff (2004) points it out, weak examination of patents could not insure either its quality or its originality. Firms were thus not incited to buy patents. This is all the more true since monopoly protection was limited as information on patents were lacking<sup>6</sup>. As a proof, patents' cession are very weak in XIXth France. For instance, the number of cession is equal to 36 in 1878 and 91 in 1898<sup>7</sup>. Note also that buyers and sellers belong mainly to the same département (more than 80% in both cases as we let down transaction with foreigners). As firms bought patents on production purpose, this last point has two consequences : it gives evidence of local industry and innovation type interlocking ; it rules out any 'market for patent' bias from our empirical tests.

As the ratio imperfectly fit with innovation (See Griliches 1990 for discussion on patents) qualitative inquiries might be useful as well. Looking on the "bulletin des lois" helped us knowing more about individual patents<sup>8</sup>. First, the share of companies' (sociétés)<sup>9</sup> is smooth and weak over time (almost 10% and less than 7% without Paris). Second, industrial patents are numerous in industrial départements. For instance, the industrial département of Grenoble is mainly composed of industrial patents from small and medium firms and private inventors.

We got the additional data through different sources. The INED website<sup>10</sup> provides the population figures per French département. Jobert (1991) gives the business tax statistics. The Bottin du Commerce et de l'Industrie is used to evaluate the number of bank branches. Credit development and GDP per capita are provided by Bazot (2010)<sup>11</sup>.

We get information for all ten years from 1881 to 1911. In other words, the panel is composed of four years and 84 départements.

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6. "The attempt to obtain information was also inhibited by restrictions placed on access viewers had to state their motives ; foreigners had to be assisted by French attorneys; and no extract from the manuscript could be copied until the patent had expired." (Khan & Sokoloff 2004)

7. we include cessions to foreigners and patents retro-cessions in the calculation. Figures dwindle dramatically as we withdraw those cases (22 in 1878 and 59 in 1898).

8. The "bulletin des lois" gives only information about the depositor if not represented by an attorney and provides a very brief description of the patent.

9. Firm figures are available for companies only

10. [www.ined.fr](http://www.ined.fr)

11. Many thanks to Miren Lafourcade who tested the accuracy of our GDP estimation given Toutain's calculation of 1862 and 1896 (see Combes & al., 2008). This test could not be done by ourself as Toutain's data unavailable yet. According to the test our GDPs are very similar to Toutain's one as  $R^2 = 0.98$  and  $0.95$  without Paris area.

Table 1 gives some descriptive statistics. Let's add some comments on banking figures. Looking on branch evolution of both kind of bank is a first step of understanding. For instance, local banks set up more branches than deposit banks in the highly industrial département of Grenoble from 1881 to 1911. This fact is similar in the département of Lille, Lyon and Le Havre. At the opposite some rural départements are subject to this outcome as well. The département of Lozère is a good example of such case. This fact proves two points : first, reverse causality between growth and ratios we use in the econometric model is not actually high, second, on respect to the previous facts the interaction term we put inside is all the more interesting since ratios' figures are heterogeneous.

## 6 Results

This section is divided on two parts. We display results of the first set of regressions in one hand and results on innovation on the other.

### 6.1 Growth results

Whatever the tested model, all results converge to the same point. Local banking is more correlated with growth than deposit banking. As we think of the interaction term is of high importance, regressions are implemented to compare results as this one included in or not. Table 2 and 3 gives the results. Let's deal in first with equation (1), GDP per capita growth and the first banking ratio. Coefficients of interest are positives ( $\alpha = 0.1$  &  $\gamma = 0.05$ ) and significant ( $p_\alpha = 0.001$  &  $p_\gamma = 0.04$ ) whereas the whole model is quite explicative since  $R^2 = 0.46$  (Cf. Figure 1 for marginal effect graphs). Growth is related with local banking and the relation is all the more strong since the area is industrialized, results are suggesting. Note  $\alpha = 0.04$  &  $p_\alpha = 0.001$  without interaction term while  $R^2 = 0.41$ . Therefore, the interaction term gives definitely more grounds to the results. What occurs as the banking structure ratio shift? The shape of result remains the same. Unlike with the first ratio, regression displays insignificant coefficient as the interaction term absent ( $p_\alpha = 0.26$ ). However results keep the same shape when the interaction term included. Coefficients of interest are positives ( $\alpha = 0.45$  &  $\gamma = 0.25$ ) and significant ( $p_\alpha = 0.002$  &  $p_\gamma = 0.009$ )<sup>12</sup> while the whole model is quite

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12. Let's a short explanation of results. According to the graph about marginal effect of the second banking structure indicator on GDP per capita growth as the importance of non agricultural production change, if an exogenous shock increases  $BS_2$  by 0.1 point (what correspond to  $1/30$  of  $\max BS_2 - \min BS_2$ ) GDP per capita growth rises up by 3%

explicative ( $R^2 = 0.40$ ). All in all, conclusions give evidence of local banking and NAP size interlocking in the process of GDP per capita growth.

What is the shape of result as looking on NAP per capita growth and the first banking ratio. Coefficients of interest are still positives ( $\alpha = 0.11$  &  $\gamma = 0.06$ ) and significant ( $p_\alpha = 0.009$  &  $p_\gamma = 0.04$ ) whereas the whole model is quite less explicative than before  $R^2 = 0.23$  (Cf. Figure 2 for marginal effect graphs). Unlike previous result, banking coefficient turns insignificant as the interaction term withdrawn. In other words, local banking promotes NAP per capita growth as long as initial NAP high. Using the other indicator of banking structure provides very interesting results as well. Still, banking coefficient turns insignificant as the interaction term withdrawn. In other words, looking on marginal effect of  $BS_2$  on NAP per capita growth as  $LNAP$  changes, gives evidence of the interaction interest<sup>13</sup>.

All in all, results seem to rule out simultaneity bias as  $\alpha$  insignificant as long as the interaction term is withdrawn<sup>14</sup>. This prove that economic growth is more related to local banks than deposit banks at least on industrial areas. Local banking and industry are thus strongly tied in the growth process as marginal effect graphs are suggesting. Long term loans, information asymmetry and investment needs are probably the main aspects of the phenomena.

Let's look on results with equation (2). First, deposit banking coefficients are never significantly correlated with GDP and NAP per capita growth. Second, local banking is positively correlated with GDP per capita growth with and without interaction term. Third, the interaction term is significant as the dependent variable is GDP per capita growth. Fourth, local banking is positively and significantly related with NAP per capita growth as long as local banking interaction term belong to the regression.  $R^2$  still rises up dramatically as the interaction term is included in the model. To sum up, those results confirm the previous ones.

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on the whole period as  $LNAP = 2$  while it rises up by 0.9% as  $LNAP = 1$ . The effect of  $BS_2$  could even be negative as  $LNAP < 0.7$  (what correspond to the 25 percentile point). Note lastly that standard errors shape gives evidence of strong significance of results.

13. according to the related graph, as it increases by 0.1 point,  $BS_2$  rises up NAP per capita growth by 3% as  $LNAP = 2$ . Also, this outcome turns to 0.8% as  $LNAP = 1$ .

14. note also that, given the shape of the banking structure ratios, a bias exist if deposit banks dependence to GDP per capita growth is different to the one of local banks. Hence, coefficients are negatively biases as deposit banks dependence is superior to the one of local banks. Also, coefficients are positively biases in the opposite case. The direction of the bias is quite difficult to assess but it would be doubtful that simultaneity bias caused alone the sign of the estimated coefficients. On the contrary traditional literature on the topic gives evidence of higher growth dependence of deposit banks, at least in the American case (see for instance James 1981).

## 6.2 Innovation results

Results go to similar direction about innovation. Innovation is positively and significantly correlated with the banking ratio as regression on equation (3) is telling us ( $a = 0.45$  &  $p_a = 0.02$ ). In other words, innovation is related with the more local banking départements. Also, results of (4) and (5) converge to this conclusion. Local bank branches per capita is positively and significantly correlated with innovation ( $a = 0.13$  &  $p_a = 0.06$ ) while total bank branches per capita is not ( $a = 0.10$  &  $p_a = 0.14$ ). The more the local banking market share, higher the innovation figures. Adding GDP per capita, enterprises per capita and population density do not change the results. Lastly, bootstrapping tests do not bring about differences in results as well.

Results remain highly positive and significant as we withdraw temporal dummies. Also, the contrast is stronger as we compare results with (4) and (5). Lastly, This point is highly encouraging according to the market for patent issue. If such market was existing along the period both temporal and geographical fixed effect should be highly significant. Indeed, according to Lamoreaux & Sokoloff (2001), such market should dwindle significantly patent deposit share from rural areas.

Let's speak lastly about control variables. The share of industrial output and firms average size are rarely significant and often negatively correlated with the indicator of innovation. Correlation with urbanized population should be at play. It might prove also that probability to provide useful innovation is not directly related with industrialization. Lastly, it might be due to large industrial firms reluctance in providing information on their research. However, if such points deep and large, fixed effects should critically change the results, what is not the case here.

## 7 Interpretation of results

Why should local banks be more related with growing industry as results are suggesting? Information management is the key point of understanding. Compare to deposit banks, because they belong to local businesses, local banks get high aptitude to bring funds to riskier clients. Their knowledge reduces asymmetries of information and helps figuring out firms values (Berger & Udell 1996). They seize high value added projects and avoid anti selection process. Furthermore, because of their local position local banks prevent moral hazard through reputation costs threat. In other hand, small size helps facing unusual situations by adapting funds to client needs. All in all, accurate knowledge gives local banks the ability to select the most promising

firms of the area.

However, what credit devices were used? According to Nishimura (1995) local banks from industrial districts provided long term loans through bills renewing and advance in account. Also, local knowledge helps them issuing and dealing local companies' shares (Cf. Lescure & Plessis 2004). In other words, unlike deposit banks, local banks were not limited to commercial credits<sup>15</sup>. According to Lescure (2009), commercial portfolio in 1910 represent 50% of regional bank's 'other credits' and 120% of deposit bank ones. As long term loans are specifically needed by industrial firms, such outcome confirms the higher local banks ability to lend to "modern" sectors.

Hence, why should local bank figures be correlated with innovation ones? the answer stems from industry, innovation and investment relations. Results entail two possible explanation, depends on the causality direction. First, innovation exists before banking relations. Here, local banks help financing investment of the related project. Second, banking relation is anterior to innovation. As long as expected returns are related with invention and technical improvement, local banks selection promotes (directly or not) this innovation.

## 7.1 Investment credit, local banking and innovation

This section deals with reverse causality. What therefore means the causality? Here, is it because firms were innovative that local bank branches were numerous compare to deposit bank ones? In other words, does innovation give advantage to local banking? Because innovation entails investment, local firms need long term loans. Unlike deposit banks, unable to provide such funds, local banks are more suited to do business with innovative firms. As banking profit of the area depends on long term credits, local banks are more profitable here than outside. This might be one reason for innovation and local banking correlation.

Obviously, as investment level depends more to industrial activities, we should get positive correlation between industry, local banking and NAP and GDP per capita growth as long as local banks efficient. That is what we found especially through interaction terms results. Therefore, innovative firms from industrial areas get credit to local banks what increases investment, productivity and growth.

A quite different story is however at play if we change the direction of causality.

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15. Archives of the Banque de France gives examples of deposit banks' exclusion from local businesses. For instance, as the Banque de France chose to set up a branch in Cherbourg, inspectors reported the Société générales' inability of doing business with local firms as proved by its small volume of credits.



## 7.2 Bank relationship, selection and innovation

This second part deals with bank selection effect. A couple of theories rises up according to local bank lending abilities. Assume first that local banks can not provide funds to all profitable firms of the area. Because they have good private knowledges, local banks are however able to select those promising highest expected return. As long as expected returns of local banks are related to firms' dynamism, local banks select firms with highest innovative features. Assume now that local banks are not constraints anymore. Since information is costly to pool, they may choose to invest in relationship according firms expected returns. Still, local banks select promising and innovative firms.

How bringing more ground to this thesis? Because of credit constraints, remaining firms should not be able to survive in the long run in both cases. Hence, anything improving local banks lending ability should reduce the bankruptcy rate. How to prove this point? The answer entails two additional issues. First, what observing fact might increase local banks lending on the period? Second, what model might underpin this fact?

As argued by Bazot (2010) Banque de France branches helped local banks coping with liquidity constraints as deposit banks rose up their business network. Also, since deposit bank gleaned the Banque de France business, this one was urge to find new business partners, as well. In other words, Banque branch transactions were particularly useful to local bankers and vice-versa. Lescure (2003) reports that the rediscount portfolio was made up of 83% of local bank bills in 1880 and 1910. Supply and demand were there to celebrate the union. The Banque de France was thus highly incited to enhance its branch network along the period.

Therefore, observing bankruptcy rate evolution due to Banque de France geographical expansion is a good starting point<sup>16</sup>. The model should also implements interaction term to catch the point we are interesting for. The testing model is so :

$$B_{i,t} = \zeta \left( \frac{LOC}{POP} \right)_{i,t} + \mu BQ_{i,t} + \psi \left( \frac{LOC}{POP} \right)_{i,t} * BQ_{i,t} + \sum_j \beta_j CONT_{i,j,t} + T_t + u_i + \phi_{i,t} \quad (6)$$

$BQ_{i,t}$  is the number of Banque de France branches divided by the département size. Control variables are : GDP per capita, innovation ratio, firm average size and share of urbanized population. The bankruptcy rate ( $B_{i,t}$ ) is the number of bankruptcy per enterprise.

Regressions results are highly consistent with the hypothesis as  $\psi$  negatives (= -0.16) and significant ( $p_\psi = 0.02$ ) (see table 4 and Figure 3). Also,

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16. Bankruptcy data are available in the "Compte générale de la justice civile et commerciale".

looking on regression [1], when it increases by 0.1 point (what correspond to 1/12 of  $\max \frac{LOC}{POP} - \min \frac{LOC}{POP}$  as calculated in thousand of inhabitant) bankruptcy rate decreases by 1% as  $SUCC = 0.2$  (50 percentile point). This outcome turns to 0.6% as  $SUCC = 0.4$  (80 percentile point).  $\zeta$  is positive ( $= 0.12$ ) and significant ( $p_\zeta = 0.02$ ), suggesting higher bankruptcy rate as local banking business high. This fact fits with the story we are telling about as long term industrial credits are riskier than short term commercial ones. In other words, credits to investment and innovation entail more risk so more failure. Results are quite the same as we withdraw firm's average size and share of urbanized population from the regression. Adding deposit bank per inhabitant does not change the results whereas this variable is not statistically significant<sup>17</sup>. Substituting fixed effect by random one does not change the results as well.

### 7.3 Synthesis

Whatever the causality at play local banks bring about NAP per capita growth, either through investment or selection of good projects. Let's speak more on the overlapping case. It is indeed probable that both effects play in the same time. Assume that a invention leads a small firm<sup>18</sup> to invest in a new project. Assume first the investment costly. The firm can not avoid external finance. It therefore asks for local bank help. Rising large funds entail either bonds or share issues. The bank brings it help through different ways. First, it provides funds until bonds and shares are sold. As the period can be quite long such loans entails some risks<sup>19</sup>. The bank has thus to be sure of the firm project. Second, it helps to deal bonds and shares using their local influence. Third, it keeps some bonds and shares in vault. This third case is however quite rare.

Assume now that firms can use its own funds to finance the investment. However, raw materials and working capital entails massive demand of credit, sometimes for more than one year (Cf. Nishimura 1995). As the project nascent, the bank has to know more on it, this is the reason why such credits are most often provided by well informed insider lenders<sup>20</sup>. Therefore, by choosing or not to bring funds to the firm, the bank indirectly selects or not the project<sup>21</sup>.

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17. results on request to the author

18. as empirical facts are suggesting, patents deposit was rarely done by companies.

19. there are risk due to liquidity shocks, moral hazard, difficulty of the firm and losses of better opportunities

20. belonging to the same industrial districts

21. Note that if the innovative firm collapses the related patent is lost as the inventor

The bank makes one of these choices (depends on circumstances) as long as the project expected gain maximize its profits according to the set of information available. All in all, as the bank helps the firm to raise funds, investment increases the firm productivity and its potential growth level. Moreover, as the bank chooses the most promising projects the firm should be good enough to generate new innovations in the future. There is thus a couple of positive effects in the long run.

## 8 Discussions

We would like to add few points of discussion. First, as the Banque de France was a main actor of the banking system in the period, it might be useful to assess its policy, given those new results. Second, might deposit banks be assessed through this outcome. Third, do Paris district matter for interpretation. Fourth, what this study might tell on the Gerschenkron's debate.

### 8.1 Assessing the Banque de France policy

In a recent contribution, Bazot (2010) gave evidence on Banque de France branches ability to improve firm access to credit. The union with local banks were also put in front of the demonstration. As the Banque only brought liquidity to close actors, local banks could substitute previous reserves with safe discountable bills as soon as the Banque branch was built. Local banks credits increased what reduced liquidity constraints in the area (as also documented in table 4). As this process was applied with local firms as well (though scale weaker), firms were therefore urged to provide commercial credit to their clients. All in all, Banque branches increased credit development in significant way.

However, does such policy increase wealth? Indeed, some feared that local banking rescue keeps on the banking system with an archaic shape. As deposit banks were the alternative to local banking at this time, the Banque repel the ascent of the former by keeping alive the latter. This point is thus strongly related with the present inquiry. Since we proved that local banks were more able to bring about innovation and growth, at least in industrial areas, Banque de France policy was part of this success. Unless credit development played negatively on economic growth in the same time (what

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can not pay for it. This fact is however caught by our data as we use the tax rather than raw patent number.

seems improbable), the Banque de France policy probably helped promoting industrialization.

## 8.2 What about deposit banks ?

Even though local banking is more able to trigger economic development, the assessment of deposit bank needs a reappraisal. First deposit banks are part of the system so their position influenced the one of other banks. As documented by Lescure (2009), local banks change their asset portfolios because of deposit banks constraint. Indeed, local banks mainly provided commercial credits before 1890's. The trend shift as deposit banks used their specific advantage to take up this business. Thereby, local banks provided riskier (industrial) loans from this point of time as deposit bank competition rises up.

The same argument might be used regarding Banque de France policy. Deposit bank still triggered the Banque de France union with local banks so that any positive effect of the Banque branches policy has to be assessed according to this fact. Thus, industrial finance we documented here might indirectly depend to deposit banks expansion of the late XIXth.

## 8.3 Paris issue

All results we got withdrew the Paris' district. Thus, is this choice entails some biases and unobserved effects reducing the quality of interpretation? As Paris is the main city of patent deposit one might argue that the empirical work inquires for half of the phenomenon only. Though this remark correct, adding Paris to regressions enhances estimations quality. Indeed, Paris gets many local banks which the figure grows up on the period. Adding Paris in the data generates isolated points, in spite of fixed effects. Thus, this choice might have finally played against us.

Another bias might stem from the gap between Paris and the rest of France. One could argue that Paris provided the elite to the rest of the country. Moreover, innovation from Paris might be the most important ones. The first issue does not matter actually as the important point is not the whole innovation process but the relation between local banking, innovation, investment and industrial productivity. The second issue is solved through qualitative analysis. Observing patent description as told in the "bulletin des lois" brings information on patents types and their expected influence. For instance, patents for commercial purposes should be less influent than industrial ones. Accurate inquiry of the source gave no evidence of outperforming patents in Paris.

## 8.4 English and German banks efficiency

What can be add to the Gerschenkron's debate on the light of this new study. As the English banking system very concentrated, results suggest German advantage through information management. On this respect, traditional argument are let down. Hence, German banking structure might be good in promoting growth because of its ability to know more on industrial needs. As told by the present model, industrial finance bring growth about through selection process. Representation to firm's board does not matter anymore since banks trigger industrial progress by selection of the most promising firms (and projects). This point might thus be done neither by influencing firms direction nor by providing massive credit loans.

However, comparison is quite tricky. Local banks specificities are numerous. For instance, local knowledge is probably higher for French local banks than German universal banks. Moreover, English joint stock banks were probably less "timorous" than French deposit banks. As far as we know, English banks got more credit tools to bring about industrial progress. For instance, English banks rarely provided loans through commercial discount device (Cf. Lescure 2009). In other hand, each banking system is specific and follow its own path. For instance, Although well suited to finance small industries (Guinnane 2001), German credit cooperatives have no business room in France and England.

As a consequence, German advantage, if any, might stem from close industrial connection. At the opposite, English disadvantage, if any, might be related to 'distance'<sup>22</sup> with firms. But we must stay prudent as both might depend on remaining national institutions (Cf. Hall and Soskice 2001 for an introduction on this point). Therefore, institutions interlocking might brings more clues on reasons of banking specificities, preventing any conclusion without deep inquiry about national global structures.

## 9 Conclusion

This paper argues that banking structure matter for development in France. We especially show dramatic local banking influence on this respect. This result is not due to local banks size but stem from their ability to gather and use information. At the opposite, deposit banks structure prevent them to get precise information particularly needs to lend into "complex" environments. Therefore, because industrial credits are uncertain per se, local banks were so relatively more apt to sustain industrial projects. On this res-

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22. distance is either cultural or geographical but the former is probably more at stake.

pect, innovation and local banking relationship is the empirical justification of such theoretical position.

Conclusions are hard to transpose but they might shed some lights on the efficient banking structure debate. For instance, as German banking system was more dispersed than English one, German industrial success might come from information management rather than specific features of German universal banks. Credit cooperative were thus more likely to have influential position in the German industrialization process. On the other hand, as information management depends on the bank size, bank mergers might hampers innovative projects. It is all the more true since national industries belong to industrial districts whose information do not get out. Thus, large banks are not necessarily the best economic option as they have no ability to grab local and precious knowledges.

On the other hand, this paper gives evidence of possible banking market inefficiency. This point stem from the banking market per se as competition emerges from deposit and credit side. On this respect, even though local banks have the ability to sustain innovation, investment and growth due to specific advantages on credit market side, they are not able to compete on deposit market side. Therefore, some local banks might suffer from liquidity constraints due to competition on deposits and safe (liquid) commercial credits.

Lastly, according to transaction cost theory, present transaction costs reduction (especially through information and communications technologies) might diminish firms average size by allocating a wide part of the production to specialized SMEs. Furthermore, by introducing congestion costs into models of economic geography Krugman & Venables (1995) designed a theoretical path for sectoral diversification as empirically showed by Imbs & Wacziarg (2003). Therefore, sectors diversification and firms decentralisation should enhance the figure of innovative SMEs in the future. The way those firms will improve their productivity and reduce their costs is thus an important issue. Since small and medium size firms are hard to survey quantitatively, specific knowledges are needed to finance them. As a consequence, according to this contribution, local banking activities should potentially perform new financial solutions in the future.

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TABLE 1 – Descriptive statistics : mean and standard deviation

	1880	1890	1900	1910
Innovation ratio	0.40 [0.33]	0.32 [0.34]	0.26 [0.22]	0.24 [0.26]
LOC/DEP	19.4 [10.1]	13.9 [7.7]	5.0 [3.6]	2.6 [1.8]
Local bank per capita	0.60 [0.27]	0.60 [0.24]	0.57 [0.24]	0.56 [0.25]
Deposit bank per capita	0.03 [0.02]	0.04 [0.03]	0.14 [0.08]	0.24 [0.09]
Bankruptcy rate	0.25 [0.12]	0.34 [0.14]	0.36 [0.16]	0.28 [0.12]
GDP per capita	0.57 [0.17]	0.61 [0.19]	0.72 [0.23]	0.74 [0.21]
Firms average size	0.62 [0.22]	0.71 [0.24]	0.85 [0.30]	0.77 [0.27]
urbanized pop share	0.26 [0.14]	0.28 [0.15]	0.30 [0.16]	0.32 [0.17]
Enterprise per capita	0.46 [0.11]	0.49 [0.12]	0.52 [0.11]	0.56 [0.11]
NAP share	0.49 [0.13]	0.56 [0.13]	0.60 [0.13]	0.57 [0.14]
	BS1	BS2	BT1	BT2
Mean	-0.082	-0.37	-0.037	0.21
SD	[1.42]	[0.46]	[0.24]	[0.09]
	g1	g2	SUCC	
Mean	0.33	0.51	0.37	
SD	[0.17]	[0.23]	[1.02]	

N=84 for each year. NAP is non agricultural production. LOC/DEP is the number of local bank branches per deposit bank branches. Innovation ratio is the tax per hundred of urbanized inhabitants. Local bank per capita is the number of local bank branches per ten thousands inhabitants. Deposit bank per capita is the number of deposit bank branches per ten thousands inhabitants. Bankruptcy rate is the number of bankruptcy per hundred of enterprises. GDP per capita is GDP/10000 per capita. Firms average size is the non agricultural production per ten enterprises. Enterprise per capita is the number of firms per hundred of inhabitants. BS1, BS2, BT1 and BT2 are defined in Table 2. g1 is GDP per capita growth from 1881 to 1911 and g2 is non agricultural production per capita growth on the same period. SUCC is the Banque de France branches density (per 10000Ha).

FIGURE 1 – Banking structure marginal effect on GDP per capita growth as initial level of non agricultural production change

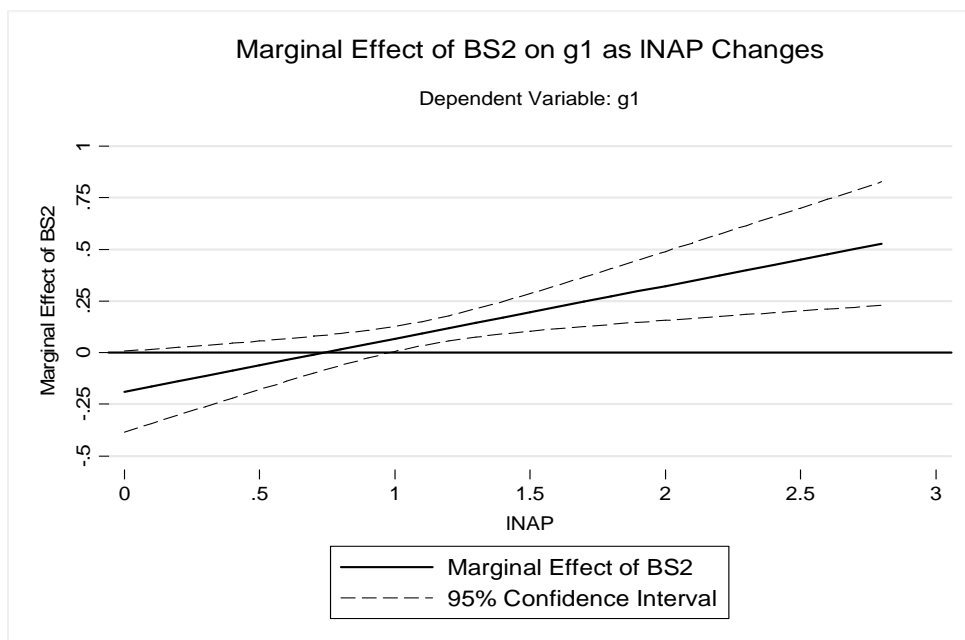
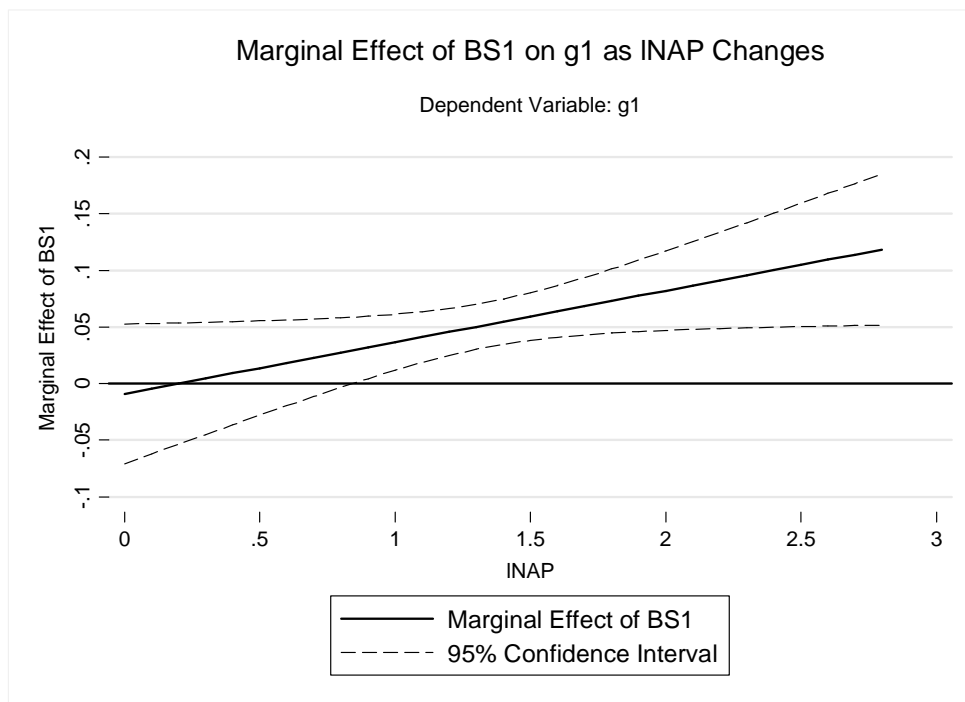


TABLE 2 – Determinant of GDP per capita growth from 1881 to 1911

	(1)	(2)	(3)	(4)	(5)	(6)
BS1	0.04*** [0.01]	0.10*** [0.03]				
BS2			0.05 [0.04]	0.45*** [0.13]		
BT1					0.29*** [0.06]	0.58*** [0.19]
BT2					0.42 [0.26]	0.25 [0.71]
BS1*lnAP		0.05** [0.02]				
BS2*lnAP				0.25*** [0.09]		
BT1*lnAP						0.24* [0.14]
BT2*lnAP						-0.01 [0.58]
lnAP	0.04 [0.16]	0.10 [0.15]	0.06 [0.17]	0.19 [0.15]	0.10 [0.15]	0.16 [0.16]
R2	0.42	0.46	0.34	0.40	0.44	0.46
N	84	84	84	84	84	84

\*\*\*, \*\*, \* significant at 1%, 5% and 10% confidence, standard errors into brackets. OLS regressions on département basis from 1881 to 1911. BS1 is the first "banking structure" ratio. It is the difference from 1880 to 1910 of the number of local bank branches per inhabitant divided by the difference from 1880 to 1910 of the number of deposit bank branches per inhabitant. BS2 is difference from 1880 to 1910 of the number of local bank branches per inhabitant minus the difference from 1880 to 1910 of the number of deposit bank branches per inhabitant. BT1 is the first bank type ratio. It is the difference from 1880 to 1910 of the number of local bank branches per inhabitant. BT2 is the difference from 1880 to 1910 of the number of deposit bank branches per inhabitant. lnAP is the log of non agricultural production in 1880. All regressions add credit development growth (1881/1911) variable and the log of initial (1881) figure of : credit development, bank branches per capita, population density and enterprise per capita.

FIGURE 2 – Banking structure marginal effect on non agricultural production per capita growth as initial level of non agricultural production change

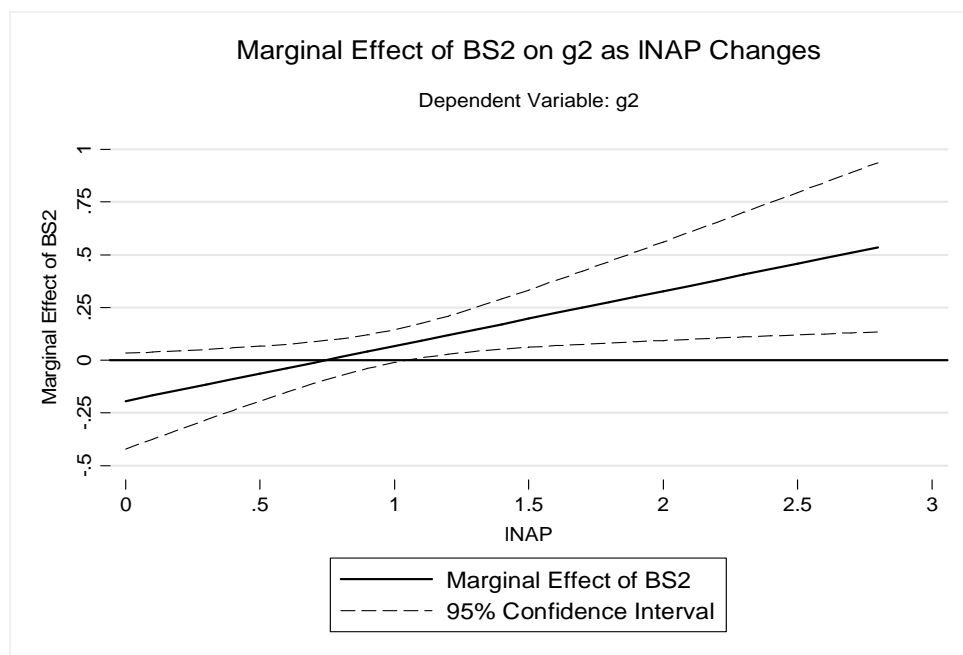
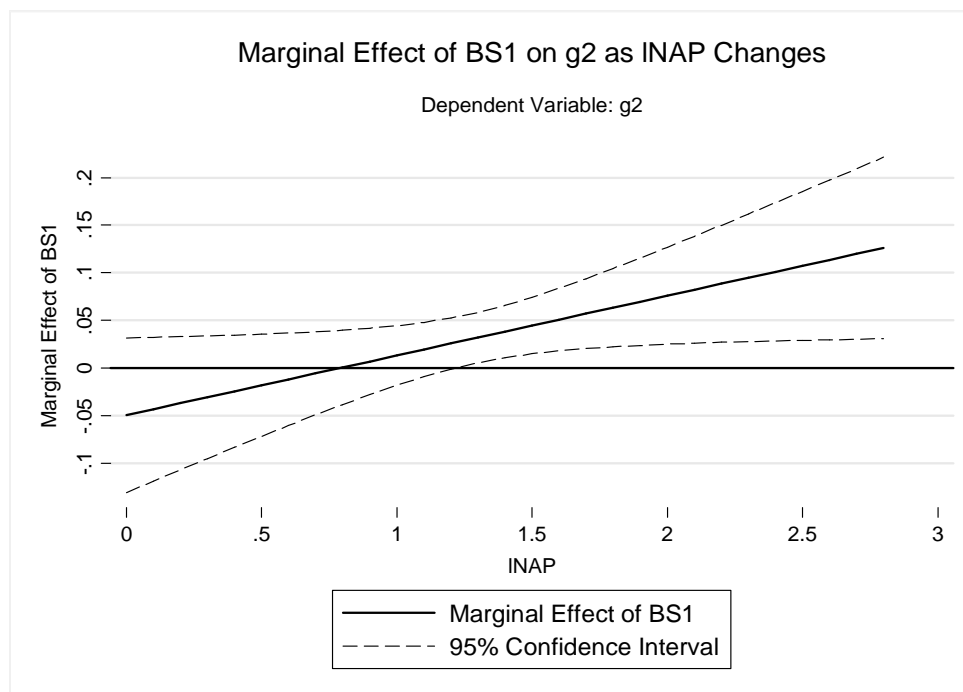


TABLE 3 – Determinant of NAP per capita growth from 1881 to 1911

	(1)	(2)	(3)	(4)	(5)	(6)
BS1	0.02 [0.02]	0.11*** [0.03]				
BS2			0.05 [0.05]	0.45** [0.17]		
BT1					0.21** [0.09]	0.53** [0.25]
BT2					0.44 [0.38]	0.53 [1.26]
BS1*INAP		0.06** [0.02]				
BS2*INAP				0.26** [0.11]		
BT1*INAP						0.25 [0.19]
BT2*INAP						0.12 [0.89]
INAP	-0.20 [0.26]	-0.11 [0.25]	-0.20 [0.26]	-0.06 [0.25]	-0.15 [0.26]	-0.14 [0.24]
R2	0.19	0.23	0.19	0.22	0.22	0.23
N	84	84	84	84	84	84

\*\*\*, \*\*, \* significant at 1%, 5% and 10% confidence, standard errors into brackets. OLS regressions on département basis from 1881 to 1911. NAP is the non agricultural production. All regressions add credit development growth (1881/1911) variable and the log of initial (1881) figure of : credit development, bank branches per capita, population density and enterprise per capita.

TABLE 4 – Innovation and local banking

	(1)	(2)	(3)	(4)
LOC/DEP	0.84*** [0.15]	0.54*** [0.14]	0.52** [0.25]	0.42* [0.23]
fixed vs random	random	fixed	random	fixed
temporal dummies	no	no	yes	yes
R2 within	0.14	0.18	0.16	0.18
N	296	296	296	296
	(5)	(6)	(7)	(8)
LOC/POP	0.22*** [0.07]	0.15* [0.08]	0.16*** [0.07]	0.13* [0.07]
fixed vs random	random	fixed	random	fixed
temporal dummies	no	no	yes	yes
R2 within	0.06	0.14	0.16	0.19
N	336	336	336	336
	(9)	(10)	(11)	(12)
BK/POP	-0.02 [0.05]	-0.05 [0.05]	0.14** [0.07]	0.10 [0.07]
fixed vs random	random	fixed	random	fixed
temporal dummies	no	no	yes	yes
R2 within	0.07	0.13	0.16	0.18
N	336	336	336	336

\*\*\*, \*\*, \* significant at 1%, 5% and 10% confidence, standard errors into brackets. All regressions add firm average size and share of non agricultural production.

FIGURE 3 – Local banking marginal effect on GDP per capita growth as succursale's density change according to regression (1) and (2)

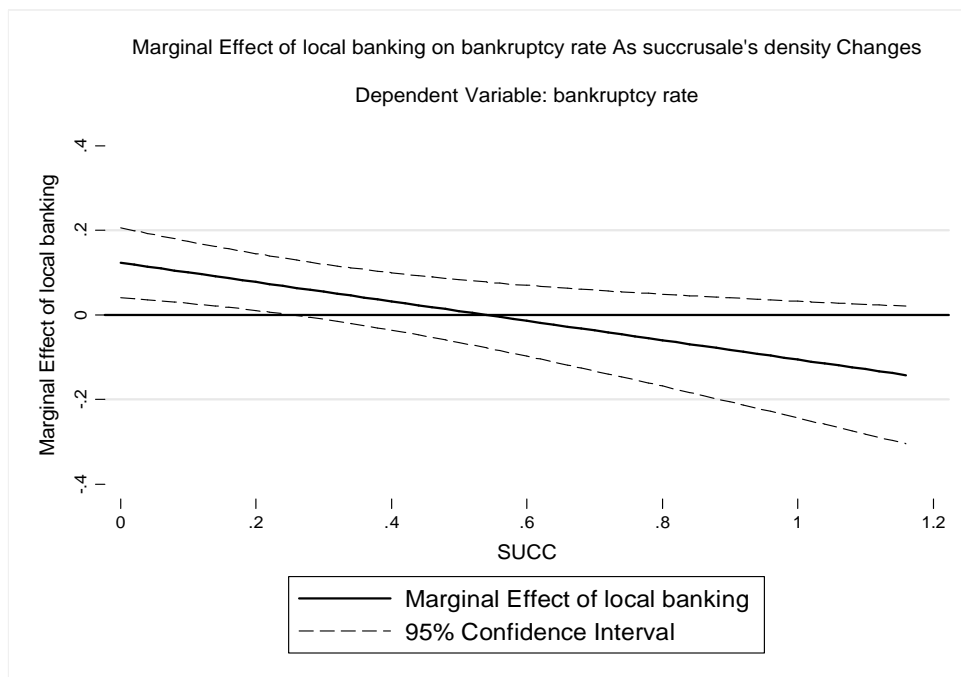
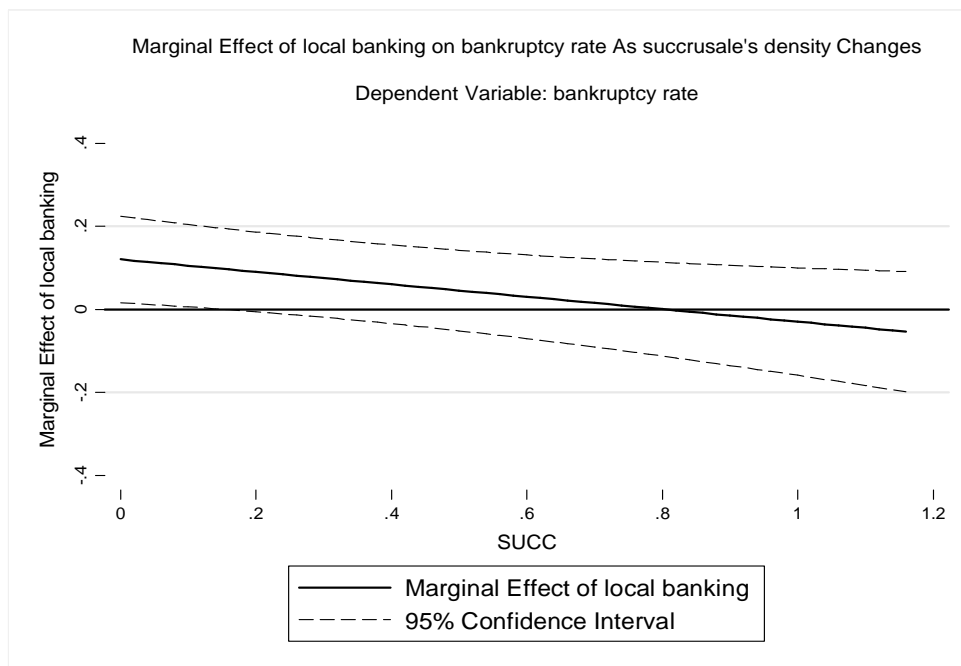




TABLE 5 – Bankruptcy, Banque de France branches and local banking

	(1)	(2)
LOC/POP	0.12** [0.05]	0.11** [0.05]
(LOC/POP)*SUCC	-.013** [0.007]	-.017*** [0.006]
SUCC	0.06 [0.05]	0.08* [0.05]
R2 within	0.35	0.33
N	336	336

\*\*\*, \*\*, \* significant at 1%, 5% and 10% confidence, standard errors into brackets. (1) adds GDP per capita, urbanized population share, firm average size and innovation indicator while (2) adds only GDP per capita, innovation indicator and urbanized population share. Both regressions adds geographical and temporal dummies.