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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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PRELIMINARY AND INCOMPLETE

Abstract

We examine the impact of financial integration on the regional spread of Japan's great recession in the early 1990s. Prefectures with many small manufacturing firms AND a low degree of bank integration with the rest of the country saw the largest and most persistent declines in output. This suggests that financing frictions faced by credit-dependent firms were much more severe in less financially integrated regions. But what determines variation in the degree of banking integration across prefectures? We argue 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 19th century. Silk reeling emerged as Japan's main export industry after 1868 and had a huge impact on the development of the financial system. The industry was heavily dependent on trade credit and exporters formed cooperatives to facilitate access to finance and to enforce quality control systems. The silk regions therefore embarked on a path to development in which small mutual or cooperative banks played – and continue to play – an important role. Since these banks raise capital and lend only regionally, the main silk exporting areas developed a financial system that was effectively less financially integrated with the rest of the country at the onset of the Great Recession. Using the degree of mechanization in the silk reeling industry (which, as we argue, was key for the growth of silk exports and for the development of trade finance) in 1895 as an instrument, we corroborate our result that the post-1990 decline was worse in prefectures with low financial integration and high credit dependence.

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KEY WORDS: Japan; Great Recession; Lost Decade; Banking Integration; regional business cycles; financial accelerator; trade finance;

Introduction

We examine the impact of financial integration between prefectures in the regional spread of Japan's great recession. As our starting point we acknowledge that – even in a clearly very highly integrated national economy such as Japan – there may be substantial cross-regional differences in financial integration. Such differences may have long-standing historical origins that may not matter much for macroeconomic transmission in tranquil times. However, they may mean that a large common, country-wide shock – such as the burst of Japan's Asset Price Bubble in the early 1990s – can be transmitted very differently to different regions.

Specifically, tightening credit constraints in a major financial recession can exacerbate the negative impact of the aggregate shock. How severe such constraints are and what their effect on the regional economy is depends on both demand and supply factors. Following Rajan and Zingales (1998), we identify cross-regional differences in credit demand using the number of small, allegedly credit-dependent manufacturing firms. To identify regional differences in supply, we suggest to focus on how financially integrated a region's banking sector is with the rest of the country. Our results are as follows: first, we show that prefectures with many small manufacturing firms saw the largest and most persistent declines in output. However, the link between small firm importance and the depth of the recession depends on the degree to which a region's banking sector is integrated with the rest of the country: in financially less integrated prefectures, this link is very strong – i.e. conditional on the importance of small firms, these regions saw deeper and more persistent declines in output. Conversely, this link between credit dependence and recession depth is almost absent in highly integrated regions. We interpret this finding as evidence that a lack of financial integration has exacerbated financial frictions for small, credit-dependent firms, deepening the crisis. 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 regional lenders.

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 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 finance in 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 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 late 19th century level of mechanization in the silk industry as an instrument for financial integration, we cor-

roborate 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 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.

Placement in the literature

Our study places itself at the intersection of at least two literatures. 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. At a general level, we add 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 'deep' financial integration. These differences mattered decisively in how a big common shock a hundred years later proliferated through the country.

In our analysis, we also connect to a recent literature that used the burst of Japan's big property and stock market bubble of the 1980 as an identifying device for bank lending behavior and common lender effects (see Peek and Rosengreen (200x, 200x) and Imai and Takarabe (2011)).

¹ While these papers emphasize how banking integration can accelerate the spread of a crisis, our results here emphasize how a lack of financial integration can worsen a recession in particularly credit-dependent sector 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 and interesting for a number of reasons.²

First, at a general level, macroeconomic transmission may be very different in deep economic crises and in this in turn may bring out the importance of differences in financial structure and development more strongly than would be the case under more benign economic circumstances.

Secondly, 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. It therefore 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 may have been absent in previous downturns.

Third, it is interesting to study the Japanese experience in particular, because the burst of the bubble had unusually 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 and of the medium-

¹In using banking crisis as the identifying shock, our analysis is also related to De l'Arricia et al. (2008) and Kroszner et al. (2006) who examine the aftermath of banking crisis in a large cross-section of countries. Our focus here however is in the regional implications of a common (country-wide) shock over regions and time whereas these studies emphasize the typical path of an economy following a (generally country-specific) banking crisis.

²The 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 cross-regional differences in financial integration as we do here.

term consequences for growth, employment and industrial structure.

Forth, while 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, there is virtually no evidence for the implications of the crisis (and of regional differences in financial development) for regional business cycles and medium-term growth. We provide this evidence here. We believe that our results may also inform current discussions about the international and regional spread and the severity of the subprime crisis.

The remainder of this paper is now structured as follows: section two 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 three 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 four 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 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 indicator 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) banks, mutual banks (Sogo banks), industrial credit association (Shinkins), by agricultural, fishery and other credit cooperatives, 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 banking system. (REFERENCE) 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 large 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 purely 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).

Hence, regional lenders are in general 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. For now it is just important to note that these banks were, from the outset, set up to lend regionally and that they still largely did so by the end of the 1980s. In fact, until the 1990s government regulation under the 'convoy system' also restricted these regional banks to open branch networks outside their prefecture of origin (see Hoshi and Kashyap (2000) and Hosono, Sakai and Tsuru (2007) for details).

Specifically, the group of industrial credit associations (Shinkin) deserves some special consideration in our analysis. Shinkins are regional cooperative banks that lend exclusively at a regional level and to their members which are small businesses. As we will show, their roots are particularly tightly related to the development of the silk industry in the late 19th century. Their 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. Once firms "graduate", i.e. outgrow these thresholds, they are required to raise their borrowing needs outside the cooperative sector, i.e. usually with the big regional or nationwide banks. 'Graduation' therefore generally substantially raises a small firm's financing costs (REFERENCE). 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, more strongly so than the second-tier regional banks (Sogo), which also lend mainly locally but are not quite as severely restricted to do so.³

³Many 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.

Finally, 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.

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 report results for both measures.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. 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 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 but to keep on lending locally. Our discussion of the historical roots of the cooperative banking sector will allow us to address issues of simultaneity in detail. We now turn to our econometric implementation.

⁴We further buttress the interpretation of these lending shares by relating them to 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.

Econometric implementation

Our main results are based on two econometric specifications. The first are 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 an indicator of the aggregate shock that hit the economy in 1990. In most specifications we chose

$$AggShock_t = Post1991_t$$

where $Post1991_t$ is a dummy that is one from 1991 onwards. These specifications allow us to make statements about the average growth rates after 1990. Alternatively, we consider

$$AggShock_t = Post1991_t \times \Delta gdp_t$$

where Δgdp_t is the aggregate (nation-wide) GDP growth rate. This choice allows to make statements about how sensitive a prefecture's output is to fluctuations in country-wide GDP – irrespective of whether these are positive or negative.

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 $AggShock_t = Post1991_t$; when the crisis dummy moves from zero to one, regions with more small businesses experience lower average growth rates. Conversely, when $AggShock_t = \Delta gdp_t$ we would expect the coefficient to be positive – regions with many small businesses are also more exposed to the aggregate decline in GDP.

Our main hypothesis is that the coefficient α depends on credit supply and that financial integration plays an important role in increasing credit supply. 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 measures of financial integration so that, controlling for first-order effects, we obtain:

$$\Delta gdp_t^k = AggShock_t \times \left[\alpha_0 SME^k + \alpha_1 FI^k + \alpha_2 FI^k \times SME^k + \alpha_3' X^k \right] + \mu^k + \tau_t + \epsilon_t^k \quad (2)$$

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. This is our second main specification.

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 address the potential endogeneity of FI in the above regressions.

Data

All data is prefectural level. (Nominal) prefectural GDPs are taken from Annual Report on Prefectural Accounts (Cabinet Office of Japan). Price index is taken from the Ministry of International Affairs and Communications of Japan. SME in terms of employee and value added at prefectural level is taken from Manufacture Census of Japan (Ministry of Economy, International Trade and Industry).⁵ We define small and medium enterprises as having less than 300 employees.. 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) (1964 to 1996).

Turning to instrumental variables, the data on silk reeling at prefectural level in the late 19th century is taken from Zenkoku Seishi Kojo Chosa (Survey of Silk-reeling Factories throughout Japan). We obtain data on the number of factories (factories are classified by whether they use machinery or hand-reeling) and total production per year (again by machines, by hand, and total), all at prefecture level. The earliest available year is 1896. The largest most important silk prefectures by output are Nagano and Gifu followed by Aichi, Kyoto, and Yamanashi.

⁵The 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.

Results

Baseline results

Table 1 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. In both panels, the aggregate shock is $AggShock = Post1991_t$, i.e. we focus on average growth rates after 1990. 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 value 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 $(25 - 16) * 0.08 = 0.7$ 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.

We further explore this result based on our second specification (2) in which we 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 2 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 prefectures). This is highly significant, suggesting that indeed the core areas were 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.

Transmission channels

To shed light on the transmission of the Great recessions to credit-dependent prefectures, Table X repeats the regressions from Table XX but now with lending as the dependent variable.⁶

⁶Our 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, we refer to the lending by xxx as 'city banks' and to the remainder as 'regional bank' lending.

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 X are consistent with this notion: The first five columns provide results for total lending, in columns VI-XX 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 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 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. These results strongly support the idea that it was the ability of city banks to pool funds across regional boundaries that allowed them to extend credit to small firms. The lack of regional banks' integration into the nationwide economy seems to have hindered access to credit for these particularly credit-dependent entities.

An important strand of the recent literature has emphasized the role of evergreening in banks' credit decisions during Japan's Great Recession. Caballero et al. (2008) show 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. They also show that this evergreening behavior led 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 finding: first, Caballero et al. document their finding based on a set of publicly listed (and therefore rather large) firms. In fact, they argue that evergreening was particularly pervasive within *Zaibatsu*, the tight industrial conglomerates that encompass industrial firms and banks. Our finding here that small firms found it hard to gain access to credit is therefore consistent with Caballero’s et al.’s result that much of the available credit was actually absorbed by big, inefficient firms with preferential access to banks. Furthermore, we focus on manufacturing, which is one of the sectors which according to Caballero et al. was least affected by evergreening.⁷ Our finding therefore suggest that lack of financial integration had the strongest adverse effects in those regions where evergreening was plausibly least widespread. And the regressions in Table XX suggest that this was the case because big, nationwide banks withdrew from these areas. Clearly, our results do not let us rule out that banks withdrew of credit from areas where they had low market share to do evergreening in other prefectures. However, our results do suggest that the crisis had a significant impact on the allocation of credit to credit-dependent firms and that this had considerable long-term macroeconomic consequences in terms of growth – irrespective of whether this shift in credit allocation was driven by a conventional credit-crunch or even exacerbated by Zombi lending behavior. To our knowledge, this is a point that has not been previously been documented in the literature.

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

⁷Peek and Rosengreen (200x) show 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 entirely let us preclude that regional banks also did some evergreening. 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 evergreening by regional banks. Hence, evergreening by regional banks could actually increase the role of financial integration for productive small firms’ access to credit and therefore for medium-term growth in the region.

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 poor growth prospects anyway. In the same mould 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 favour 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 therefore 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 at least partly determined by the interaction between 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.

Specifically, the opening of Japan following the Harris treaty of 1858 was an exogenous event that led to the emergence of silk thread as Japan's first and (till the onset of world war

II) foremost export good. International circumstances 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 Li (1982).⁸

Unlike other industries that started to emerge with the opening of the treaty ports – e.g. cotton 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 led sericulture to be particularly concentrated in these areas. The reason why the silk reeling industry located close to the silk worm raising areas was that the sourcing of silk cocoons of suitable quality was of utmost importance for the production process. Having a local network of suppliers was essential. Also, in the early stages of the industry's development, railways and other transport infrastructure were not available. Since cocoons needed to be reeled relatively fresh to prevent them from drying which would have led to a low quality thread, the silk reeling was either done by the farmers raising the cocoons directly or in filatures nearby.⁹

The reeling of cocoons was initially largely done by hand. As described in Nakabayashi (2006), the depression of the 1880s led 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 quality. Only thread of such consistent quality could be woven on mechanized looms. And the consistent quality of the thread, in turn, could only be achieved through a mechanized reeling process (REFERENCE).

⁸While 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, purchase of machinery etc. (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 particularly important competitive advantage for Japan as silk weaving became increasingly industrialized, in particular in the United States (see 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.

⁹The silk reeling mills (filatures) also strongly depended on local manual labor that could be seasonally employed (silk cocoons could be harvested one or – later two – times a year only and then needed to be processed quickly). Women and girls from the villages where silk worms were raised provided exactly this pool of labor.

The need for increased mechanization led to an increasing separation of silk worm farming and silk reeling. While not particularly capital intensive, mechanization required some capital that not all small hand reelers could raise. (Nagabayahsi (2006). ¹⁰The silk reelers therefore formed cooperatives. A key driver behind this tendency towards the cooperation of small, independent firms was that the quality levels required for the capture of the US market could only be attained through a process called re-reeling. Japan's high humidity levels carried the risk that reeled silk would curl during transport. Therefore, the thread was reeled a second time. This re-reeling was done in the larger, cooperatively operated mechanized filatures and it was this centralized re-processing of the silk that enabled reelers cooperatives to implement a strict quality control system (see Nakabayashi (2006) for an excellent description of the details of this quality insurance system). Only thanks to this type of quality insurance 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.

The separation of sericulture from the increasingly mechanized processing of silk also had considerable impact on financial development. The reason was that the silk reeling business depended strongly on trade credit. Silk cocoons were the most important input, accounting for 80 percent of the operating cost of a filature. However, small 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, 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. Therefore, a prominent role was again played by the reelers cooperatives and by the Yokohama silk brokers who not only acted as intermediaries between the international market for silk thread (largely based in Yokohama and other port cities – foreigners were not allowed to travel the country themselves) but that also organized the whole production and marketing chain. Importantly, these brokers would extend trade credit to small filatures so they were able to buy cocoons. Initially, the brokers –who often originated from the silk areas themselves – would advance unsecured credit or the small firms would have to post collateral in the form of real estate or would have family members or friends from their village vouch for them. Even in its early

¹⁰Many farmers who had previously also reeled silk by hand would specialize in the growing of cocoons. The shift in demand led to an expansion of sericulture to all parts of Japan. Improved infrastructure made quick transport of cocoons over large distances possible by the late 1880s.

days, the silk trade therefore led to the spontaneous emergence of local credit cooperatives, with the cooperative assuming joint liability. However, the growing financing needs of the silk business soon led to the emergence of the first regional banks. These banks would provide loans secured by silk to silk reelers. Nakabayashi (2001) details the working of these 'advances on documentary bills': a silk-reeler could obtain a loan from a regional bank against a so-called documentary bill drawn on a reputed whole-saler in the Yokohama market to whom the silk reeler would ship his produce. Thus, the wholesaler 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 themselves. As Nakabayashi emphasizes, in this system it was therefore the wholesaler who ultimately screened the quality of the borrower, i.e. the silk reeling firms.

Clearly, 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 Yokohama Specie bank. A second tier of whole salers would refinance themselves only through the city banks. On the purchasing side, the most reputed wholesalers could also trade the silk of the most reputed producers of silk such as the Kaimeisha cooperative from the Suwa district, Japans silk heartland, in Nagano prefecture. A key aspect in the whole-salers screening of the silk was the consistency of silk quality. As argued by Nakabayashi (2001) the reputation of a silk brand in the Yokohama and New York silk markets was a key signal, allowing the best silk produces to obtain credit from the biggest and most reputed silk merchants. Hence the establishment of quality control systems by silk reelers' cooperatives was an important precondition for the formation of the institutions financing the silk export trade – including the emergence of cooperative and other regional banks.

As we have argued before, the degree of mechanization itself went in hand with higher quality – both because the required quality levels could only be achieved through mechanization and because the centralized re-reeling process was a precondition that allowed the implementation of quality control systems for a large set of small, decentralized producers. The mechanization of Japn's silk sector therefore is an important driver of the development of the specific financial institutions driving small business finance in Japan: regional banks, many of which are of cooperative origin.

This link is documented in Figure 1, in which we plot, the number of mechanized silk filatures in a prefecture in 1896 against our measures of banking integration in the 1980s. It turns out that there is a clear positive relationship that we now explore in more detail. Specifically, we propose to use the number of in the late 19th century as an instrument for financial integration in our regressions examining the spread of the 1990s great recession.

IV results

First stage regressions

Table 3 reports the first stage of our IV regressions for regional and city banks. We also report results separately for Shinkins. As noted earlier, Shinkins are industrial cooperative banks that only lend to their members which are mainly small businesses. Many of these Shinkin eventually developed from the silk cooperatives and we would expect the impact of our instrument to be particularly strong in its impact on the pre-1990 market share of these small banks.

In the first column of each bank-type panel we report the regression of pre-1990) (log) lending share on the (log) number of silk filatures in a prefecture in 1895. In our plots above, Tokyo is a clear outlier with an unusual high lending share of big city banks and a very low lending share of regional banks. This – most likely – is attributable to the fact that all city banks are nowadays headquartered in Tokyo and they are the main banks of big corporations which are equally headquartered in Tokyo. We therefore include a Tokyo dummy in all our regressions here.

The baseline specification reveals a clear positive and highly significant link between the mechanization of the silk sector and the lending share of regional banks. The impact, as we conjectured its particularly strong for the market share of Shinkin, with an individual t-statistics on the number of filatures exceeding four. Conversely, for the lending share of the universal banks themselves, the coefficient on silk filatures is negative, though not individually significant. The first -stage F -statistics for instrument validity exceeds 10 for the regional banks.

Another important variable that we might expect to play a key role for the silk merchants' ability to screen borrower quality is a producers' distance to Yokohama, the main silk market (see Petersen and Rajan (2002)). A specification based on the distance between the respective prefecture and Kanagawa (where Yokohama is) is presented in the second column. This co-

efficient has a negative sign throughout, indicating that distance is indeed detrimental to the development of lending relationships . However, the coefficient is negative on both regional and universal banks, though it is significant only in the Shinkin subcategory of regional banks. In the third column of each panel finally we also include a control for the core economic areas: Tokyo, Osaka, Aichi, Kanagawa, Chiba, Saitama, Hyogo and Kyoto prefectures. Doing so leaves the regressions for the regional bank lending shares virtually unaffected. For the city banks, who for probably much the same reasons as for Tokyo have high market share in these core areas, the coefficient on the mechanized silk filatures now becomes significant and the F-test exceeds the critical value of 10.

Instrument exogeneity

As we have argued, the mechanization of the silk industry was important for determining regional banking because it allowed to increase quality and to implement control systems in the centralized, cooperatively run silk filatures. This, in turn was decisive in the development of credit relationships between the Yokohama silk market and regional banks because quality and brand reputation were the most important aspects for Yokohama silk dealers in judging borrower quality. Where borrower quality was high, regional banks were successfully established and these banks preserved their high shares of the local lending market for more than a century.

Several concerns could be raised about this line of argument: 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 argue, it was an exogenous price shock that changed the incen-

tives for mechanization. We address these issues in turn.

Table 4 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.¹¹ This suggests that something is special about mechanization, consistent with our interpretation that mechanization signals high borrower quality.

We address the second point by noting that many scholars who have studied industrialization during the Meiji period (references), have argued that one of the factors that favored the emergence of silk as an export staple was that even mechanized silk reeling was not particularly capital intensive.¹² Also, 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.¹³ The exogenous shock that changed this was the decline in the price of hand-woven silk in the 1880s following the French depression (see Nakabayashi (2009)). High-grade silk, however increased in price due to the high demand in the US market. And this high, consistent grade silk could only be produced in mechanized silk filatures. It was this exogenous shock that completely changed the incentive for mechanization and also encouraged the implementation of quality control system through

¹¹Note 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.

¹²Mechanized 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.

¹³One 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 neighbouring 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.

cooperatives.

Hence, whether a region mechanized its silk reeling industry more or less strongly may have depended on pre-existing region-specific characteristics, including local differences in financial development. However, it is the interaction with the exogenous price shock that caused these differences to have a century-run impact on the local structure of the banking market: directly after Japan's opening, the degree of mechanization was very low. In all these prefectures, reelers had to obtain trade credit to finance cocoons but access to credit from the city banks was limited. The Yokohama silk brokers would advance trade credit against collateral, or against joint liability of a group of silk producers – spontaneous credit cooperatives. What is important for our argument is only that the silk reeling industry – mechanized or not – is associated with a special, regional model of banking. In the areas that mechanized successfully and therefore ultimately acquired the bulk share of the export market, this model proliferated successfully and served the regions well in their path to economic development. This preserved a large market share for regional banks that are less integrated with the rest of the country. In other areas the silk industry declined more quickly and was super-seeded by other industries whose development could not – or not to the same extent – be served by the regional banks.

Silk and modern-day small business importance

The regional cooperative banking model of the silk regions with its focus on small businesses and manufacturing may also have an impact on the cross-regional distribution of our SME measure at the onset of the 1990s recession. In fact, the silk sector led the way in Japan becoming a manufacturing nation. If our measures of SME importance and regional financial integration are too highly correlated, this could affect the interpretation of our results. Specifically, our finding that the impact of the Great recession is worst in areas with many small manufacturing businesses whenever financial integration is low would have little empirical content if the respective control groups (e.g. areas with low small business importance and low levels of financial integration) was essentially empty.

In Table 5 we address this issue by regressing our measures of SME importance on our silk-industry related variables. It turns out that the number of mechanized filatures is indeed an predictor of the share of small manufacturing businesses in the local economy before 1990. However, so is the distance to the main silk-producing regions (by output). When we put

the instruments together in a regression, it is only the distance that matters for manufacturing SME importance, not the number of mechanized filatures. Conversely, the last columns show that if we put both distance and the number of mechanized filatures into the same regression for measures of regional banking importance, it is mainly the degree of mechanization that is significant. Besides the prefecture-level lending share of Shinkin (industrial credit associations) we also use the founding year of the first Shinkin in a prefecture following the enactment of the Industrial Cooperative Act in 1901. Thus, similar to Aecmoglu and Johnson (2005), two separate instruments allow us to ‘unbundle’ the impact of the silk industry on different aspects of economic development: the learning-by-doing associated with the silk industry clearly had an impact on the spread of manufacturing but one would expect this spread to depend on geographical distance and not so much on the number of filatures.¹⁴ This is what we find. Conversely, it is mainly the level of mechanization that is important for the regional cooperative banking variables, not whether a region is close to an important silk region. This suggests that our results on the interaction between small firm importance and regional differences in financial integration are not mainly driven by a high correlation between the two variables.

Second-stage results

We wrap up the presentation of our results in Table 6 in which we repeat the estimates our baseline-specification but now with the sample split conducted on instrumented financial integration measures. We use the strongest set of instruments as implied by the first-stage *F*-statistics reported in Table 3: mechanized filatures and the Tokyo dummy for the regional bank’s lending shares and for Shinkins; for the city banks we also add the core dummy. The fitted values are then again split into a high financial integration group and a low financial integration group.¹⁵

As is apparent, all results from Table 1 go through: the recession is deeper in prefectures with a high share of small manufacturing businesses in value added or employment – provided financial integration was low. The coefficients in the low-financial-integration part of the sample is also very close to the OLS estimates in Table 1. In the high financial integration group,

¹⁴We obtain almost the same results if we use prefecture-level manufacturing shares instead of manufacturing shares of small businesses only.

¹⁵The results for the Shinkin are exactly identical to the ones obtained for the Regional banks as a whole. Since only one instrument is used, the sample split is independent of the coefficient on the instrument (log # of mechanized filatures) and this sorting is not affected by the inclusion of the Tokyo dummy.

the coefficients are somewhat more negative than they were based on the OLS estimates in table one but still generally just half the size of the coefficients for the high FI group and always insignificant. [...]

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 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 late 19th 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.

References

- Acemoglu, Daron, and Simon Johnson.** 2005. "Unbundling institutions." *Journal of Political Economy*, 113(5): 949–95.
- Bernanke, Ben.** 1983. "Non-Monetary Effects of the Financial Crisis in the Propagation of the Great Depression." *American Economic Review*, 73: 257–76.
- Bernanke, Ben, and Mark Gertler.** 1989. "Agency Costs, Net Worth and Business Fluctuations." *American Economic Review*, 79: 14–31.
- Gertler, Mark, and Simon Gilchrist.** 1994. "Monetary Policy, Business Cycles, and the Behavior of Small Manufacturing Firms." *Quarterly Journal of Economics*, 109 (2): 309–40.
- Guiso, L., P. Sapienza, and L. Zingales.** 2004. "Does Local Financial Development Matter?" *Quarterly Journal of Economics*, 119(3): 929–969.
- Hoshi, Takeo, and Anil Kashyap.** 2000. "The Japanese Banking Crisis: Where Did it Come from and How Will it End?" *NBER Macroeconomics Annual 1999*, 14: 129–201.

- Hosono, K., K. Sakai, and K. Tsuru.** 2007. *Consolidation of Banks in Japan: Causes and Consequences*. National Bureau of Economic Research Cambridge, Mass., USA.
- Imai, M., and S. Takarabe.** 2011. "Bank Integration and Transmission of Financial Shocks: Evidence from Japan." *American Economic Journal: Macroeconomics*, 3(1): 155–183.
- Jayaratne, Jith, and Philip E. Strahan.** 1996. "The Finance-Growth Nexus: Evidence from Bank Branch Deregulation." *Quarterly Journal of Economics*, 111 (3): 639–70.
- King, R. G, and R. Levine.** 1993. "Finance and Growth: Schumpeter might be right." *The Quarterly Journal of Economics*, 108(3): 717.
- Li, M. L.** 1982. "Silks by Sea: Trade, Technology, and Enterprise in China and Japan." *The Business History Review*, 56(2): 192–217.
- Morgan, Donald P., Bertrand Rime, and Philip E. Strahan.** 2004. "Bank Integration and State Business Cycles." *Quarterly Journal of Economics*, 119 (4): 1555–85.
- Nakabayashi, M.** 2001. "The Rise of the Modern Silk Reeling Industry and Financial Institutions: The Formation of the Institution of Providing Advances on Documentary Bills." *Japanese Yearbook on Business History*, 18: 119–139.
- Nakabayashi, M.** 2009. "Imposed Efficiency of the Treaty Port: Japanese Industrialization and Western Imperialist Institutions." *ISS Discussion Paper Series*.
- Petersen, M. A, and R. G Rajan.** 2002. "Does Distance still matter? The Information Revolution in small Business Lending." *The Journal of Finance*, 57(6): 2533–2570.
- Rajan, Raghuram G., and Luigi Zingales.** 1998. "Financial Dependence and Growth." *The American Economic Review*, 88(3): 559–586.

Table 1: 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	Regional Banks		City Banks		Regional Banks: Shinkins only		low
		high	low	high	low	high	low	
$Post1991_t \times SME_{VA}^k$	-0.07 (-2.04)	-0.13 (-4.04)	-0.01 (-0.19)	-0.0140 (-0.25)	-0.12 (-3.82)	-0.12 (-3.03)	-0.03 (-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	high	low	high	low	high	low
$Post1991_t \times SME_{EMP}^k$	-0.08 (-1.96)	-0.15 (-3.73)	0.01 (0.01)	-0.002 (-0.02)	-0.15 (-3.78)	-0.15 (-4.06)	-0.04 (-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 $\Delta gdp_t^k = \alpha \times Post1991_t \times SME^k + \mu^k + \tau_t + \epsilon_t^k + constant$ where $Post1991_t$ is a dummy indicating the period from 1991, SME^k is small-business importance and μ^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 2: Robustness – interaction terms and additional controls

	I	II	III	IV	V	VI	VII	VIII
	Regional	City	Regional	City	Regional	City	Regional	City
Interactions of $Post1991_t$ with pre1990 variables:								
... SME_{VA}^k	-0.09 (-4.16)	-0.07 (-2.85)	0.33 (2.19)	-0.45 (-3.57)	0.30 (2.39)	-0.47 (-3.68)	0.32 (2.70)	-0.52 (-4.19)
... $RegionalBankShare$	0.04 (0.89)		0.27 (3.04)		0.24 (3.31)		0.18 (2.67)	
... $CityBankShare$		-0.05 (-2.39)		-0.15 (-4.54)		-0.16 (-4.19)		-0.08 (-1.85)
... $SME^k \times RegionalBankShare$			-1.51 (-2.73)	0.68 (3.13)	-1.36 (-2.95)	0.72 (3.22)	-1.34 (-3.06)	0.81 (3.91)
... $SME^k \times CityBankShare$								
... $Lending / GDP$					-0.0006 (-1.28)	0.0003 (0.60)		
... $CoreArea$							-0.01 (-1.67)	-0.01 (-2.90)
$\Delta LandPrice_t \times CityBankShare$ (sample ends 2003)							0.15 (3.32)	0.19 (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 $\Delta gdp_t^k = Post1991_t \times [\alpha_1 SME_{VA}^k + \alpha_2 FI^k + \alpha_3 SME_{VA}^k \times FI^k + \alpha_4 X_t] + \mu^k + \tau_t + e_t^k$ where $Post1991_t$ is a dummy indicating the period from 1991, SME_{VA}^k 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). μ^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 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 3: First stage IV regressions for prefectural lending shares by bank type

	(log) share in prefecture-level lending by			
	City Banks	All (Shinkin+Sogo)	Regional Banks	Shinkins only
mechanized filatures	-0.02	-0.03	0.06	0.15
(log #)	-1.54	-2.39	(3.21) 3.20	4.36 4.17
(log) distance to Yokohama	-0.04	-0.04	-0.04	-0.22
	-1.72	-1.26	-1.26	-3.29
Tokyo-Dummy	0.48	0.30	-0.90	-1.04 -0.66 -1.27 -0.80
	3.33	2.46	2.30 -5.02	-4.84 -4.57 -1.83 -3.04 -2.13
Core Area		0.21	-0.03	0.17
		4.20	-0.36	1.19
1st-stage F-stat	6.97	7.33	12.34 18.54	11.98 12.15 11.59 7.22 8.27
R ²	0.24	0.25	0.47 0.46	0.36 0.46 0.35 0.25 0.37

The table shows results from the first-stage regression of pre-1990 average prefectural lending shares by bank type on our set of 'quality of lending relationship' instruments. '# of mechanized filatures' refers to the number of machine-equipped silk filatures in a prefecture in 1895 and (log) distance to Yokohama measures the distance to Yokohama, the main silk port, in kilometers. Core areas are Tokyo, Osaka, Aichi, Kanagawa, Chiba, Saitama, Hyogo and Kyoto prefectures.

Table 4: Impact of alternative silk-related variables on pre-1990 financial integration measures

	(log) share in prefecture-level lending by		
	City Banks	All (Shinkin+Sogo)	Regional Banks Shinkins only
hand filatures (log #)	-0.01	0.02	-0.01
	-0.28	0.77	-0.20
mechanized filatures (log #)	-0.03	0.05	0.14
	-2.28	3.01	4.10
output: hand reeled (log tons)	0.00	0.00	0.02
	0.21	0.17	0.42
output: machine reeled (log tons)	-0.03	0.06	0.11
	-2.38	3.32	2.65
Tokyo Dummy	0.29	-0.85	-1.07
	2.16	-4.29	-2.54
Core Area Dummy	0.21	-0.03	0.18
	4.16	-0.43	1.19
1st-stage F-stat	9.07	9.18	6.07
R^2	0.47	0.47	0.37
			0.26

The table shows results from the first-stage regression of pre-1991 average prefectural lending shares by bank type 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. Core areas are as described in previous table.

Table 5: Silk, SME importance and development of regional cooperative banking

	SME by VA	SME by EMP	Founding Year 1st Shinkin	Shinkin lending share
IV first stage				
# of mech. filatures (log)	0.02 (4.06)	0.11 (4.85)	-0.001 (-2.73)	0.15 (4.33)
log distance to main silk regions	-0.0389 (-7.65)	-0.23 (-6.94)	0.001 (1.81)	-0.24 (-3.95)
	0.27	0.57	0.15	0.30
	0.57	0.57	0.07	0.26
			0.15	0.34

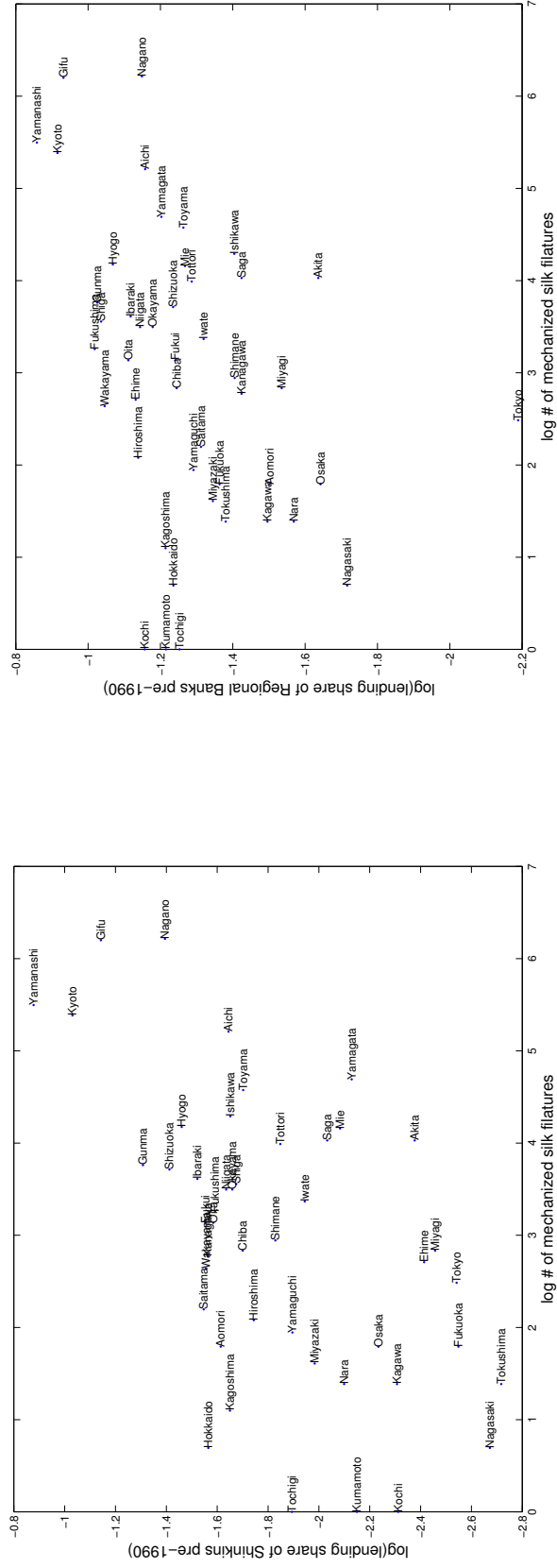
The table shows regressions of pre-1990 SME importance measures and of regional cooperative banking indicators (pre-1990 lending share of Shinkin banks and the founding year of the first Shinkin in the respective prefecture) on alternative silk-industry related instruments. ' # of mech. filatures ' refers to the number of mechanized silk filatures in a prefecture in 1895. The distance to the main silk regions is measured vis-a-vis the four main silk-producing regions (in terms of total output) in 1895: Gifu, Nagano, Yamanashi and Aichi. Founding year of the first Shinkin is measured as $\log(\text{Year}/1901)$ where 1901 is the year of the promulgation of the industrial cooperative act.

Table 6: Small firms, traditional financial institutions and financial development - IV estimates

	Sample split by importance of instrumented financial integration as measured by					
	Regional Banks		Shinkin & Cooperatives		City Banks	
	high	low	high	low	high	low
$Post1991_t \times SME_{VA}^k$	-0.12 (-3.03)	-0.03 -0.70	-0.06 (-1.19)		-0.11 (-2.61)	
R^2	0.57	0.55	0.56		0.56	
$Post1991_t \times SME_{EMP}^k$	-0.14 (-2.46)	-0.05 (-0.83)	-0.09 (-1.46)		-0.13 (-2.45)	
R^2	0.57	0.55	0.57		0.56	
Instruments	#mech. silk filatures Tokyo Dummy		#mech. silk filatures Tokyo Dummy Core Area dummy			

The table shows the coefficient α in panel regressions of the form $\Delta gdp_t^k = \alpha \times Post1991_t \times SME_t^k + \mu^k + \tau_t + \epsilon_t^k + constant$ where $Post1991_t$ is a dummy indicating the period from 1991, SME_t^k is small-business importance based on the value added (VA) and employment (EMP) based measures respectively and μ^k and τ_t are prefecture-fixed and time effects respectively. Sample period is 1980-2005. Regional banks include 2nd tier regional banks (Sougo), industrial credit cooperatives (Shinkin) and agricultural cooperatives. OLS estimates, t-statistics in parentheses. Standard errors are clustered by prefecture. The lending share of regional banks, city banks are instrumented using the best (in terms of 1st stage F-stats) set of instruments as shown in Tables 3-5 and as indicated below the regression results.

Figure 1: Regional Bank Lending Shares (pre-1990 averages) vs. number of mechanized silk filatures



NOTE: Left panel shows link for Shinkin banks (small business industrial credit associations), right panel for all regional banks (Shinkin+Sogo (mutual) banks))