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By a Silken Thread: Regional banking integration and pathways to financial development in Japan's Great Recession*

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Abstract

We examine the impact of cross-prefectural differences in financial integration on the regional spread of Japan's Great Recession in the early 1990s. In prefectures with many small manufacturing firms, post-1990 growth was significantly lower if low levels of banking integration with the rest of the country before 1990 existed. The least financially integrated and most credit-dependent prefectures also saw the largest declines in lending by major banks operating nationwide. This suggests that financing frictions were more severe in less financially integrated regions. We then show that cross-prefectural differences in financial integration in the late 20th century can be explained by regionally different pathways to financial development after Japan's opening in the late 19th century. Silk reeling emerged as Japan's main export industry after 1868. The silk industry was heavily dependent on credit for working capital, but silk reelers in the mountainous regions of central Japan generally could not borrow from the large banks in Yokohama or the other major cities. Instead, they either formed local credit cooperatives or local banks were founded with the help of Yokohama silk merchants who then effectively provided the silk reelers with trade credit. The silk regions therefore embarked on a path to financial development in which banking remained centered on a largely mutual or cooperative model and in which banks borrow and lend mainly regionally. Thus, the banking system of the late 19th-century silk-exporting regions was effectively less financially integrated with the rest of the country at the onset of the Great Recession of the 1990s. Using the number of silk filatures per capita at prefecture level in 1895 as an instrumental variable, we corroborate our result that the post-1990 decline was worse in prefectures with low levels of banking integration and high credit dependence.

Keywords: Great Recession; Lost Decade; Banking integration; Transmission of financial shocks; Misallocation of credit; Trade credit and finance; Silk industry
JEL classification: F15, F30, F40, G01, N15, N25, O16

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Introduction

We examine the impact of financial integration between prefectures on the regional spread of Japan's Great Recession after 1990. Prefectures with many credit-dependent small manufacturing firms grew much slower after 1990 if their banking sector was weakly integrated with the rest of the country. The financially least integrated and most credit-dependent prefectures also saw the largest declines in lending by nationwide-banks. This suggests that financial frictions were considerably worsened by the regional segmentation of Japan's banking market. We show that in Japan's otherwise highly integrated national economy, these regional differences in banking integration have long-standing historical origins: prefectures in which silk reeling emerged as the first main export industry in the late 19th century developed a particular system of trade and export finance in which small, often cooperative or mutual banks came to play a key role. These banks borrow and lend mainly regionally. In other regions, larger, nationwide banks eventually came to dominate the market. Therefore, the old silk regions had *de-facto* weakly integrated banking markets at the onset of the Great Recession. Hence, the extent to which a large common, country-wide shock – the burst of Japan's Asset Price Bubble in the early 1990s – was transmitted to different parts of the country literally hinged 'by a silken thread', reeled a hundred years before during the days of Meiji-era Japan (1868-1912).

Our empirical approach follows a large literature initiated by Rajan and Zingales (1998). We identify cross-regional differences in credit dependence using the number of small manufacturing firms. Our main measure of regional financial integration is the prefecture-level market share of city banks, i.e. big banks that operate country-wide as opposed to that of purely regional lenders (mainly small cooperative and mutual banks). We find that in the financially least integrated and most-credit dependent prefectures, growth rates between 1991 and 2005 were on average 0.7 percent lower than in a prefecture with average levels of financial integration and credit dependence. Conversely, the link between credit dependence and recession depth is almost absent in highly integrated regions. As the transmission channel from the financial shock to the real economy, we identify the lending behavior or the large nationwide (so called: 'city') banks: these most severely restricted their lending in areas where they traditionally had the lowest market share.

The second part of our analysis then turns to the question: what determines variation in

the degree of financial integration across prefectures? We take a deep dive into Japanese economic history to argue that cross-prefectural differences in financial integration at the onset of the 1990s Great Recession can to a large extent be explained by regionally different pathways to financial development. After Japan's opening for trade in the 19th century, silk thread emerged as Japan's first export staple. The development of this industry had a huge impact on the development of the financial system. With the mechanization of the reeling process in the 1880s and 1890s, silk reeling became increasingly separated from the growing of cocoons. Therefore, exporting silk reelers had to purchase cocoons which accounted for more than 80 percent of their operating cost. This made the silk reeling business very dependent on trade credit. However, small reelers – most of them located in the mountain regions of central Japan –were largely cut off from direct access to finance from the large city banks in Yokohama and other treaty ports. Instead, small regional banks provided them with operating loans against so-called 'documentary bills' drawn on reputed Yokohama silk dealers to which the reelers would ship their produce after having reeled the cocoons. Therefore, regional banks provided a loan for which the Yokohama merchant was ultimately liable and it were ultimately the Yokohama silk merchants who had to monitor the quality of the credit relation with the silk reelers. A key aspect of the quality of this relationship was the quality of the reeled silk thread that the silk reelers would ultimately deliver to the Yokohama merchant. An important part of quality improvement, in turn, was the mechanization of the silk-reeling process. Specifically, in the early stages of mechanization hand-reeled silk was often re-reeled in mechanized filatures (silk-reeling mills) that were run on a cooperative basis. The centralized re-reeling by the cooperative allowed to implement a coherent and efficient quality control systems. The boost in quality thus achieved was ultimately decisive in Japan's eventual domination of the US market for silk: the US was the first mass consumer market for silk products woven on mechanized looms. These mechanized looms required thread of very consistent quality which in turn could only be obtained through a mechanized reeling process. Hence, mechanization can be viewed as a precondition for the development of a system of trade credit and trade finance in which regional banks – often initiated either by the silk trading houses or by the cooperatives themselves – provided trade credit to local small silk reeling businesses. Regional banks operating in Japan today largely go back to these regional institutions.

We show that the prefecture-level number of silk reeling mills (normalized by population)

in the late 19th century is indeed a powerful predictor of the prefecture-level market share of these local lenders (as opposed to city banks) a hundred years later, at the onset of Japan's Great Recession – and therefore of the degree of regional banking integration in modern days. Using late19th century level of mechanization in the silk industry as an instrument for financial integration, we corroborate our above results: given the role of small firms in the regional economy, the effects of the recession was worse in less financially integrated areas.

Thus, different pathways to financial development had a century-long impact on the degree to which prefectures were effectively financially integrated when the Japanese bubble burst in the early 1990s: During Japan's industrialization, western-style bank finance was extremely important in developing other industries – cotton , railways, steel milling or coal mining – whereas the main silk reeling areas embarked on a way to economic growth in which financial development was largely based on many small, often cooperatively owned banks. While this model certainly served the needs of the silk industry very well, it eventually led to a long-lasting regional fragmentation of the banking system that persisted over a century. As we argue, regional differences in the level of financial integration, in turn, then had a considerable impact on small firms' access to finance during the crisis and on post-crisis growth differentials between prefectures. Hence, how the recession affected a region after the great bust of the early 1990s, therefore, literally, hinged 'by a silken thread' – reeled a hundred years before, in the days of Meiji-era Japan.

Contribution to the literature

Our study places itself at the intersection of several strands of literature. First, we contribute to the empirical literature on financial development (King and Levine (1993), Rajan and Zingales (1998), Jayaratne and Strahan (1996), Morgan, Rime and Strahan (2004)). While much of this literature has focused on the growth implications of financial development and on international comparisons, our focus here is more on business cycle implications and on intra-national (regional) differences in financial structure. Here, we have precursors in the work of Jayaratne and Strahan (1996) and Morgan, Rime and Strahan (2004) for the United States and Guiso, Sapienza and Zingales (2004) for Italy. We add an important novel aspect to these literatures by emphasizing how differences in financial *integration* can be the outcome of alternative pathways to financial *development*. Each model of development – the cooperative one for the silk

reeling regions, the western-style system of city banks for other regions – seems to have served the specific financing needs of the respective industries very well at the time and each seems to have been instrumental for regional economic development over the last century. Today, the regions that form modern Japan at first sight appear as highly financially integrated and they clearly share the same regulatory and legal framework. Still, the different historical pathways have a long shadow in creating interesting heterogeneity in terms of regional differences in 'deep' financial integration. These differences mattered decisively in how a big common shock a hundred years later proliferated through the country.

Our results therefore also draw attention to path dependence as an important aspect of the debate about financial development vs. financial integration and their relative roles for growth and the transmission of macroeconomic disturbances. *Prima facie*, our results suggest that it is financial integration that matters most directly for macroeconomic transmission, not financial development: cross-prefectural differences in conventional measures of financial development (credit over GDP, the number of bank branches) do not seem to be able to account for the regional spread of the crisis across Japan. But we *do* find that financial integration in and by itself can be an outcome of a particular path to financial development; the pathway to financial development affects financial integration which in turn affects the spread of the crisis.

The paper also contributes a regional perspective to the literature on banking crises and financial integration (Dell'Ariccia, Detragiache and Rajan (2008) and Kroszner, Laeven and Klingebiel (2007)). These studies examine the aftermath of banking crises in a large cross-section of countries. Our focus here is in the regional implications of a common (country-wide) shock over regions and time whereas Dell'Ariccia, Detragiache and Rajan (2008) and Kroszner, Laeven and Klingebiel (2007) emphasize the typical path of an economy following a (generally country-specific) banking crisis.

We also add a regional dimension to the literature on the role of international banking for the cross-country transmission of shocks. (Cetorelli and Goldberg (forthcoming), Peek and Rosengren (2000, 1997)). Peek and Rosengren (2000) emphasize common-lender effect of the Japanese shock of the early 1990s on US banks. Peek and Rosengren (1997) show that Japanese banks that operated in international markets, cut back on their foreign lending – markets that the often had only recently entered. One way to interpret these results is as evidence of relationship lending: banks withdraw from regions with which they have relatively weak ties.

Our results here are quite analogous: in fact, city banks cut down their lending in particular in prefectures in which they had a traditionally low market share. We add to this by showing that this effect was stronger in areas with many small firms. Our results also relate to recent findings by Cetorelli and Goldberg (forthcoming) who show that the internal liquidity management of US banks operating internationally actually exacerbated the transmission of domestic (i.e. US) liqiduity shocks on foreign economies, leading to a reduction in lending.

Our analysis is closely related to Peek and Rosengren (2000) and Imai and Takarabe (2011) who also have used the burst of Japan's big property and stock market bubble of the 1980 as an identifying device for bank lending behavior . These papers focus on common lender effects and on how banking integration can accelerate the spread of a crisis. our analysis here emphasizes how a lack of financial integration can worsen a recession in particularly credit-dependent sectors and areas. Also, different from most earlier studies, our focus here is on the regional dimension of Japan's Great Recession. This focus, to our knowledge, remains quite novel to the literature.[1] The Japanese experience has been studied in much detail from a macroeconomic perspective, with special attention to the banking sector or based on firm-level data. However, there is so far much less evidence for the implications of the crisis (and of regional differences in financial integration) for regional business cycles and medium-term growth. We provide such evidence here.

The burst of Japan's bubble triggered a severe banking and financial crisis and which is likely to have particularly tightened the financial constraints faced by credit-dependent households and firms. Our approach allows to study regional variation in the workings of the financial accelerator and the balance sheet channel (see Bernanke (1983), Gertler and Gilchrist (1994) and Bernanke and Gertler (1989)) that is plausibly stronger than in a "normal" downturn that is not associated with a major financial crisis. It is particularly interesting to study the Japanese experience also because the burst of the bubble had such persistent effects on economic activity, leading to what is often referred to as a 'lost decade'. This gives us a long observation period after the shock in which to study the repercussions and robustness of changes in business cycles

[1]The only recent paper we are aware of is Imai and Takarabe (2011) who study the role of banking integration for cross-prefecture level differences in the exposure to the house price shock. They conclude that house price shocks in the core areas had bigger (negative) spillovers in areas with high banking integration. We corroborate their results below as a test of robustness of our main findings. Our analysis here, however, focuses on how the lack of financial integration has exacerbated the financial frictions that were induced by the common shock. Also, Imai and Takarabe (2011) do not offer a historical explanation for why there are cross-regional differences in financial integration as we do here.

and of the medium-term consequences for growth, employment and industrial structure.

A recent important literature focusing on the Japanese experience after 1990 has emphasized that Japan's bursting bubble cannot be characterized as a conventional credit crunch (Caballero, Hoshi and Kashyap (2008), Peek and Rosengren (2005)). Rather, banks seem to have engaged in evergreening insolvent borrowers in the hope that either their borrowers or the banks themselves would eventually get bailed out by the government. This seems to have led to to the emergence of a class of "Zombie", insolvent firms firms that starved other, productive firms, from credit, hindered the creation and growth of new firms and thus stifled growth in the aggregate economy (Caballero, Hoshi and Kashyap (2008). Our results are actually consistent that evergreening was one of the financial frictions that contribute to our findings. First, Caballero, Hoshi and Kashyap (2008) show that manufacturing was one of the sectors that was least affected by ever-greening. Our focus here is on small manufacturing firms – the ones that are therefore most plausibly deprived of the credit of which the (generally large) 'zombies' benefited Also, it seems that ever-greening was particularly pervasive within *Zaibatsu*, the tight industrial conglomerates that encompass industrial firms and banks and that it was done in particular by large banks. One of our findings is that large banks withdrew from areas where they had traditionally a low market share and where there were many small manufacturing firms. Clearly, this is consistent with the possibility that large banks withdrew credit to evergreen large customers in their core business regions.

A key innovation of our paper is that it explores the long-term historical origins of why Japan's crisis of the 1990s spread across the country in the way it did. These historical aspects of our results build on a literature that has shown that Japan's opening for trade was indeed a natural experiment. Bernhofen and Brown (2005, 2004) showed that this opening spurred the development of industries in which Japan had a comparative advantage, and the silk industry is a pre-eminent example of such an industry. To our knowledge, we are the first to point at the role that silk has played in the development of particular structures in banking markets and at how these structures persisted over a century. In explaining the emergence of these differences in banking market structure , we build on an important recent literature that has emphasized the role that trade credit can play in attenuating informational asymmetries (Petersen and Rajan (1997)) and in overcoming barriers to growth in environments with low financial development (Fisman and Love (2003)): silk reeling firms were largely located in remote prefectures and

were not able to borrow directly from the banks in the big port cities. Instead the Yokohama silk merchants who sold the silk to the international market also effectively provided trade credit to the reelers. In the longer term, only mechanized reelers were able to provide the consistently high quality required by the international (in particular US) markets. Therefore, the prefectures in which there was a high concentration of reeling firms and that mechanized early had a competitive advantage and became the main silk exporting regions: in the absence of other financing opportunities, access to trade credit thus allowed silk reeling to grow faster than other industries and to become Japan's first key export industry.

The remainder of this paper is now structured as follows: section 2 provides background on our identification strategy and presents details about small business finance and the regional tiering of the banking sector in Japan. It also introduces the data. Section 3 presents our basic stylized facts: the fallout from the crisis was much stronger in regions where financial constraints were more severe, either because there were many small firms that are dependent on external finance or because access to finance – due to a weak integration of the region's banks with the rest of the country – was more difficult. Section three acknowledges the potential endogeneity of our regional banking and financial integration measures and introduces our instrument: we show that a prefecture's degree of mechanization in the silk reeling industry in the late 19th century is a powerful predictor of the local importance of regional banks in the late 20th century and we proceed to demonstrate that these long-standing differences in financial integration have a long shadow: they strongly affected regional differences in macroeconomic transmission in the Great Recession of the 1990s. Section 4 discusses our results further and concludes.

Identification: small business finance and regional banking in Japan

Our conjecture at the outset is that financial integration improves access to credit. To identify how cross-prefecture differences in financial integration affected the regional spread of the Great Recession, we follow the approach by Rajan and Zingales (1998) in arguing that differences in financial integration should matter more where dependence on credit is stronger. Hence, it should be the interaction between dependence on finance and financial integration that determines how strong the crisis hits a region. As argued by Rajan and Zingales (1998)

and Guiso, Sapienza and Zingales (2004), focussing on such interactions makes for a much stronger identification of the effects of the treatment (in our case: financial integration) because unobserved confluent factors can easily be controlled for: if regional differences in financial integration are time-invariant or only evolving very slowly (as we would expect), then it is impossible to separate their effect from a a fixed effect in a panel setting if their marginal impact of financial integration on the outcome (e.g. growth or volatility) is fixed. If, however, the marginal impact of financial integration on the observed outcome depends on other characteristics (such as the dependence on external finance of households or firms), then the interaction allows to separate the effect of financial integration from any first-order confluent factor that would be captured by the fixed effect.

As our primary gauge of a prefecture's dependence on external finance, we use the share of small manufacturing firms in output or employment in the local economy. Our data are from Japan's manufacturing census and they provide a detailed account of value added and employment by firm size in the manufacturing sector. For each prefecture, we multiply this share of small firms in manufacturing with the prefecture's manufacturing share. Manufacturing firms are generally much more capital intensive and dependent on working capital than will be firms in other sectors. Hence, the manufacturing share by itself is already an indicactor of dependence on external finance. Interacting this share further with the share of small firms in the sector should there provide us with a particularly powerful measure of credit dependence.

Our main indicator of differences across prefectures in financial integration is the prefecture-level share in bank lending accounted for by banks that operate nationwide (and therefore pool bank funds across prefectures) vs. those that operate only regionally (and therefore are more directly exposed to local economic conditions). To construct these shares, we obtain data on bank lending by prefecture and type of bank from the Bank of Japan. These data allow us to distinguish between lending by city (i.e. nationwide and first-tier regional) banks, and second-tier regional mutual banks (Sogo banks), industrial credit associations (Shinkins) , by agricultural, fishery and other credit cooperatives. Our data set also contains prefecture-level lending by the postal office (after 1973) and by the Shoko Chukin bank (a government-sponsored bank lending to small business nationwide).

Until the onset of the Great Recession of the 1990s and the ensuing banking crisis, Japan had a regionally very clearly tiered and segmented banking system. (Hoshi and Kashyap (2004);

Kano and Tsutsui (2003)) The big city banks are the foremost lenders overall and are the main banks to operate nationwide. There are also some large previously regional banks (so-called first-tier regional banks) that operate nationwide or at least in most parts of the country. These two groups are included in our measure of lending by nationwide banks. The post office as well as the Shoko Chukin are also nationwide lenders but account for only a modest share of overall lending. The genuinely regional banks on which we have data fall into two main groups: Mutual banks (Sogo banks, also often referred to as 'second tier' regional banks) and industrial credit associations (Shinkin).[2]

Many of the regional lenders are cooperative or mutual banks. Below we elaborate in detail that many of these banks have their origin in the development of trade finance for small firms and cooperatives in the silk reeling sector of the late 19th century. From the outset, they were set up to lend mainly regionally. And constrained by regulation and statutes they still largely did so by the end of the 1980s. In fact, until the 1990s government regulation under the 'convoy system' restricted these regional banks to open branch networks outside their prefecture of origin (see Hoshi and Kashyap (2000) andHosono, Sakai and Tsuru (2007) for details).

The group of industrial credit associations (Shinkin) possibly most starkly illustrates the regional segmentation in Japan's banking sector. Shinkins are industrial cooperative banks that lend exclusively at a regional level and to their members which are small businesses. As we will argue, their roots are particularly tightly related to the development of the silk industry in the late 19th century. An Industrial Cooperative Law governing the operation of such credit cooperatives was enacted as early as 1900. The Shinkins' operation today is governed by the Shinkin law of 1951, which stipulates that Shinkin banks can only lend to their members, i.e. small firms, and are confined in their lending to their prefecture of origin and only to firms below a certain equity (and employment) threshold. Hence, by virtue of the legal remit of Shinkins, their lending is a) particularly likely to be directed at small businesses and b) very clearly restricted to their prefecture of operation. Hence, we expect the lending share of Shinkin banks to be a particularly tight measure of regional segmentation (see Kano and Tsutsui (2003) and the literature surveyed there). The situation is similar for second-tier regional banks (Sogo) which also lend mainly locally but are generally not quite as severely restricted by their statutes

[2]Our data set also provides detail on the lending by other non-agricultural cooperatives by prefecture and we also include this in our measure of regional bank lending. The joint lending volume of Sogo and Shinkin banks usually dwarfs the lending of these credit cooperatives, though.

to do so.[3]

Our two main measures of regional banking integration therefore are the share of regional (Sogo and Shinkin banks) and the share of nationwide (city and first-tier regional) banks in prefecture-level lending. We refer to the latter as 'city bank' share. By construction, the regional lending share is negatively related to financial integration, whereas the city bank lending share is positively related. As we have discussed, there is a host of smaller regional and smaller nationwide (government sponsored) banks, so that the joint share of Sogo and Shinkin banks in a prefecture's total lending is not exactly equal to one minus the share of city banks. For robustness, we therefore generally report results for both measures and sometimes also for the narrower regional measure, based on the Shinkin lending share alone. [4]

Clearly, the share of lending by regional vs. city banks could be a function of the local demand for credit. We note at the outset, though, that aggregate (country-wide) variation in the demand for credit (stimulated e.g. by variations in monetary policy or by an asset market boom as happened during the 1980s) should *a priori* affect banks of all types equally, leaving the cross-regional pattern of their lending shares largely unaffected. Also, in all our regressions we use pre-crisis (i.e. pre-1990) lending shares as measures of financial integration. This should alleviate the most direct feedbacks of the crisis on the lending shares of individual banks.[5] Still, it could be the case that the lending share of regional banks is relatively high simply because there are a lot of small businesses or because these businesses are doing particularly well. To the extent that Shinkins or other regional banks offer the best financing conditions for small firms, they would then be first call for these businesses. This would increase the share of total prefecture-level lending accounted for by the regional banks. Conversely, the bias might go in the opposite direction if nationwide banks withdraw from an area where growth prospects are poor whereas regional lenders have no choice bu to keep on lending locally. Our discussion of

[3]Many second tier banks already got bought up by first tier regional banks or city banks throughout the 1980s. After 1990 they are sufficiently small as a category so that they no longer appear as a separate item in the Bank of Japan data set which we use here. Also, since the mid 1980s, some of the second-tier regional banks have access to the interbank market, whereas Shinkins do not. Hence, we would expect our empirical results based on the Shinkin measure to be somewhat stronger overall. As we show below, this is indeed the case.

[4]Our interpretation of these lending shares as measure of financial integration is further butressed by their high correlation with a widely-used macroeconomic indicator of financial integration – savings investment correlations in the spirit of Feldstein and Horioka (1980): in panel regressions of prefecture-level investment rates on savings rates, we include an interaction with our regional and city bank lending shares respectively. The coefficient on the interaction terms is significant in both specifications and negatively signed for the city bank lending share and positively for the regional banks' lending share.

[5]For example, some regional banks were hit strongly by the banking crisis of 1997/98. See e.g. Spiegel and Yamori (2006) for the discosure decisions of Shinkin banks durin that crisis.

the historical roots of the cooperative banking sector will allows us to address such issues of simultaneity in detail. We now turn to our econometric implementation.

Econometric implementation

Our main results are based on two basic econometric specifications. The first are panel regressions of the form

$$\Delta gdp_t^k = \alpha AggShock_t \times SME^k + \mu^k + \tau_t + \epsilon_t^k \quad (1)$$

where Δgdp_t^k is GDP growth in period t in prefecture k, $SME^k$is a measure of the pre-crisis (i.e. before 1990) importances of small businesses in prefecture k and $AggShock_t$ is a an indicator of the aggregate shock that hit the economy in 1990. The terms $\mu^k$and $\tau_t$are prefecture-fixed and time effects respectively and ϵ_t^k is the error term. We chose

$$AggShock_t = Post1990_t$$

where $Post1990_t$ is a dummy that is zero until 1990 and one from 1991 onwards. These specifications allow us to focus on the long-term growth effects after 1990.

Specification (1) allows the impact of the aggregate shock on prefecture-level GDP growth to vary as function of the importance of small businesses in a given prefecture. As we have discussed, small business importance is an indicator of the prefecture-level demand for or dependence on credit. Our conjecture – based on Rajan and Zingales (1998) – is that the link between credit dependence and aggregate GDP growth is negative; when the crisis dummy moves from zero to one, regions with more small businesses experience lower average growth rates.

Our main hypothesis is that the coefficient α depends on credit supply and that financial integration plays an important role in improving local credit conditions after the aggregate shock: α should be negative but we would expect it to be more negative in regions with low levels of financial integration. Our first way to test this hypothesis is to split the sample into one group of prefectures with high financial integration and a group with low financial integration and to estimate the specification (1) separately for each group.

Our second, more formal way of testing the same hypothesis allows α to depend linearly

on our continuous measures of financial integration so that,controlling for first-order effects, we obtain:

$$\Delta gdp_t^k = AggShock_t \times \left[\alpha_0 FI^k \times SME^k + \alpha_1 FI^k + \alpha_2 SME^k + \boldsymbol{\alpha}_3' X^k\right] + \beta' \boldsymbol{c}_t^k + \mu^k + \tau_t + \epsilon_t^k \quad (2)$$

where FI^k is one of our measures of financial integration discussed above and where we have added X^k , a vector of additional prefecture-level characteristics that also may affect the impact of the aggregate shock on regional output growth and where $\boldsymbol{c}_t^k$ is a vector of additional controls that may vary by time and prefecture and $\boldsymbol{\beta}$ the associated vector of coefficients. This is our second main specification. In this specification the marginal effect of credit dependence is a continuous linear function of financial integration so that

$$\frac{\partial \Delta gdp_t^k}{\partial SME^k} = \alpha_0 FI^k + \alpha_2$$

and we would expect that – conditional on the number of credit-dependent firms in the prefecture – growth should be higher if financial integration is high, so that $\alpha_0 > 0$.[6]

A couple of remarks are in order on this specification: Regression (2) is a differences-in-differences (DD) specification in which the interactions with the the intervention (the aggregate shock) vary only by prefecture (k) and not by time. This approach emphasizes the spirit of our analysis: we do not claim that short-term, year-to-year fluctuations in financial integration or small business importance affect growth outcomes in the longer term. Rather, we argue that there are long-standing differences in the degree of finanical integration or small business importance that have long-run effects. We want to focus on those. [7] Bertrand, Duflo and Mullainathan (2004) strongly advocate this approach, arguing that the use of longer-term averages (instead of characteristics that vary over time and cross-section) hugely improves the reliability of DD estimates.

After a description of our data, we move on to discuss our baseline results that are based on the above specifications. Afterwards we discuss the different historical origins of regional versus nationwide banks. This discussion will allow to suggest an instrument with which to

[6]Clearly, the sample-split specification (1) can be interpreted as nested version of (2) if we code FI^k non-continuously as a dummy indicating above or below-median financial integration.

[7]In fact, as we discuss in detail below, we will use pre-1990 characteristics to shield our analysis against short-term feedbacks of growth on financial integration or the share of small businesses in the prefectural economy.

address the potential endogeneity of FI in the above regressions.

Data

Most of our data is at the prefectural level. There are 47 prefectures in Japan. We drop Okinawa prefecture, which had a special status as US territory until the early 1970s and still remains economically segmented from the mainland in many ways. Hence, there are 46 prefectures in our sample. (Nominal) prefectural GDPs are taken from *Annual Report on Prefectural Accounts* (Cabinet Office of Japan). We deflate using the country-wide consumer price index, taken from the Ministry of International Affairs and Communications of Japan. The importance of small manufacturing firms in terms of employee and value added at prefectural level is taken from the Manufacturing Census of Japan by the Ministry of Economy, International Trade and Industry).[8] We define small and medium enterpreises as having less than 300 employees.[9] The lending in terms of bank type (City bank, Regional bank, Shinkin bank, Shoko Chukin and Sougo bank etc.) at prefecture level is taken from *Economic Statistics Annual by Prefecture* (Bank of Japan). The prefecture-level breakdown of these data by bank type only runs to 1996. GDP and SME-data cover the period 1980-2005.

Prefectural borders in Japan have remained unchanged since the early 1890s. This will allow us to use late 19th-century prefecture-level data as instruments in the second part of our analysis. Specifally, data on the number of silk filatures (reeling factories) in the late 19th century is taken from *Zenkoku Seishi Kojo Chosa (Survey of Silk-reeling Factories throughout Japan)*. Filatures are classified by whether they use machinery or hand-reeling and by total production per year (again by machines, by hand, and total), all at prefecture level. We use data from the earliest available year, which is 1895. The largest most important silk prefectures by output are Nagano and Gifu, followed by Aichi, Kyoto, and Yamanashi.

[8]The number of manufacturing establishments in the years 1981, 1986, 1991 and 1996 was 873,000, 875,000, 857,000 and 772,000 respectively. This tells us that the number of Japanese firms remained unchanged during 1980s and 1990s.

[9]Note that this cut-off is also consistent with membership constraint of Shinkin banks

Results

A first look at the data

Table 1 provides a first look at the data. For each prefecture, the first two columns of the table present city bank lending shares, our measure of SME importance (by valued added) for the 1980-1990. The last two column report post-1990 prefectural GDP growth rates and the growth rates of lending by city banks. We also highlight the core economic areas which may differ from the rest of the country: these include Greater Tokyo (Tokyo, Chiba, Saitama and Kanagawa (with Yokohama as major city)), the Kanto region (Osaka, Hyogo (with Kobe as major city) and Kyoto) as well as Aichi prefcture (with Nagoya as the major city). The cross-prefectural standard deviations show that for each of these characteristics, there is considerable variation around the mean. The average lending share of city banks is around 52 percent, ranging from just over 40 percent in prefectures such as Kochi, Gifu or Nagano (two of which are silk prefectures as we will see later) to more than 70 or even 80 percent in Greater Tokyo or other fore prefectures. The GDP share of small manufacturing firms is around 15 percent, ranging from around 10 percent in remote prefectures such as Hokkaido (in the north) or Kagoshima (in the South-West) to almost 25 percent in Gifu or Shiga.

Post-1990 GDP growth (per capita) was particularly low (and strongly negative) in some of the core areas, which were particularly exposed to the burst of the stock market and property bubble. But also prefectures such as Tochigi, Gunma or Yamanashi had negative average growth rates. Maybe somewhat surprisingly, the highest average post-1990 growth rates (per capita) were achieved in some remote prefectures such as Miazaky or Saga in the West.

An optical impression of the regional distribution of pre-1990 characteristics (SME importance and banking integration) and post-1990 growth can be gleaned from the two maps in Figure 1. The map on the left shows geographical dispersion in SME importance and financial integration (the city bank lending share). Clearly, the city bank share is highest in the core areas: greater Tokyo and the Kant regions. Conversely, financial integration is quite low not only in some remote regions but also in many manufacturing regions in central Japan and in the neighborhood of the big cities. As we will argue later, this is the silken thread: many of these regions were silk reeling regions and took a special pathway to financial development. Turning to post-1990 GDP growth (right map), we again see the fallout of the crisis in the core

areas (white, low growth) but there is a lot of variation in GDP growth rates across prefecture and again many areas in central Japan have relatively low growth rates. As we saw in the map on the left, many of these regions have no shading, i..e they are regions with a low lending share of city banks and, often, with a high SME share. We now explore this link more formally and present our first regression results.

Baseline results

Table 2 presents our first set of results: Panel A for the measure of small business importance based on value added, Panel B for the employment-based measure. The first column estimates the baseline specification (1) based on all prefectures. Regions with a higher share of small manufacturing businesses in either output or employment clearly were hit significantly more by the crisis. The effect is big: increasing the share of small manufacturing firms in employment or output by just one percentage point, lowers the average growth rate by $0.07 - 0.08$ percent This is economically quite sizeable: the average of SME share (based on valued added) is 16 percent and the range is from roundabout 8 percent in prefectures such as Nagasaki and Tokyo to 25 percent in prefectures such as Saitama or Shiga. According to our regressions these SME-intensive prefectures have seen a $(25 - 16) * 0.08 \approx 0.7$ percent lower annual growth rate over the 15 years following the burst of the housing and stock market bubble than the average prefecture. The orders of magnitude for employment for employment are similar.

Once we split the sample into two groups of 23 prefectures according to the levels of financial integration based on our measure of lending shares of regional and city banks, we find that the estimate of $0.07 - 0.08$ masks considerable heterogeneity: In the low financial integration (i.e. high-regional and low-city bank share groups respectively), the coefficient is twice as high, consistently between -0.12 and -0.15 and highly significant. This implies that prefectures with the highest share of small businesses (by output) in areas with low financial integration saw growth rates that were up to 1.4 lower than the national average – and this is over 15 years, i.e. from 1991 to 2005. Conversely, in regions whose banking sectors were highly integrated with the rest of the country there is no significant link between small business importance and the depth of the recession at all. This is our first main result: The recession had the worst consequences in areas where dependence on credit was high *and* where banking integration was low. Our interpretation of this finding is that credit dependent small firms faced severe credit

constraints in regions where cross-regional banking flows were limited.

In Table 3, we further explore this result based on our second specification (2). Here, we will also include additional controls. The first two rows expand the baseline specification to just include the interaction between the $Post1991$ dummy and our two measures of banking integration. Interestingly, regions with a high (low) lending share of city (regional) banks grew more slowly overall, possibly a reflection of the fact that the city bank share is particularly high in the big centers which were hit most by the housing price declines. We will return to this point shortly. Once we add the interaction with SME-importance, our previous results are confirmed: conditional on small firm importance, prefectures with more integrated banking sectors saw lower declines in their average growth rates.

We add additional controls in the subsequent columns. In the regressions in columns V and VI of Table 3 we add a measure of financial depth, total lending in a prefecture as share of its GDP. This is not significant. In Columns VII and $VIII$ finally we add an indicator for whether a prefecture is a core economic area (Tokyo, Osaka, Aichi, Kanagawa, Chiba, Saitama, Hyogo and Kyoto prefectures). This is highly significant, suggesting that indeed the core areas where hit harder by the crisis. The specifications in columns VII and $VIII$ also include an alternative measure of the aggregate shock – the land price change in the core areas – interacted with the local lending share of city banks. The rationale for doing so is to see if our main results hold up once we control for alternative channels of cross-regional transmission. Specifically, Imai and Takarabe (2011) have shown very persuasively that areas that were more financially integrated with the rest of the country were more directly exposed to the decline in collateral values. This, in turn, had direct effects on economic activity in these prefectures. We corroborate the Imai and Takarabe (2011) result: prefectures with higher shares of city (vs. regional) bank lending are considerably more exposed to fluctuations in the collateral value of land in the core areas. However, this channel coexists with the channel that is our focus here: vis-à-vis the earlier specifications, in the regressions on columns VII and $VIII$ all coefficients on SME importance stay very stable and highly significant. Hence, low levels of interregional banking integration lead to a deeper recession in areas with many small, finance-dependent firms.

Dynamic effects

Our results so far suggest that post-1990 growth was lower ceteris paribus in areas with low financial integration and many credit-dependent firms *on average*. In Figure 2 we study the role of banking integration for the *dynamics* of growth during the lost decade. We split prefectures into four groups based on pre-1990 characteristics: above/below median banking integration and above/below median small business importance. Then, within each financial integration group, we look at the cumulative growth differential between the high SME (i.e. high credit dependence) and the low SME (low credit dependence) subgroups. The results in the figure show, that – irrespective of the degree of banking integration – prefectures with many small manufacturing firms generally grew less than those with few small firms: both the blue (solid) and the red (dashed) lines are below zero. However, the within-group growth differential is particularly marked for the group with low financial integration, suggesting that low regional banking integration was indeed associated with particularly low growth in very credit-dependent areas. This effect is big: in the least financially integrated areas the cumulative growth difference until 2005 between high and low SME amounts to an about 8 percent difference in per capita GDP, in the most financially integrated areas to around 3 percent. Furthermore, for the least integrated group, the maximum cumulative growth differential between low and high SME groups was almost 9 percent in 2001.

Transmission channels

To shed light on the transmission of the Great Recession to credit-dependent prefectures, Table 4 repeats the regressions from Table 3 but now with lending as the dependent variable.[10] Our interpretation of the previous results was that low financial integration would make small firms' access to credit more difficult in the Great Recession. The results in Table 4 are consistent with this notion: The first five columns provide results for total lending, in columns VI-X and XI-XV we distinguish between lending by City banks and lending by regional banks.

In each panel, the first two columns report regression on small importance and financial integration, but without the interaction term: the results show that lending declined more

[10]Our prefecture-lending data set ends in 1996. Also, there is a change in the definition of universal banks (which include Sogo Banks after 1991). Since Sogo banks are a small share of total lending,w e refer to the lending by xxx as 'city banks' and to the remainder as 'regional bank' lending.

strongly in areas with a high share of city banks. And the first two columns (V&VI and XI and XII) in the next two panels show that it is indeed city bank lending that declined most strongly in the areas that had a high market penetration by city banks. This is essentially a version of the findings in Imai and Takarabe (2011) who report that lending declined most strongly in areas with many city banks due to a common lender effect: city banks were heavily affected by the land price decline in the core areas, cutting their lending also in more provincial areas.

The last three columns of each panel report what happens once we add the interaction term between small firm importance and our financial integration measure: high financial integration does seem to lead to more lending in areas of high credit-dependence Conversely, lending growth seems lower *ceteris paribus* in areas with many credit-dependent firms and a low level of financial integration. The corresponding columns in the second and third panel show that it is in particular the lending by city banks that declined in credit-dependent but financially less integrated regions. Conversely, the country-wide decline in city bank lending due to the bursting asset bubble seems considerably mitigated in areas where city banks traditionally had a high market share and where there are many small firms. Finally, the lending growth of regional banks seems quite unaffected by the degree of financial integration or the importance of small firms.

On the one hand, these findings suggest that Japan's financial crisis constituted a major credit supply shock and that this shock spread very unequally across prefectures: it strongly affected regions with many credit dependent firms and low levels of financial integration – understood here as a locally low market share of banks that operate nationwide. On the other hand, we do *not* think that our results are best interpreted as a a simple credit-crunch: *a priori* we would expect a credit crunch to affect credit supply rather uniformly across different types of banks. We find that this is clearly not the case. Rather, the decline in lending explained in the least integrated and most credit dependent prefectures is predominately explained by nationwide banks cutting back on their lending. Peek and Rosengren (2000, 1997) have shown that Japanese banks that operated internationally did predominantly cut back on lending in foreign markets following the crisis – markets that they had often only recently entered. Our results are the first to document the relevance of this channel for the intra-national, i.e. regional dimension of Japan's Great Recession: regions in which nationwide banks have only a relatively

weak standing see the largest declines in credit and economic activity.[11]

Our results also tie in with and important strand of the recent literature has emphasized the role of ever-greening in banks' credit decisions during Japan's Great Recession (Peek and Rosengren (2005) and Caballero, Hoshi and Kashyap (2008)). These authors argue that big banks would often defer action on bad loans in the hope that the situation of borrowing firms might improve or that the government would take action to bail out the banks or their borrowers. Caballero, Hoshi and Kashyap (2008) show that this ever-greening behavior lead to the creation of 'zombie' firms which were effectively bankrupt but that — due to their continued preferential access to finance — could keep more productive competitors out of the market or at least make access to credit difficult for them. We emphasize that our results here are actually very much consistent with this pattern: first, Caballero, Hoshi and Kashyap (2008) document their finding based on a set of publicly listed (and therefore rather large) firms. In fact, they argue that ever-greening was particularly pervasive within *Zaibatsu*, the tight industrial conglomerates that encompass industrial firms and banks. Second, Caballero, Hoshi and Kashyap (2008) show that manufacturing was one of the sectors that was least affected by ever-greening.Our focus here is on small manufacturing firms – the ones that are therefore most plausibly deprived of the credit of which the 'zombies' benefited.[12]

Our findings so far suggest that cross-prefectural variation in financial integration played a major role in the transmission of Japan's crisis to its regions: low financial integration had the most adverse affects in the most credit-dependent areas. The reason for this was that nation-

[11]One possible explanation of this pattern is relationship lending: banks withdraw from markets in which they have relatively few long-standing credit-relationships to keep on lending to large, long-standing customers. Small banks also tend to lend to small businesses (see Berger et al. (2005) for the United States and Uchida, Udell and Watanabe (2008) for Japan). The evidence we present in the second part of the paper is also consistent with the view that relationship lending matters here: we show that the market share of regional banks vs. nationwide banks at the prefecture level has long historical roots and that regional banks are strongest in areas where silk reeling was important in the late 19th century and where silk reelers' cooperatives were important in founding the first regional banks. It seems plausible that small firms in such areas are more likely to have long-standing relationships with their regional banks (of which, if it is a cooperative) they may even be a member) rather than with the branch of a nationwide bank.

[12]Peek and Rosengren (2005) discuss that the incentive to 'evergreen' clearly depends on the importance of the borrowers' debt for the bank's balance sheet. Clearly, banks will therefore tend to evergreen mainly large borrowers. The small firms that are our focus here, are likely to be small borrowers for city banks, however. They may still be relatively big borrowers from the perspective of a small regional bank, though, and our results do not preclude the possibility that regional banks on their part also did some ever-greening. But this does not affect the empirical relevance of the channel we are investigating here: If regional banks evergreen inefficient small firms, depriving more efficient competitors from credit, then we would expect that better access of these competitors to credit from outside their region (i.e. big city banks) would certainly help alleviate the adverse aggregate effects of the ever-greening by regional banks. Hence, evergreening by regional banks could actually help explain the pattern we see here by increasing the importance of financial integration for productive small firms' access to credit and therefore for growth in the region.

wide banks reduced-lending particularly strongly in areas where they used to have a relatively weak standing.

Endogeneity issues

Clearly, both the importance of small businesses as well as – and in particular – the prefecture-level lending share of city and regional banks could be endogenous. Note that the setup of our regression should alleviate the most immediate concerns in this direction: all regressions presented so far use SME and lending shares which are time averages from the period *before* the burst of the bubble (i.e. over 1980-1990), so that the immediate feedback from post-1990 GDP growth on small firm importance and lending shares should clearly be limited. In our view this eliminates many sources of potential endogeneity. We acknowledge, however, that it may not fully solve the problem, in particular to the extent that lending behavior by banks and firm creation depend on growth expectations in an area. For example, if city banks withdrew business from areas in which they perceived low growth potential whereas lenders who can only lend in their region of origin just kept on lending irrespective of local growth opportunities, then we would indeed find that areas with low shares of city banks in local lending see lower growth after the recession. Also, the recession may then still hit small firms harder, but it would not be for the reason that these firms have low access to credit but because the region has pour growth prospects anyway. In the same mold it could be the case that the importance of small firms is higher or lower in areas with low growth opportunities. On the one hand, high regional growth opportunities may favor the creation of new firms, whereas low growth prospects may limit firm growth, keeping firms small.

We now turn to asking what the deep determinants of cross-regional differences in banking integration are in Japan. As a byproduct, this discussion will deliver a powerful predictor of the lending share of regional and city banks in the 1980s. We argue that this predictor is very plausibly not correlated with growth opportunities in the post 1990 period and therefor constitutes a valid instrument for financial integration in our regressions above.

The silken thread: historical pathways to financial development

Our results so far suggest that cross-regional variation in the severity of the Great Recession is to a large extent determined by the interaction between external credit dependence (measured by small business importance) and the integration of the region's banking sector into the national economy. We argue next that cross-regional differences in the importance of regional vs. nationwide banks ultimately reflect long-standing differences in local financial development which can historically be traced back to the opening of the treaty ports. This historical backdrop then motivates the instrument that we propose for the market shares of regional banks during the 1990s: the number of silk filatures per head of population in a prefecture in 1895.

Historical background

The opening of Japan's ports for trade following the Harris treaty of 1858 was an exogenous event that led to the emergence of silk thread as Japans first and (till the onset of world war II) foremost export good.[13] International circumstances for Japan's entry into the world market for raw silk were propitious: silk worm pests had severely hit French and Italian silk output by the mid 19th century. The opening of the Suez Canal also substantially increased access to European markets. And, most importantly, the increased industrialized use of silk in the United States had opened up a new market on the other side of the Pacific (see Federico (1997) and Li (1982)). [14]

Unlike other industries that started to emerge with the opening of the treaty ports – e.g. cotton mills or machinery – the silk industry was – and largely remained till its decline at the eve of World War II – highly fragmented. While sericulture had started to spread throughout Japan during the Tokugawa period, the mountainous areas of central Japan were climatically most suited for raising silk worms. This lead sericulture to be initially particularly concentrated in these areas. In the early days, silk growing and reeling was largely a cottage industry, with

[13] Bernhofen and Brown (2005, 2004) argue very convincingly that Japan's opening was a natural experiment and that the specialization in silk reflected comparative advantage.

[14] While China was historically the leading producer of silk, with the best produce exceeding Japanese silk in quality, Japanese innovations in sericulture in the late Tokugawa period and the emergence of cooperative structures to ensure quality, provide credit and help the purchase of machinery (to be discussed below) soon put Japan in a position to provide silk of very consistent quality to the world market. This standardization in quality proved a particuarly important competitive advantage for Japan as silk weaving became increasingly industrialized, in particular in the United States (Li (1982)). Note also that the US maintained high tariffs on woven silk but strongly depended on the imports of silk thread for its weaveries. Hence, it was reeled silk thread that remained the main export staple.

farmers who grew the cocoons also reeling the silk.

The reeling of cocoons was initially largely done by hand. As described in Nakabayashi (2006), the French depression of the 1880s changed this. France had traditionally been a market for high-quality hand-reeled silk. The depressions tehrefore lead to a huge decline in the price of hand-reeled silk whereas demand for machine-reeled silk exploded in the US, leading to a huge relative price increase for the latter. The reason for this shift in demand from hand-reeled to machine-reeled silk was that the US market – as the first mass consumer market for silk products – required large industrial-scale quantities of silk thread of very consistent (though not necessarily the highest) quality. Only thread of such consistent quality could be woven on mechanized looms. And the consistent quality of the thread, in turn, could mainly be achieved through a mechanized reeling process (Nakabayashi (2006)).

The need for increased mechanization accelerated the separation of silk worm farming and silk reeling. This was the case for two reasons. First, while not particularly capital intensive, mechanization required *some* capital that not all small hand reelers could raise. (Nakabayashi (2006), Miwa and Ramseyer (2006)).[15] Secondly – and most importantly for us here – the separation of reeling and the cocoon rearing made it necessary for reelers to purchase cocoons. This required access to working capital: cocoons had to be bought in the spring but the reeled raw silk could only be shipped to the Yokohama market after the silk had been reeled, towards the end of the Summer. Hence, filatures strongly depended on credit for working capital. In fact, the purchase of cocoons accounted for up to 80 percent of the annual operating costs of a filature (see e.g. Federico (1997)).

We argue that this need for credit that was brought about by the separation of sericulture from the increasingly mechanized processing of silk had considerable impact on regional financial development. Smaller filatures were largely unable to borrow from the new western-style banks which had started to emerge soon after the opening of the country in the 1870s and 1880s. Located mainly in the big cities such as Yokohama, Osaka or Tokyo, these banks found it difficult to assess borrower quality of the small silk reeling firms, most of which were located in remote and inaccessible parts of the country.[16] A key role was therefore played by by the

[15]Many farmers who had previously also reeled silk by hand would specialize in the growing of cocoons. The shift in demand lead to an expansion of sericulture to all parts of Japan. Gradually, infrastructure improved and railways made quick transport of cocoons over large distances possible by the late 1880s.

[16]In particular, in the early stages of the industry's development, there was no direct access to these prefectures via railway.

Yokohama silk brokers who not only acted as intermediaries between the international market for silk thread (largely based in Yokohama – foreigners were not allowed to travel the country themselves) and the reelers but that also organized the whole production and marketing chain. Importantly, these brokers had detailed knowledge of market conditions in Yokohama. They also travelled to the sill regions frequently and therefore had an informational advantage about local conditions in the silk reeling areas and the borrower quality of small silk reeling firms. It were these silk brokers who would extended trade credit to small filatures so they were able to buy cocoons. Sure, the growing financing needs of the silk business soon also led to the emergence of the first regional banks. These regional banks also made loans to the local silk reelers. But to a large extent, they did not effectively raise the capital required for the loan from outside the region. Rather it was the Yokohama silk merchant who effectively raised the capital for the loan to the silk reelers in the Yokohama market. Nakabayashi (2001) details the working of these 'advances on documentary bills': a silk-reeler would generally obtain a loan from a regional bank only against a so-called documentary bill drawn on a reputed whole-saler in the Yokohama market to whom the silk reeler would later ship his produce. Thus, it was the wholesaler who would ultimately be liable for the loan made by the regional bank. While the Yokohama wholesalers would refinance themselves from city banks in Yokohama or directly based on promissory notes from the Bank of Japan, the Yokohama banks would not lend to the reelers directly. As Nakabayashi emphasizes, in this system it was therefore the wholesaler who ultimately had to screen the quality of the borrower, i.e. the silk reeling firms. Conversely, the regional banks, initially only acted as local intermediaries.[17]

Our line of argument is based on a recent literature which emphasizes that access to trade credit is an important driver of industry growth when financial development is low and bank finance is not available (Petersen and Rajan (1997) and Fisman and Love (2003)). Petersen and Rajan (1997) emphasize the informational advantage in assessing borrower quality that may be associated with trade credit relationships. We go beyond these papers in arguing that relatively easy access to trade credit through the Yokohama silk brokers also had an important feedback on the development of the banking system in the silk reeling regions: the banking system

[17]Miwa and Ramseyer (2006) that even when they started to make direct loans to the silk reelers, banks 'piggy-backed' on the informational advantage of the Yokohama silk brokers, e.g. by only complementing loans that were made by the silk brokers. Also, the Yokohama merchants were also often themselves involved in the foundation of the regional banks or had substantial share holdings in them. See also Naito (2008) for a detailed case study on the emergence of local banks in the silk reeling regions.

stayed largely regional, with local banks acting as local clearing houses for loans that were effectively made by the Yokohama brokers. Conversely, more direct access to finance from the big city banks (that soon started to operate throughout the country) helped the development of more capital intensive-industries such as machinery, cotton-milling, railways etc. in other regions.[18]

A second reason why the banking system in the silk regions developed very much along regional lines was that silk reelers responded to the challenge of having to improve quality by forming local cooperatives. Specifically, the consistent quality levels required for the US market could initially only be attained through a process called re-reeling. Japan's high humidity levels during the summer carried the risk that reeled silk would curl during transport. Therefore, the thread was reeled a second time. Whereas the first round of reeling would take place in a decentralized way in the individual small reeling firms – initially often still by hand – a second round of mechanical reeling was done in the larger, cooperatively operated filatures. Not only did the centralized mechanical re-reeling allow small reelers to get consistent quality without having to invest into mechanized filatures on their own. The centralized re-processing of the silk also enabled reelers' cooperatives to implement a strict quality control system (see again Nakabayashi (2006) for an excellent and detailed description). Thanks to this type of quality assurance system, Japanese silk exporters came to dominate the US market and were able to build considerable brand names in the New York silk market by the late 19th century.

Hence, cooperatives spearheaded mechanization and the development of quality control systems and therefore – ultimately – of a brand image for raw silk. But from the outset, they also acted as local financial intermediaries. By the turn of the century, the role of the cooperatives had become so important that they were regulated by law in the the first industrial cooperative act of 1900. For the first time, this law also regulated the role of industrial credit cooperatives. Silk reeler's cooperatives also were behind the foundation of the first cooperative banks in the 1920s. These industrial cooperative banks were the direct precursors of modern-day Shinkins, which next to Sogo banks, are the main regional banks that we are studying here and that

[18]Miwa and Ramseyer (2006) emphasize the role of trade credit and cooperative structures in providing working capital for the silk reeling industry. They contrast this with cotton mills: cotton mills were hugely capital intensive, many of them acually raised capital on the new stock exchanges and imported lots of modern machinery. Not so silk reeling. This industry stayed relatively labor intensive and was highly fragmented, charaterized by many small firms. As Miwa and Ramseyer (2006) note, none of the 40 firms listed on the Osaka stock exchange in 1900 were in the silk industry.

— to the present day — raise capital from and lend only to their local membership of small businesses.

As we have argued, mechanization contributed to the separation of cocoon growing and reeling and thus made credit for working capital a necessity. On the other hand, the improved quality achieved through mechanization also made obtaining trade credit easier. Mechanization and the development of the trade credit and export finance system fed on each other: consistent quality of the raw silk was an important part of the credit-relationship between the Yokohama silk merchants and the reelers (see Nakabayashi (2006)). The most reputed producers of silk (e.g. the *Kaimeisha* cooperative from the Suwa district, Japans silk heartland, in Nagano prefecture) also had access to the most reputed Yokohama silk merchants – the ones with the best re-financing conditions.[19] Hence, access to trade credit fostered the growth of the silk industry and it were the most reputed reelers who came to dominate the export market, whereas hand reelers and lower-quality mechanical reelers ended up serving only the domestic market.

In this way, the peculiar system of trade credit and export finance of the silk industry came to perpetuate itself, leading silk regions to develop a banking sector that was largely regional and in which large supra-regional city banks played – and continue to play – a relatively smaller role. This reasoning provides us with our instrument: we use the number of filatures per capita in a prefecture in 1895 as an instrument for the lending share of regional banks in a prefecture during the 1980s.

Figure 3 plots the (log) number of filatures per head in 1895 against the average prefecture-level lending share between 1980 and 1990 for regional and city banks. There is a clear positive relation between regional bank lending shares and the per capita number of silk filatures in 1895. Consistent with this, tor city banks, the link is negative. Table 5 provides further analysis of this link. The coefficients of a regression of lending shares on silk filatures is significant for all three bank types. We also run the same regression, but now including a set of controls: the pre1990 relative GDP of a prefecture, and controls for the core prefectures (Greater Tokyo (Tokyo, Chiba, Kanagawa,and Saitama), the Kanto region (Osaka, Hyogo), Aichi and Kyoto). We also include a dummy to control for the (logarithmic) distance to Yokohama, as the first

[19]There were different strata of wholesalers. The most reputed whole salers could refinance themselves directly from the bank of Japan and Japan's export bank, the Yokohame Specie bank. A second tier of wholesalers would refinance themselves only through the city banks (see Nakabayashi (2009)).

and biggest open port. These are the controls we also include later in our IV regressions. The link between silk and lending shares remains unaffected by these controls, most of which (with the exception of distance to Yokohama) are also insignificant. Note that the link between silk and lending shares is particularly strong for the Shinkins. This is consistent with the historical origin of Shinkins: as we discussed above, most Shinkins emerged from silk reelers' industrial cooperatives.

The fourth column of Table 5 also reports regressions of prefecture-level credit over GDP on our silk instrument, again with and without controls. Credit over GDP is a widely-used measure of financial development. The regressions show that there is no significant link between silk and financial development measured in this way. We think that this finding is important for the interpretation of our results: we are *not* saying that the silk regions were financially less developed at the onset of the recession of the 1990s. Instead, what we are claiming is that the silk regions embarked on a path to financial development that was strongly influenced by the specific institutions of trade and export finance in the silk industry. For the reasons discussed above, this led silk regions to adopt a financial system characterized by regional, cooperative banks – differently from the non-silk regions, in which larger, country-wide city banks came to dominate the market. Both routes to development seem to have served the specific needs of the industries that then developed in these regions.[20] What is important for our analysis here, is that these different pathways to financial *development* happened to matter for the transmission of the Great Recession of the 1990 because they led to effectively different levels of financial *integration*: the regional model of banking in the 19th century silk-reeling regions therefore implied a lower level of *de-facto* integration with the rest of the country during the 1990s downturn. This seems to have adversely affected access to credit in these regions, exacerbating the crisis.

Our reasoning suggests that our instrument is relevant. Before we move on to present results, we discuss potential challenges to instrument validity.

[20] After all, as regards silk reeling, Japan did come to dominate the world market for silk until silk as an industry started to decline after world war II.

Exogeneity

Several concerns could be raised concerning silk as an instrument for regional banking integration during the 1980s: first access to finance may have been a precondition for the mechanization of the silk industry, not its outcome. Therefore, secondly, mechanization may just be one aspect of the general growth of the silk industry which – as a whole – had to rely on credit for its development. We make the following remarks: first, even if true, this objection is unlikely to invalidate our instrument for the late 20th century market shares of regional vs. city banks. The reason is that the main concern about endogeneity of the financial integration measures in our late 20th-century regressions arises from expectational feed-backs from post-1990 growth rates to pre-1990 lending shares. We think that it is very unlikely that post-1990 prefecture-level growth expectations feed back on the development of the financial sector and the silk industry before 1900.

Secondly, even to the extent that pre-existing differences in financial development – or other unobserved regional characteristics – may have favored the move towards mechanization, they did not directly cause it. As we have argued, it was an exogenous price shock that changed the incentives for mechanization. We address these two issues in turn.

Scholars of economic history who have studied industrialization during the Meiji period (1862-1912), have argued that one of the factors that favored the emergence of silk as an export staple was that silk reeling – mechanized or not – was not particularly intensive in terms of fixed capital.[21][22] In the early stages of the industry's development it is not even clear that mechanization offered huge advantages in terms of increased productivity. In fact, mechanization made only slow progress throughout the 1860s and 1870s, in spite of significant government support aiming at the improvement of quality.[23] The exogenous shock that changed this was the decline in the price of hand-woven silk in the 1880s following the French depression coupled with the huge demand for mechanically-reeled silk in the United States (see Nakabayashi

[21] See e.g. Yamazawa and Yamamoto (1979), Yamazawa (1975), Fujino, Fujino and Ono (1979)

[22] Even mechanized filatures are not particularly lumpy investments. In principle what is required is a steam boiler to heat the thread at very constant temperatures and water or steam power for the reeling. Even in the mechanized filatures, manual labor, not fixed capital, remained the main factor input. Thus, mechanization could in principle be afforded by even small firms or groups of silk farmers.

[23] One prime example is the attempt of the Meiji government to install a role model plant in the village of Tomioka near Nagano in the heart of the main (hand) silk producing area of Gunma prefecture in the 1870s. This plant was very successful in training skilled workers but did not become economically viable. Instead, it was in Suwa district of the neighboring prefecture of Gifu and in Aichi prefecture, where the mechanization quickly took hold in the 1880s following the decline in the relative price of hand-woven silk.

(2009)).

Table 6 shows that it was not the general development of the silk sector *per se* but rather its mechanization that is closely related to the development of regional versus city banking. In the table we report specifications in which we regress our pre-1990 lending shares by bank type on both mechanized and hand filatures. We also consider output-related measures, i.e. we regress lending shares on the output of hand-reeled silk (so-called hanks) and on the output of machine-reeled silk. In all specifications and across all bank types it is apparent that always the variable measuring mechanization – be it the number of filatures or machine-reeled output – that is significant, whereas the hand-reeling related variables are all insignificant for all bank types.[24] This suggests that something is special about mechanization, consistent with our interpretation that mechanization led to the need for trade credit because it necessitated a separation of cocoon growing and reeling and because it allowed to improve quality, thus signaling borrower quality to the Yokohama silk merchants.

IV results

Table 7 now presents our IV results. Since the endogenous variable, FI, appears as an interaction in our regressions, we need to instrument two variables: our measure of banking integration, FI, and its interaction with our measure of credit dependence, $SME^k \times FI^k$. We use our silk variable and its interaction with SME^k as instruments for both of these variables. The first set of regressions in Table 7 shows the regressions without further controls. Our instrument seems relevant for all three specifications – city bank lending share, regional banks lending share and Shinkin lending share. Note that the instrument is strongest for the Shinkin lending share, consistent with the historical roots of Shinkins in the silk cooperatives of the late 19th century.

The magnitude of our main coefficient of interest – on the interaction between the post-1991 dummy, the SME-share and our measure of financial integration is always similar to the one obtained from the baseline panel regressions in Table 3. If anything, the estimated effects are even stronger than in the baseline specification.

[24]Note that this result is not owed to a generally very low share of hand production: on average, machine-reeled silk accounted for roundabout three quarters of prefecture-level output of silk in 1895, and the range is from around 5 percent to more than 90 percent. Hence, in many prefectures a significant share of output continued to be reeled by hand. Note also that the cross-sectional correlation between prefecture-level output of hand-reeled and machine-reeled silk is quite low: no higher than 0.3.

In the remaining regressions in the table, we now include additional controls in the first and second stages. First, we present a set of regressions in which – besides a core area dummy – we also include relative GDP. This leaves our first-stages very much intact. Also, our coefficient of interest in the IV regression remains stable relative to the specifications without control and vis-à-vis the baseline regressions. We lose some of the significance for the IV estimate, but this is likely to arise because of a collinearity between financial integration, the role of manufacturing and relative GDP. Note that relative GDP is not anywhere close to being significant (except for the Shinkin-regression), whereas our coefficient of interest remains significant at the 10 percent level (city banks) or not too far below that (with t-stats above 1.40) for the regional banks' lending shares. Clearly, relative GDP is likely to be endogenous, so this regression puts a rather unfair test on our model. Still, our main results go through. For example, the property bubble in the 1980s is likely to have fueled growth expectation in some of the richest prefectures. More importantly, financial integration may be causal for GDP. We therefore drop GDP and replace it with a plausibly exogenous measure of economic and financial development: the logarithmic distance of a prefecture to Yokohama as the first open port after 1858.[25] Now, our coefficient of interest, while again remarkably stable vis-à-vis the other specifications, is significant at the 10 percent level for all three measures of banking integration.[26]

These results suggest a strong link between the degree of regional financial (and in particular: banking) integration in the 1980s, the spread of the Great Recession and the silk industry. Our instrument, however, is purely cross-sectional whereas our main regressions here are based on a panel. Clearly, this helps us overcome the limited dimension of our cross-section (with 46 prefecture, excluding Okinawa) and allows to control for common time variation and unobserved heterogeneity at the prefecture-level. However, we also check our results based on what Bertrand, Duflo and Mullainathan (2004) have called a "before-after" regression, i.e. a cross-sectional regression of average post-1991 growth rates on pre-1991 characteristics. We report results for such regressions in Table 8, once based on OLS and once based on IV. Besides our interaction of interest, $SME^k \times FI^k$, we include the first-order terms SME^k and FI^k and the

[25] The cross-sectional correlation between relative GDP and distance to Yokohama is xxx. The t-stat is xxx and the R^2 is xxx.

[26] We also checked a specification (not reported) in which we included GDP, the core area dummy and logarithmic distance to Yokohama. In this regression, none of the controls was even remotely significant (and none of the first-stage regressions turned out a much better F-statistics than we report them here). This clearly is due to the extremely high collinearity between the core dummy, distance to Yokohama and relative GDP. However, our main coefficient of interest again stayed stable and displayed t-statistics well above one (in absolute value).

core-dummy as a control.

In all cases and for all three measures of banking integration and the two measure of small firm importance (value-added and employment-based), the coefficient on $SME^k \times FI^k$ has the same sign as before. Given that we estimate five coefficients from cross-section of 46 prefectures, it is also very interesting to see that the coefficient is significant at the 10 percent level or close to it in most specifications—including both OLS and IV. This suggests that the basic patterns in the data that we document in this paper – including the link between silk and regional banking sector integration – are discernible even in a simple cross-sectional regression that does not allow us to control for common time-variation or unobserved heterogeneity across prefectures.

We conduct further robustness checks in Table 9, where we examine alternative measures of credit dependence at the prefecture level. One concern that could be raised against our results is that the fraction of small firms in a local economy could itself be endogenous. For example, many firms might stay small because there are poor growth prospects in the respective prefecture. This might then also lead nationwide banks to withdraw credit from these areas, invalidating our identification. We address this concern in two ways:

First, we argue that poor growth prospects could certainly affect the number of small firms in an area by a couple of percentage points, but it is not likely to completely overturn the cross-prefecture distribution of the share of small firms in a prefecture's economy. We therefore use the rank of a prefecture in the cross-sectional distribution as an alternative measure of small firm importance.[27]

Secondly, we build on **?** to construct an exogenous measure of external credit dependence at the prefecture level. The Rajain Zingales measures pertain to manufacturing industries in the United States. We obtain pre-1990 prefecture-level shares for Japan for each of these manufacturing industries from the manufacturing census. We then use these weights to construct an average external finance dependence in manufacturing in a prefecture. Finally, we scale this measure with the share of manufacturing in local GDP.

Table 9 presents our results, based on both IV and OLS. The results strongly confirm our previous findings: in areas with many credit dependent firms, the downturn was much worse

[27]This is very much in the spirit of the classical approach by Durbin (1954), who advocated the use of rank indicators as an instrument in error-in-variables models.

if the area had a low degree of banking integration with the rest of the country.

Credit dependence and long-term growth prospects

As a final exercise, we address the concerns that a recent literature has raised about the Rajan-Zingales "external-finance dependence' approach that we have used in this paper: financial development, financial integration and industry structure may go in hand in the long-run. Higher levels of financial development and better access to international financial markets may eventually foster the development of particularly finance-dependent sectors and firms (Fisman and Love (2004), Bekaert et al. (2007)). Clearly, this reasoning could constitute a challenge to the causal interpretation of our main coefficient of interest, i.e. the one in the interaction between SME and FI: if the specific financial institutions that were associated with the rise of the silk industry also fostered the emergence of particular industries (other than just silk), such as e.g. manufacturing or were conducive to the emergence of many small firms, then it will be impossible to interpret our coefficient of interest as the marginal effect of financial integration *given* a certain level of finance dependence. What we need is an exogenous (with respect to finance) measure of the growth potential of the credit-dependent industries (and therefore: the plausible future industry structure) of a prefecture.

We expect that the influence of finance on industry structure would actually lead our results so far to be weaker than they should be in the absence of this influence: as we have shown, the availability of trade credit to silk exporting firms held back the banking integration of these regions with the rest of the country. This would mean that growth prospects for other, external-finance dependent sectors in these regions were likely to be constrained by limited access to finance (since these industries would not have access to the same preferential trade finance arrangements as the silk industry enjoyed in its early days).[28] Therefore, if this 'access to finance'- channel was the main determinant of modern-day industry structure, we would expect to see that credit dependent sectors, such as e.g. small manufacturing firms, would actually account for a relatively small part of the regional economy in the silk prefectures. The opposite is the case:

In Table 10 we regress our measures of external finance dependence on the total number

[28] Exporting firms in other sectors have likely benefited from access to trade finance in some way. But note that silk was the main export product till the onset of world war II. Also, Japan became a significant exporter in machinery and other capital-intensive and credit-dependent sectors only well after the turn to the 20th century.

of filature per head of population and a set of controls. This link is highly significant, but silk regions are actually particularly manufacturing intensive. Given that manufacturin is rather credit dependent, this is opposite to what we should expect if limited access to finance was the main determinant of industry structure in our data set. The finding therefore suggests that silk has affected the rise of a large manufacturing sector with many small firms through other channels than finance. In fact, it is well documented in the business history literature that – as Japan's first large export industry – silk reeling prefectures served as a nucleus for the development of manufacturing know-how, notably in the machinery sector. As Japan learned to produce and export high quality silk it also developed its manufacturing sector.[29] We exploit this insight to separate the long-term impact of silk on manufacturing that is exogenous to the finance from the one that arises from the specific financial institutions associated with the silk industry. Specifically, we conjecture that knowledge externalities etc. that may lead to the emergence of manufacturing clusters are a direct function of proximity. Therefore, we use a prefecture's minimal distance to one of the four prefectures with the highest number of mechanized filatures in 1895 (Kyoto, Nagano, Gifu, Shizuoka) as an exogenous measure of growth expectations in the manufacturing sector at the end of the 19th century.

The remaining columns of Table 10 show that this identification assumption is justified empirically: once we include the logarithmic distance to the main (mechanized) silk regions as an additional regressor along with the (log) number of total filatures per head, we can disentangle the two effects very clearly: In the regression with industry structure as the dependent variable, the distance variable has a much larger coefficient than the number of filatures per head and is also much more highly significant. Conversely, for our financial integration measure as dependent variable, the picture is exactly opposite: the coefficient on distance, (though still significant) is very small whereas the one on the number of filatures is both large and significant. This suggests we can use log distance to the main silk areas as an indicator of growth expectations in the late 19th century and as an instrument for the role of manufacturing (and credit dependence) at the end of the 20th century. Conversely, we continue to use the number of filatures per capita as a measure of dependence on working capital and trade credit and

[29] This view is consistent with the role of inter-industry spillovers emphasized by Glaeser et al. (1992). Specifically, Jacobian (i.e. inter-industry) externalities tend to be particularly important in the early stages of an industry's development.

therefore as an instrument for banking sector integration during the 1980s.[30]

In Table 11, we now repeat our panel IV regressions, but now treating both SME importance and financial integration as endogenous variables. Based on the our discussion from before, we instrument SME, FI and their interaction using distance to the main mechanized silk filatures, the number of filatures and the interaction of these two. We again include a set of controls: a core area dummy and logarithmic distance to Yokohama. The results corroborate our previous findings: the first stages of the IV regressions are highly relevant throughout and our coefficient of interest generally stay significant and quantitatively stable vis-à-vis our baseline OLS specifications. We conclude that – while the specific institutions of the silk industry have had an impact on the rise of manufacturing at large – our main conclusion remains intact: the downturn of the 1990s was deeper and more prolonged in areas with many credit dependent firms and low levels of banking sector integration with the rest of the country. These were essentially the ancient silk regions that were the main powerhouses of Japans rise as an export nation from the late 19th century. Hence, the regional dimension of the Great Recession was determined by an invisible silken thread that links the silk regions of the 19th century, their specific financing institutions and their specific pathway to financial development to cross-regional differences in financial integration and industry structure in the late 20th century.

Conclusion

This paper has explored the regional dimension of the Japan's Great recession following the burst of the stock market and housing bubble in the early 1990s. We show that an important determinant of how hard a prefecture was hit during the 'Lost decade' was the prefecture's degree of integration into the national economy as a whole. Clearly, Japan is a highly financially integrated economy and it would seem surprising that cross-regional differences in financial integration are so big that they can account for a substantial regional heterogeneity in the responses to the common shock of the bursting bubble. However, we recognize that until at least the onset of the crisis, there was a highly regionally fragmented banking system whose roots

[30]Our line of argument is similar to Aecmoglu and Johnson (2005) who – in a different setting – report that both settler mortality in colonial times as well as English legal origin individually both have prognostic power for measures of property rights and contracting institutions today but that, when both are used in the same regression, English legal origin mainly affects contracting institutions whereas settler mortality affects property rights but not contracting institutions.

go back to the rise of silk reeling as Japan's first export staple. This regional fragmentation has had a considerable impact on access to finance by small, credit dependent manufacturing firms. We show that the impact of the crisis was particularly strong in areas with low pre-1990 levels of financial integration and many small manufacturing firms.

We then seek to identify the deep historical and economic origins of this regional fragmentation of the banking market. We argue that the development of regional banks was largely triggered by the development of the silk industry in the years following the Meiji Restoration and the opening of Japan for international trade: for exogenous reasons such as climate and the need to source cocoons, the silk reeling industry was located in the mountain areas of central Japan. The main market for silk was in the port of Yokohama. Silk reeling was heavily dependent on trade credit since cocoons had to be bought after harvest in spring or early summer whereas the reeled silk thread could only be shipped to Yokohama a couple of months later. Silk finance was therefore largely provided by small regional banks who provided operating loans against so-called 'documentary bills' drawn on reputed Yokohama silk dealers to which the reelers would ship their produce after having reeled the cocoons. Therefore, regional banks provided a loan for which the Yokohama merchant was ultimately liable and it were ultimately the Yokohama silk merchants who had to monitor the quality of the credit relation with the silk reelers. An important aspect of the quality of this relationship was the quality of the reeled silk thread that the silk reelers would ultimately deliver to the Yokohama merchant. An important part of quality improvement, in turn, was the mechanization of the silk-reeling process. Specifically, in the early stages of mechanization hand-reeled silk was often re-reeled in machine filatures (silk-reeling mills) that were run by the cooperative. The re-reeling by the cooperative allowed to implement centralized quality control systems and consistent quality was ultimately decisive in Japan's later domination of the US market.

We show that the prefecture-level number of mechanized silk reeling mills in the late 19th century is indeed a powerful predictor of the prefecture-level market share of these local lenders (as opposed to city banks) a hundred years later, at the onset of Japan's Great Recession – and therefore of the degree of regional banking integration in modern days. Using late19th century level of mechanization in the silk industry as an instrument for financial integration, we corroborate our above results: given the role of small firms in the regional economy, the effects of the recession was worse in less financially integrated areas.

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Table 1: Japanese prefectures: descriptive statistics

	Prefecture	City bank share in total lending	SME share in GDP	post-1990 avg growth rates of GDP	City bank lending
1	Hokkaido	46.95	9.30	0.35	9.85
2	Aomori	54.14	8.53	0.40	5.86
3	Iwate	41.01	12.26	0.78	12.94
4	Miyagi	61.16	10.77	0.14	9.42
5	Akita	51.56	12.72	0.66	8.93
6	Yamagata	41.42	18.29	0.51	13.22
7	Fukushima	43.54	17.06	0.58	14.27
8	Ibaraki	53.36	19.31	-0.15	12.69
9	Tochigi	55.89	20.70	-0.08	12.33
10	Gunma	51.91	21.17	-0.16	9.93
11	**Saitama**	65.18	24.47	-0.22	9.33
12	**Chiba**	56.76	13.89	0.12	12.87
13	**Tokyo**	85.50	7.98	-0.49	4.16
14	**Kanagawa**	64.09	13.84	-0.67	9.02
15	Niigata	48.20	17.48	0.58	11.60
16	Toyama	55.52	19.30	0.41	8.29
17	Ishikawa	58.92	17.70	0.36	5.82
18	Fukui	54.78	20.94	0.60	6.68
19	Yamanashi	41.68	20.09	-0.14	8.97
20	Nagano	42.55	21.91	0.28	9.85
21	Gifu	43.57	24.68	0.16	8.18
22	Shizuoka	50.68	22.26	0.43	6.61
23	**Aichi**	61.95	18.08	-0.04	7.46
24	Mie	49.21	19.72	0.89	12.54
25	Shiga	47.25	24.86	-0.16	14.61
26	**Kyoto**	54.81	17.85	0.23	6.57
27	**Osaka**	76.44	19.21	-0.40	6.36
28	**Hyogo**	53.67	17.66	-0.72	9.05
29	Nara	65.85	19.67	0.08	9.92
30	Wakayama	46.21	14.95	1.08	11.48
31	Tottori	48.59	12.74	0.02	10.07
32	Shimane	40.59	13.66	1.01	10.25
33	Okayama	50.43	17.90	-0.21	10.52
34	Hiroshima	55.45	14.32	0.31	10.97
35	Yamaguchi	51.86	12.16	0.76	9.23
36	Tokushima	55.27	15.36	0.89	13.14
37	Kagawa	60.32	18.00	0.17	9.63
38	Ehime	47.02	16.87	0.38	12.42
39	Kochi	40.32	10.00	0.52	14.76
40	Fukuoka	61.42	10.49	0.26	8.96
41	Saga	45.30	15.81	1.10	11.45
42	Nagasaki	56.68	7.87	0.41	10.09
43	Kumamoto	46.95	9.96	0.12	13.82
44	Oita	46.19	10.39	0.92	10.58
45	Miyazaki	44.71	10.68	1.01	9.37
46	Kagoshima	41.80	9.48	0.94	9.47
	Mean	**52.54**	**15.92**	**0.31**	**10.08**
	Std. Deviation	**9.39**	**4.74**	**0.46**	**2.51**

Note: all number in percent. Core prefectures highlighted in bold.

Table 2: Small business importance, financial integration and the Great Recession

Small manufacturing firms and the effect of the Great Recession on prefecture-level output growth rates

Panel A: Based on value added SME-measure

	All prefectures	Sample split by importance of ...					
		Regional Banks		City Banks		Regional Banks: Shinkins only	
		high	low	high	low	high	low
$Post1990_t \times SME^k_{VA}$	-0.07	-0.13	-0.01	-0.0140	-0.12	-0.12	-0.03
	(-2.04)	(-4.04)	(-0.19)	(-0.25)	(-3.82)	(-3.03)	(-0.70)
R^2	0.55	0.56	0.58	0.6042	0.53	0.57	0.552

Panel B: Based on employment based SME-measure

	All prefs.	high	low	high	low	high	low
$Post1991_t \times SME^k_{EMP}$	-0.08	-0.15	0.01	-0.002	-0.15	-0.15	-0.04
	(-1.96)	(-3.73)	(0.01)	(-0.02)	(-3.78)	(-4.06)	(-0.64)
R^2	0.55	0.55	0.58	0.60	0.53	0.55	0.5866

The table shows the coefficient α in panel regressions of the form $\Delta gdp^k_t = \alpha \times Post1990_t \times SME^k + \mu^k + \tau_t + \epsilon^k_t + constant$ where $Post1990_t$ is a dummy indicating the period from 1991, $SME^k$is small-business importance and$\mu^k$and τ_t are prefecture-fixed and time effects respectively. Sample period is 1980-2005. Regional banks include Sogo banks, Shinkins and agricultural and credit cooperatives. OLS estimates, t-statistics in parentheses. Standard errors are clustered by prefecture.

Table 3: Robustness – interaction terms and additional controls

Interactions of $Post1990_t$ with pre1990 variables:	I Regional	II City	III Regional	IV City	V Regional	VI City	VII Regional	VIII City
$...SME^k_{VA}$	-0.09	-0.07	0.33	-0.45	0.30	-0.47	0.32	-0.52
	(-4.16)	(-2.85)	(2.19)	(-3.57)	(2.39)	(-3.68)	(2.70)	(-4.19)
$...RegionalBankShare$	0.04		0.27		0.24		0.18	
	(0.89)		(3.04)		(3.31)		(2.67)	
$...CityBankShare$		-0.05		-0.15		-0.16		-0.08
		(-2.39)		(-4.54)		(-4.19)		(-1.85)
$...SME^k \times RegionalBankShare$			-1.51		-1.36		-1.34	
			(-2.73)		(-2.95)		(-3.06)	
$...SME^k \times CityBankShare$				0.68		0.72		0.81
				(3.13)		(3.22)		(3.91)
$...Lending/GDP$					-0.0006)	0.0003		
					(-1.28)	(0.60)		
$...CoreArea$							-0.01	-0.01
							(-1.67)	(-2.90)
$\Delta LandPrice_t \times CityBankShare$ (sample ends 2003)							0.15	0.19
							(3.32)	(2.06)
R^2	0.55	0.56	0.56	0.56	0.56	0.55	0.58	0.58

The Table shows results from the regression $\Delta gdp^k_t = Post1991_t \times \left[\alpha_1 SME^k_{VA} + \alpha_2 FI^k + \alpha_3 SME^k_{VA} \times FI^k + \boldsymbol{\alpha}'_4 X_t\right] + \mu^k + \tau_t + \epsilon^k_t$ where where $Post1991_t$ is a dummy indicating the period from 1991, $SME^k_{VA}$is small-business importance based on value added, FI^k is the emasure of financial integration (regional and city bank share in total lending in prefecture k). $\mu^k$and τ_t are prefecture-fixed and time effects respectively. $CoreArea$ is a dummy for the core economic areas (Tokyo, Osaka, Aichi, Kanagawa, Chiba, Saitama, Hyogo and Kyoto prefectures) and $\Delta LandPrice_t$ is the percentage change in land prices in the core prefectures from Imai and Takarabe (2011). The sample period is 1980-2005 (2003 for regressions $VI$and $VIII$ involving $\Delta LandPrice$). OLS estimates, t-statistics in parentheses. Standard errors are clustered by prefecture.

Table 4: Lending growth after 1991

Interactions of $Post1990_t$	Δlog(Total lending)					Δlog(City Bank lending)					Δlog(Regional Bank lending)				
with pre1990 variables:	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV
$...SME^k_{EMP}$	0.02	0.03	0.02	0.04	0.05	-0.05	-0.01	-0.04	-0.004	0.0055	0.15	0.17	0.14	0.17	0.16
	0.36	0.56	0.43	0.74	0.81	-0.44	-0.13	-0.37	-0.05	0.0626	1.06	1.40	1.04	1.43	1.38
$...RegionalBankShare$	0.04		0.03			0.10		0.08			0.04		0.04		
	0.65		0.63			1.00		1.02			0.49		0.56		
$...CityBankShare$		-0.08		-0.06	-0.03		-0.17		-0.15	-0.10		-0.00		0.00	-0.06
		-2.21		-2.48	-1.21		-4.34		-4.09	-1.99		-0.05		0.05	-1.22
$...SME^k_{EMP} \times RegionalBankShare$			-2.26					-4.21					1.04		
			-1.44					-2.27					0.64		
$...SME^k_{EMP} \times CityBankShare$				1.12	1.21				1.47	1.65				0.36	0.16
				1.64	1.86				1.73	2.02				0.31	0.14
$...CoreArea$					-0.01					-0.02					0.02
					-1.22					-1.93					1.89
R^2	0.58	0.58	0.58	0.59	0.59	0.79	0.79	0.79	0.80	0.80	0.73	0.73	0.73	0.73	0.73

The Table shows results from the regression $\Delta lending_t^{X,k} = Post1990_t \times \left[\alpha_1 SME^k_{EMP} + \alpha_2 FI^k + \alpha_3 SME^k_{EMP} \times FI^k + \boldsymbol{\alpha}_4' X_t\right] + \mu^k + \tau_t + \epsilon_t^k$ where $\Delta lending_t^{X,k}$ is lending growth and X stands in turn for total lending, universal bank lending and regional bank lending. $Post1991_t$ is a dummy indicating the period from 1991, $SME^k_{EMP}$is small-business importance based on employment, FI^k is the measure of financial integration (pre-1991 regional and city bank share in total lending in prefecture k). $\mu^k$and τ_t are prefecture-fixed and time effects respectively. *CoreArea* is a dummy for the core economic areas (Tokyo, Osaka, Aichi, Kanagawa, Chiba, Saitama, Hyogo and Kyoto prefectures) The sample period is 1980-1996 . The variables *SME*,*CitybankShare* and *RegionalBankShare* are cross-sectionally demeaned.

Table 5: Modern day (pre-1990) lending and silk filatures

	Financial Integration pre-1990 share in prefecture-level lending by						Financ'l Development	
	City Banks		Regional Banks				Lending/GDP)	
			All (Shinkin+Sogo)		Shinkins only		(pre-1990)	
filatures / population (log #)	-0.03	-0.04	0.03	0.03	0.04	0.04	-0.05	-0.03
	(-2.83)	(-4.46)	(3.82)	(3.82)	(4.83)	(4.41)	(-1.39)	(-1.08)
Relative GDP (pre-90)		-0.02		0.01		-0.0105		0.09
		(-1.53)		(0.90)		(-0.85)		(1.97)
Core Dummy		0.08		-0.0026		0.02		0.21
		(2.71)		(-0.10)		(0.70)		(1.94)
Distance to Yokohama (log)		0.19		-0.0051		-0.01		0.72
		(3.36)		(-0.10)		(-0.19)		(3.36)
R^2	0.15	0.65	0.25	0.28	0.35	0.39	0.04	0.35

The table shows regressions of modern-day (pre-1990) average prefectural lending shares by bank type on our silk instrument – the number of filatures per head of population in aprefecture in 1895. The control variables are the (log) distance to Yokohama (the main silk market) and a dummy for the core areas (Tokyo, Osaka, Aichi, Kanagawa, Chiba, Saitama, Hyogo and Kyoto prefectures).

Table 6: Impact of mechanization on pre-1990 financial integration measures and founding year of first industrial cooperative bank in a prefecture.

	(log) share in prefecture-level lending by						Founding year of first Shinkin in prefecture (log)	
	City Banks		Regional Banks: All (Shinkin+Sogo)		Regional Banks: Shinkins only			
hand filatures (log #)	-0.01 (-1.38)		0.01 (0.94)		-0.00 (-0.08)		-0.00 -0.09	
mechanized filatures (log #)	-0.02 (-3.35)		0.02 (2.85)		0.03 (4.22)		-0.00 (-1.89)	
output: hand reeled (log tons)		-0.00 (-0.61)		-0.00 (-0.42)		-0.01 (-0.62)		0.00 (0.66)
output: machine reeled (log tons)		-0.03 (-3.76)		0.02 (2.65)		0.02 (2.30)		-0.00 (-0.76)
R^2	0.62	0.62	0.22	0.17	0.38	0.21	0.21	0.16
Controls	yes	yes	yes	yes	yes	yes	yes	yes

The table shows results from regression of pre-1991 average prefectural lending shares by bank type (left panel) and of founding year of the first industrial cooperative bank (Shinkin) in a prefecture (right panel) on our alternative silk industry instruments: the number of hand-powered and machine filatures at prefecture-level, and the output of hand-powered and machine filatures respectively. Controls are: relative GDP pre-1990, a core area dummy and log distance to Yokohama. Core areas are as described in previous tables. The founding year of the first Shinkin is normalized by 1900 (the year of the enactment of the first industrial cooperative act). We take the logarithm of this normalized measure as our dependent variable.

Table 7: Panel IV Regressions with filatures / head in 1895 as instrument

Interactions terms of $Post1991_t$ with ...	City Banks	Regional Banks		City Banks	Regional Banks		City Banks	Regional Banks	
		All	Shinkin		All	Shinkin		All	Shinkin
$SME^k_{VA} \times FI^k$	0.92	-1.82	-2.17	1.13	-1.70	-1.60	0.89	-1.72	-1.83
	2.17	-2.16	-2.05	1.68	-1.48	-1.40	1.85	-1.79	-1.74
							-0.03	0.09	0.08
FI^k	-0.04	0.11	0.10	-0.04	0.08	0.06	-1.01	1.13	1.23
	-1.31	1.41	1.52	-0.88	0.83	0.85	-0.53	-0.10	0.25
							-1.93	-1.58	1.63
SME^k_{VA}	-0.56	-0.13	0.25	-0.67	-0.11	0.20			
	-2.45	-2.76	1.66	-1.79	-1.59	1.21			
Controls	no	no	no	yes	yes	yes	yes	yes	yes
relative GDP				0.01	-0.00	-0.02			
				0.49	-0.31	-1.88			
Core				-0.01	-0.01	-0.01	-0.00	-0.01	-0.01
				-1.54	-2.20	-2.51	-0.69	-1.58	-1.89
Distance to Yokohama							0.00	0.00	0.00
							0.75	0.67	2.71
R^2	0.55	0.55	0.55		0.56	0.56	0.56	0.56	0.56
1st-Stage F-stat for $SME^k \times FI^k$	192.09	417.23	500.25	207.30	426.66	481.70	187.22	426.04	471.68

The Table shows results from the IV regression $\Delta gdp^k_t = Post1991_t \times \left[\alpha_1 \widehat{SME^k \times FI^k} + \alpha_2 \widehat{FI^k} + \alpha_3 SME^k + \boldsymbol{\alpha}'_4 X_t\right] + \mu^k + \tau_t + \epsilon^k_t$ where where $Post1991_t$ is a dummy indicating the period from 1991, $SME^k$is small manufacturing firm importance (value-added or employment based) and X_t is a vector of controls. $\widehat{SME^k \times FI^k}$ and $\widehat{FI^k}$ are the first-stage fitted values of $SME^k \times FI^k$ and FI^k using $SME^k \times Silk^k$ and $Silk^k$ as instruments, where $Silk^k$is the log number of silk filatures per head of population in a prefecture in 1895. *CoreArea* is a dummy for the core economic areas (Tokyo, Osaka, Aichi, Kanagawa, Chiba, Saitama, Hyogo and Kyoto prefectures). The sample period is 1980-2005. t-statistics in parentheses.

Table 8: Cross-sectional Regressions

	SME_{VA} (output based)						SME_{EMP} (employment based)					
	City Banks		Regional Banks				City Banks		Regional Banks			
			All		Shinkin				All		Shinkin	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
$SME^k \times FI^k$	0.14	0.37	-0.36	-0.90	-0.28	-1.09	0.16	0.58	-0.53	-0.95	-0.44	-1.18
	1.38	1.71	-2.07	-1.39	-1.59	-1.44	1.15	1.71	-2.15	-1.75	-1.86	-1.81
FI^k	-0.04	-0.09	0.06	0.22	0.05	0.23	-0.04	-0.10	0.07	0.17	0.06	0.20
	-2.40	-1.97	2.10	1.37	1.49	1.42	-2.01	-1.99	2.12	1.87	1.71	1.83
SME^k	-0.10	-0.23	0.08	0.19	0.02	0.13	-0.11	-0.33	0.12	0.22	0.05	0.16
	-1.84	-1.92	1.49	1.21	0.74	1.20	-1.54	-1.87	1.69	1.47	1.12	1.45
Controls												
Core	-0.00	-0.00	-0.01	-0.00	-0.01	-0.01	-0.00	-0.00	-0.01	-0.01	-0.01	-0.01
	-2.58	-0.81	-4.53	-1.45	-4.79	-3.49	-2.71	-1.07	-4.82	-2.98	-5.03	-4.29
R^2	0.50	0.46	0.46	0.46	0.43	0.46	0.48	0.46	0.45	0.46	0.44	0.46
First-Stage F-stat for $SME^k \times FI^k$		13.83		9.97		18.30		12.95		6.67		12.88

The Table shows results from the cross-sectional OLS and IV regressions $\Delta gdp^k_{post1990} = \alpha_1 SME^k \times FI^k + \alpha_2 FI^k + \alpha_3 SME^k + \boldsymbol{\alpha}_4' CoreDummy^k + const + \epsilon^k$ where $\Delta gdp^k_{post1990}$ is average post-1990 (1991-2005) GDPgrowth in prefecture k, $SME^k$is small manufacturing firm importance (value-added or employment based) and FI^k our measure of regional banking integration (city bank share, regional bank share, Shinkin share). *CoreArea* is a dummy for the core economic areas (Tokyo, Osaka, Aichi, Kanagawa, Chiba, Saitama, Hyogo and Kyoto prefectures). In the IV-regressions, $SME^k \times FI^k$ and FI^k are instrumented using $SME^k \times Silk^k$ and $Silk^k$, where $Silk^k$is the log number of silk filatures per head of population in a prefecture in 1895. The F-statistics below the IV-regression pertain the the test for the significance of instruments in the first-stage regression for $SME^k \times FI^k$. t-statistics in parentheses.

Table 9: Robustness: Panel OLS and IV regressions for alternative measures of credit dependence

	$CD^k = rank(SME^k_{VA})$				$CD^k = RZ^k_{VA}$				$CD^k = RZ^k_{EMP}$			
	City Banks		Regional Banks		City Banks		Regional Banks		City Banks		Regional Banks	
Interactions of $Post1990_t$ with ...	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
$CD^k \times FI^k$	0.02	0.02	-0.03	-0.05	0.94	0.89	-1.82	-1.42	1.72	1.43	-4.43	-1.87
	3.18	2.03	-3.21	-1.95	3.23	2.22	-4.25	-2.04	2.74	1.99	-6.19	-2.08
FI^k	-0.07	-0.13	0.13	0.33	-0.10	-0.23	0.18	0.42	-0.10	-0.28	0.21	0.38
	-3.38	-2.00	4.13	1.75	-3.73	-2.13	4.91	1.83	-3.21	-2.06	6.12	1.98
CD^k	-0.01	-0.01	0.001	0.01	-0.58	-0.48	0.44	0.37	-1.07	-0.80	1.13	0.48
	-3.39	-2.12	2.77	1.90	-3.69	-2.24	3.33	2.07	-3.06	-2.06	5.40	1.98
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.56	0.56	0.56	0.56	0.57	0.56	0.57	0.56	0.57	0.56	0.57	0.56
1st-Stage F-stat for $CD^k \times FI^k$		563.82		491.84		261.89		258.57		301.52		173.67

The Table shows results from the OLS and IV regressions $\Delta gdp^k_t = Post1990_t \times \left[\alpha_1 CD^k \times FI^k + \alpha_2 FI^k + \alpha_3 CD^k + \boldsymbol{\alpha}'_4 X_t\right] + \mu^k + \tau_t + \epsilon^k_t$ where $Post1990_t$ is a dummy indicating the period from after 1990, $CD^k$is one of our alternative measures of credit dependence as indicated in the column headings: the rank in the cross-sectional distribution of small-firm shares in the GDP ($rank(SME^k_{VA})$), the value added (RZ^k_{VA}) and the emplyomentd-based (RZ^k_{EMP}) average prefecture-level Rajan Zingales-type measures. The vector X_t contains a set of controls: relative pre-1990 GDP and the core dummy for the OLS regressions and the core dummy and log distance to Yokohama for the IV regressions. For the IV regressions, $CD^k \times FI^k$ and FI^k are instrumented by $CD^k \times Silk^k$ and $Silk^k$, where $Silk^k$is the log number of silk filatures per head of population in a prefecture in 1895. The sample period is 1980-2005. t-statistics in parentheses.

Table 10: Disentangling financial integration & industrial structure

	Industrial structure				Financial Integration		
	Small manufacturing firm share		Manufacturing Share		pre-1990 lending share by		
					City Banks	Regional Banks	
	in *GDP*	in *EMP*	in *GDP*	in *EMP*		All	Shinkin
filatures / population	-0.03	-0.02	-0.06	-0.03	-0.02	-0.01	-0.01
(log #)	-6.28	-5.41	-5.05	-5.26	-1.73	-1.04	-0.96
distance to most highly mechanized	0.01	0.01	0.00	0.01	-0.04	0.02	0.03
silk regions (log)	2.04	2.87	0.31	1.87	-4.42	2.97	3.53
Core Dummy	-0.01	-0.01	-0.03	-0.02	-0.03	0.01	-0.01
	-1.68	-1.61	-2.03	-2.32	-2.11	1.16	-0.66
Distance to Yokohama	-0.03	-0.03	-0.05	-0.03	0.08	-0.01	0.01
(log)	-2.30	-2.77	-1.39	-1.77	2.69	-0.41	0.39
R^2	0.69	0.68	0.57	0.65	0.58	0.30	0.40

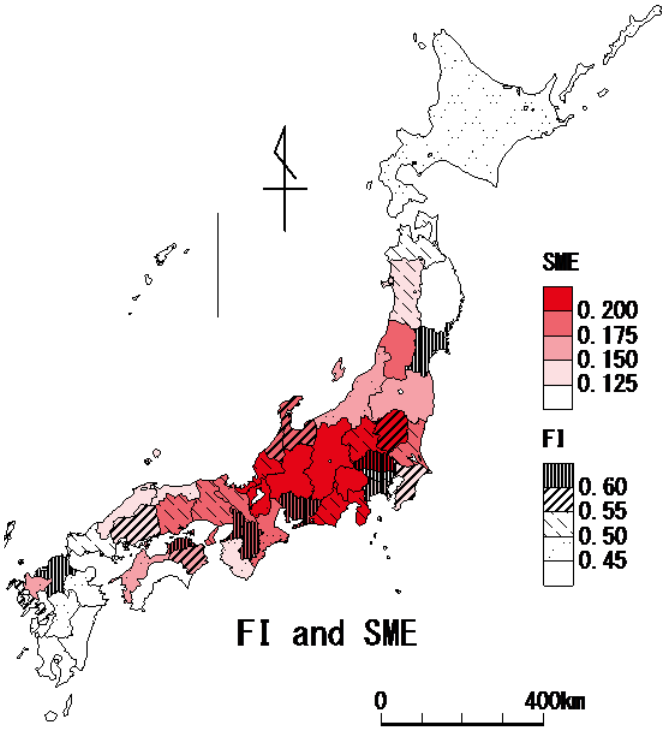
The table shows regressions of modern-day (pre-1990) industrial structure (left hand) and average prefectural lending shares by bank type on our two alternative silk-related variables: the (log) distance to the three prefectures with the most highly mechanized silk industry in 1895 {...} and the (log) number of filatures per head in 1895 and a set of controls.. The control variables are the (log) distance to Yokohama (the main silk market), a dummy for the Core areas (Tokyo, Osaka, Aichi, Kanagawa, Chiba, Saitama, Hyogo and Kyoto prefectures).

Table 11: Panel IV Regressions (both credit dependence and financial integration endogenous)

	$CD = SME_{VA}$			$CD = SME_{EMP}$			CD =Manufacturing Share in GDP		
Interactions terms	City	Regional Banks		City	Regional Banks		City	Regional Banks	
of $Post1990_t$ with ...	Banks	All	Shinkin	Banks	All	Shinkin	Banks	All	Shinkin
$CD \times FI^k$	1.38	-4.07	-4.69	2.85	-6.45	-6.54	0.85	-2.44	-5.02
	1.78	-1.91	-1.84	1.96	-2.04	-1.99	1.55	-1.64	-1.41
FI^k	-0.25	0.80	0.94	-0.43	1.02	1.05	-0.22	0.71	1.50
	-1.92	1.88	1.82	-2.06	2.00	1.96	-1.64	1.62	1.41
CD	-0.79	1.01	0.64	-1.58	1.65	0.93	-0.47	0.66	0.77
	-1.92	1.83	1.71	-2.04	2.00	1.90	-1.67	1.56	1.35
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.13	0.13	0.13	0.13	0.13	0.13	0.56	0.56	0.56
1st-Stage F-stat for $CD^k \times FI^k$	395.99	675.04	740.74	347.20	691.74	786.38	257.18	358.92	534.52

The Table shows results from the IV regression $\Delta gdp_t^k = Post1990_t \times \left[\alpha_1 \widehat{CD^k \times FI^k} + \alpha_2 \widehat{FI^k} + \alpha_3 SME^k + \boldsymbol{\alpha}_4' X^k\right] + \mu^k + \tau_t + \epsilon_t^k$ where where $Post1990_t$ is a dummy indicating the period after 1990, CD^k is our measure of credit dependence as indicated in the respective column headings and X^k is a vector of controls. $\widehat{CD^k \times FI^k}$ and $\widehat{FI^k}$ are the first-stage fitted values of $CD^k \times FI^k$ and FI^k using the log numbers of filatures per head ($filatures^k$), the (log) distance to one of the three most mechanized silk regions and the interaction between these two as instruments. Control variates are (log) distance to Yokohama and a dummy for the core economic areas (Tokyo, Osaka, Aichi, Kanagawa, Chiba, Saitama, Hyogo and Kyoto prefectures). The sample period is 1980-2005. t-statistics in parentheses.

Figure 1: Geographical distribution of Pre-1990 SME importance and financial integration and post-1990 p.c. GDP growth rates



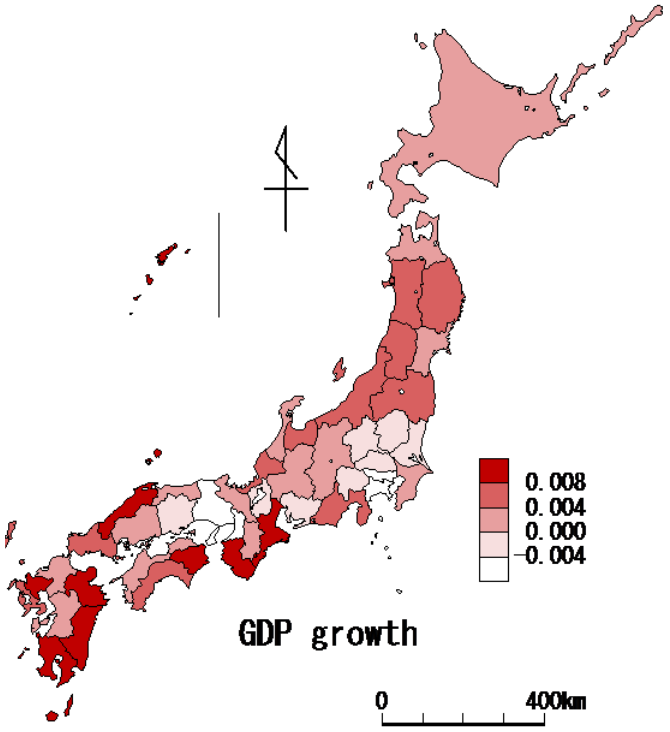


Figure 2: Cumulative Growth Differential between high and low SME group in two-way sample split (High/Low City Bank Share and High/Low SME share by value added)

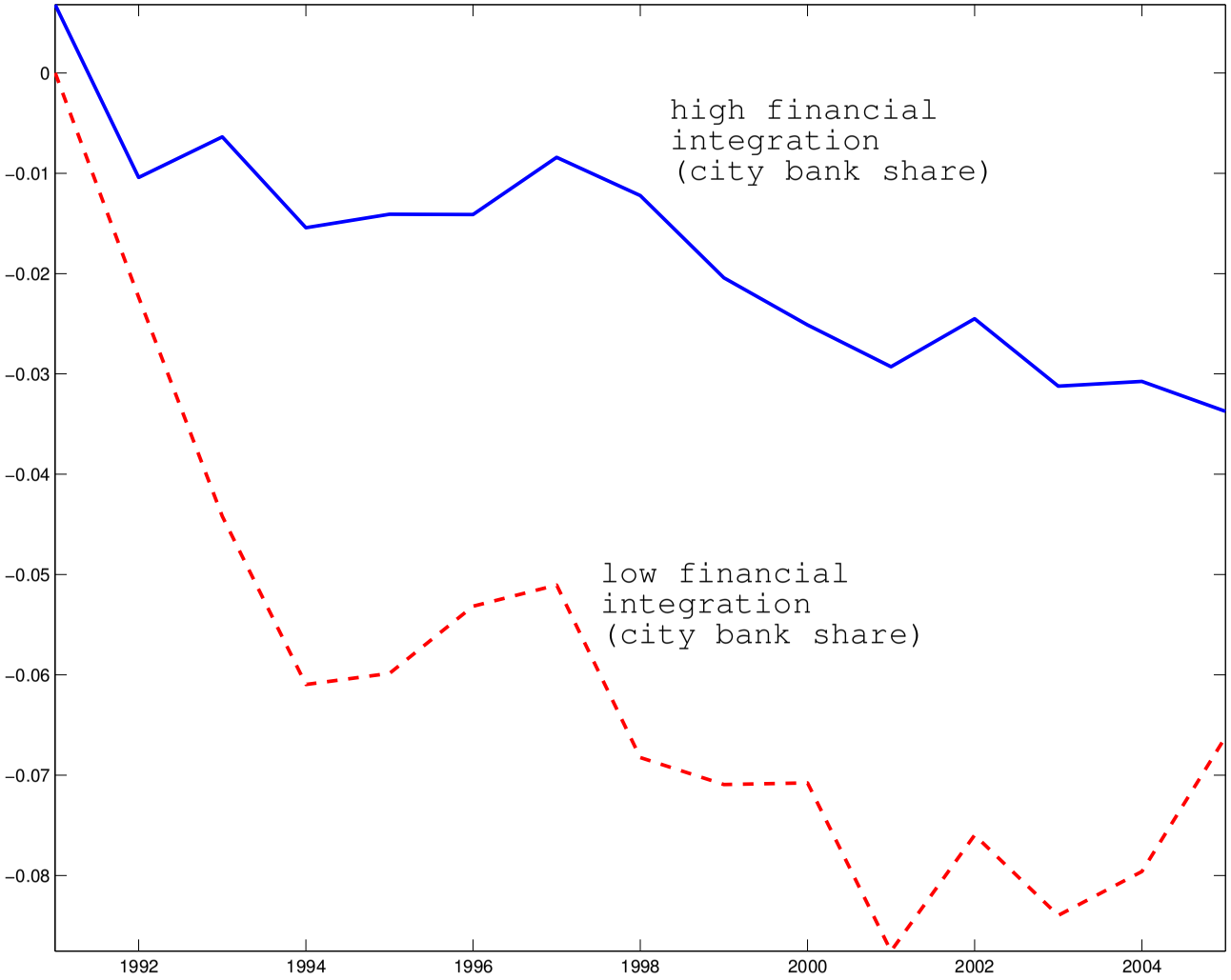
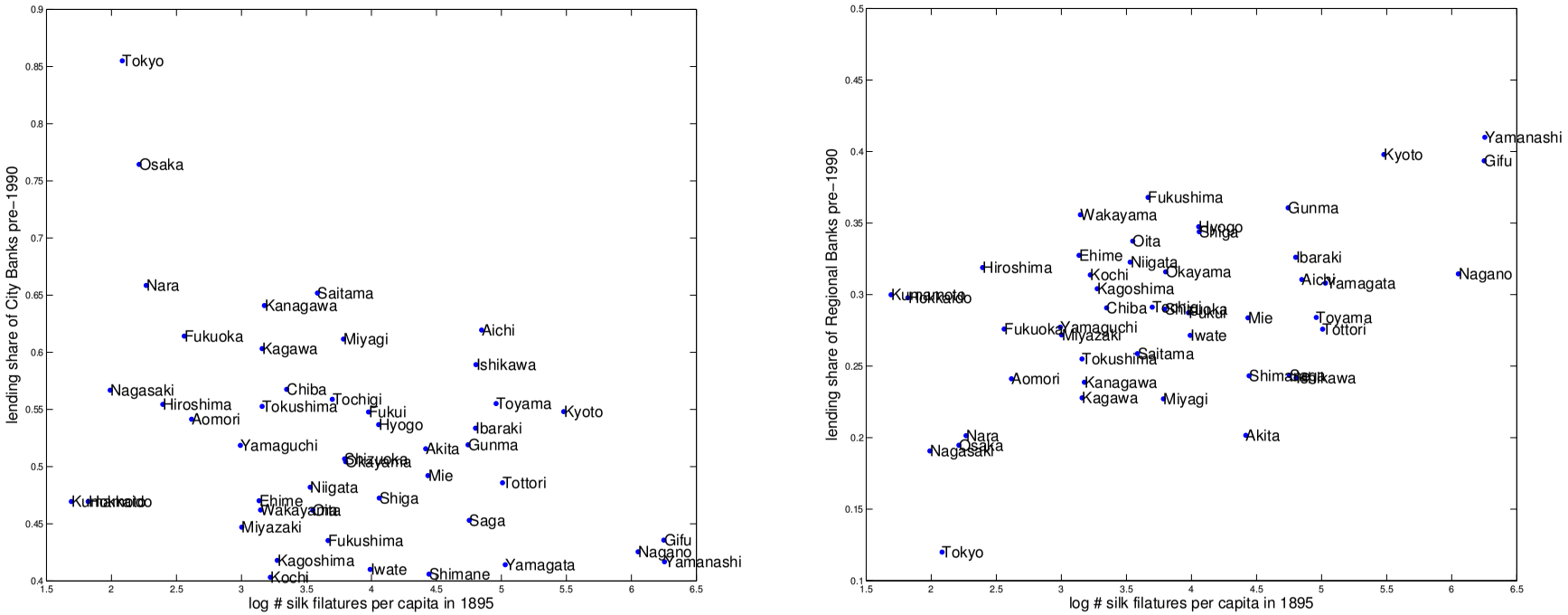


Figure 3: City and Regional Bank Lending Shares (pre-1990 (1980-1990) averages) vs. number of silk filatures per head in 1895



NOTE: Left panel shows link for City banks, right panel for all regional banks (Shinkin+Sogo banks).