'By a Silken Thread': regional banking integration and pathways to financial development in Japan's Great Recession[1]

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Abstract

Regional differences in banking integration determined how Japan's Great Recession after 1990 spread across the country. We explain these differences with the emergence of silk reeling as the main export industry after Japan's opening to trade in the 19th century. The silk-exporting prefectures developed a system of export finance centered on local, cooperative banks that preserved their dominant local position long after the decline of the silk industry. Our findings suggest that different pathways to financial development can lead to long-term differences in *de facto* financial integration, even if there are no formal barriers to capital mobility between regions.

JEL-CODES: F15, F30, F40, G01, N15, N25, O16

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Introduction

How do financial development and financial integration interact? We focus on Japan's Great Recession after 1990 to study this question. First, we illustrate how the regional segmentation of Japan's banking market influenced the way in which the recession affected different parts of the country. Prefectures with many credit-dependent, small manufacturing firms grew more slowly after 1990. This effect was particularly strong in prefectures in which regional banks dominated the local market, while it was substantially mitigated in areas with high market shares of nationwide banks. Higher levels of regional banking integration therefore contributed to dampening the effects of bank dependence, consistent with the view that banking integration improved local firms' access to credit.

We then 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 credit and export finance in which regional, cooperative or mutual banks came to play a key role in local banking markets. 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, countrywide shock—the bursting of Japan's asset price bubble in the early 1990s—was transmitted to different parts of the country literally hung 'by a silken thread' that was reeled 100 years earlier, during the days of Meiji-era Japan (1868–1912).

Our empirical approach builds on a large body of literature initiated by Rajan and Zingales (1998). We identify cross-regional differences in credit dependence using the output or employment share of small manufacturing firms in each prefecture. Our main measure of regional financial integration is the prefecture-level market share of big banks that operate countrywide (termed 'city banks') as opposed to that of purely regional lenders (mainly small cooperative and mutual banks). We find that the effects of credit dependence on post-1990 growth were compounded by low levels of financial integration: over the period 1991–2005, some of the most credit-dependent prefectures may have grown by up to 0.7 percentage points per year less because of their low

levels of financial integration. We identify the lending behavior of the large, nationwide banks as the transmission channel from the financial shock to the real economy: nationwide banks restricted lending more in prefectures in which ties between small manufacturing firms and regional banks where traditionally tight, while continuing to lend in other areas in which nationwide banks themselves had relatively strong ties with small manufacturing firms.

The second part of our analysis then turns to the question: what determines variation in the degree of financial integration across prefectures? We turn to Japan's economic history to argue that cross-prefectural differences in financial integration at the onset of the Great Recession can, to a large extent, be explained by the regions' different historical pathways to financial development. After Japan's opening to 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, silk reelers had to purchase cocoons, which accounted for more than 80 percent of their operating cost. This made the silk reeling business highly 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. The silk reelers therefore often founded cooperative or mutual banks that provided operating loans against so-called 'documentary bills' drawn on reputed Yokohama silk export merchants, to whom the reelers would ship their produce after having reeled the cocoons. As a result of their central role in this system of export finance, regional cooperative or mutual banks became particularly important (compared with large, nationwide banks) in the silk-producing regions. As we show, these regional differences in banking structure persisted even after the silk industry had virtually vanished, which happened by the mid-20th century. Regional banks operating in Japan today often have their origins in these small-scale cooperative institutions that emerged in the late 19th century.

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 that of city banks) 100 years later, at the onset of Japan's Great Re-

cession, and therefore of the degree of regional banking integration after 1990. We then use the prefecture-level variation in the number of silk filatures (reeling factories) in the late 19th century as an instrument for financial integration in the 1980s. We corroborate our previous results: the negative effect of credit constraints on output growth in the recession after 1990 was worse in less financially integrated areas.

Our results shed new light on the interdependency between financial development and financial integration: 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, large-scale bank finance was extremely important in developing other industries—cotton reeling, railways, steel milling and coal mining—whereas the main silk reeling areas achieved economic growth through financial development based mainly on 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 for over a century. As we argue, these regional differences in the level of financial integration, in turn, had a considerable impact on small firms' access to finance during the crisis and on post-crisis growth differentials between prefectures.

Contribution to the literature

Our study incorporates and builds on several strands of literature. First, we contribute to the empirical literature on financial development and macroeconomic performance (King and Levine (1993), Rajan and Zingales (1998), Jayaratne and Strahan (1996) and 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 is more on the implications for business cycles and medium-term growth, and on intranational (regional) differences in financial structure. Here, we have precursors in the work of Jayaratne and Strahan (1996), Morgan, Rime and Strahan (2004), Dehejia and Lleras-Muney (2007) and Rajan and Ramcharan (2011) for the United States and Guiso, Sapienza and Zingales (2004) for Italy. We add an important, novel aspect to this literature by illustrating how differences in financial *integration* can be the outcome of alternative

pathways of financial *development*. Each model of financial development—the system of small, regional, cooperative banks for the silk-producing regions and the system of large, nationwide banks for other regions—seems to have served the specific financing needs of each region's major industries at the time, and each seems to have been instrumental for regional economic development over the past century (see Miwa and Ramseyer (2006)). Today, the regions that form modern Japan at first sight appear to be highly financially integrated, and they share the same regulatory and legal framework. Despite this, the different historical pathways have created interesting heterogeneity in terms of regional differences in *de facto* financial integration. We argue that these differences influenced the spread of a large, common shock across the country 100 years later (the Great Recession).

Our results shed new light on the debate about the interdependency of financial development and financial integration, and their roles in growth and the transmission of macroeconomic disturbances. Studies in the spirit of Rajan and Zingales (1998) emphasize that financial development has a particularly strong impact on sectors that are especially dependent on external finance. This implicitly assumes that firms in these credit-constrained sectors cannot substitute local access to financial markets for finance from other countries or regions. An important question, therefore, is whether financial development matters *per se* or because it often arises in conjunction with a low degree of financial integration. Guiso, Sapienza and Zingales (2004) show that differences in local financial development can matter even in integrated financial markets. By contrast, Bekaert et al. (2007) argue that it is mainly financial integration—stock market and banking integration, in particular—rather than local financial development *per se* that removes financial constraints and helps in aligning growth opportunities with actual growth rates.

Our empirical findings complement the results in these papers. *Prima facie*, we find that differences in financial integration (rather than differences in local financial development) mattered most directly for the macroeconomic transmission of the shocks associated with the Japanese crisis: credit-dependent prefectures performed significantly worse if their banking sectors were poorly integrated with the rest of the country, irrespective of how financially developed they were in other respects. What we do find, however, is that a prefecture's particular pathway to financial

development effectively determined its *de facto* level of financial integration with the rest of the country, which, in turn, affected the regional spread of the crisis. We believe that this result is interesting at a general level because it suggests that *de facto* differences in financial integration can persist even in an environment in which formal barriers to interregional capital mobility are very low, as is certainly the case in modern Japan.[1]

Our results also bear an interesting resemblance to the findings by Do and Levchenko (2008), who show that export structure may be an important determinant of financial development: countries with a comparative advantage in industries with high external finance dependence will ultimately develop a financial sector that is suited to sustaining these industries, whereas countries specializing in industries with low external finance dependence will have lower financial development. Our findings here suggest that a prefecture's comparative advantage in a key export industry (silk reeling) determined the development of financial institutions in that prefecture. However, our results do not allow us to conclude whether silk regions ultimately have higher or lower levels of financial development. For our argument it is, however, sufficient that the silk regions have developed financial institutions that are different from those in other regions, in such a way as to render the silk regions effectively less financially integrated with the rest of the country during the 1990s.

The Japanese experience after 1990 has been studied in significant detail from a macroeconomic perspective or based on bank- and firm-level data. However, there is significantly less evidence about the implications of the crisis (and about the importance of regional differences in financial integration) for regional business cycles and medium-term growth. We provide such evidence here. By using the bursting of Japan's big property and stock market bubbles of the 1980s as an identifying shock to banks' lending behavior , we follow the lead of Peek and Rosengren (1997), Peek and Rosengren (2000), Amiti and Weinstein (2011) and Imai and Takarabe (2011). We also

[1]Relationship lending by banks (Berger and Udell (1995)) is one possible reason why regions are imperfectly integrated. As we will argue, in the case of Japan such networks of banking relationships have long-standing historical roots that may have given regional banks an informational advantage with respect to local customers (in particular, small businesses). This may have prevented these businesses from obtaining credit from nationally integrated banks in a downturn—leading to a *de facto* segmentation of markets even though there are no formal impediments to capital flows. See Berger et al. (2005) for the role of small banks in relationship lending and Uchida, Udell and Watanabe (2008) for an analysis of Japanese banks in particular.

add a regional dimension to the literature on the role of international banking in the cross-country transmission of shocks (Peek and Rosengren (2000, 1997) and Cetorelli and Goldberg (forthcoming)).

Peek and Rosengren (2000) emphasize the 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 they often had only recently entered. One way to interpret their results is as evidence of relationship lending: banks withdraw from regions with which they have relatively weak ties. Our results are consistent with this 'weak local ties'–view: we shows that city banks reduced their lending much less in areas where they traditionally had a high market share and where, at the same time, there were many small firms.[2] Cetorelli and Goldberg (forthcoming), who show that the internal liquidity management of internationally active US banks played a key role in the transmission of domestic (i.e. US) liquidity shocks to foreign economies.

Imai and Takarabe (2011) show that more financially integrated prefectures were more exposed to the crisis. We corroborate their results but add that this negative effect of financial integration was substantially mitigated in areas with many bank-dependent firms. Higher levels of regional banking integration contributed to better access to credit for bank-dependent small firms.

Amiti and Weinstein (2011) use differences in the external finance dependence of exporting and nonexporting firms to identify the impact of bank-level loan supply shocks on real economic activity. In our analysis, we focus on differences in credit dependence and credit supply between prefectures to identify the impact of financial constraints on real economic activity.

Our 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.

[2]Note that the weak–ties interpretation does not require that there was a preferential lending policy of nationwide banks towards small, bank-dependent firms. In view of the overwhelming evidence in favor of preferential lending to large firms, this most likely was not the case. For the relationship-based lending explanation to work, however, it is sufficient that nationwide banks were more likely to lend to small firms in areas where there were strong relationships with small firms rather than in areas where such relationships were rare. Clearly, it seems plausible that such ties are indeed stronger in areas where nationwide banks traditionally had a high market share and where, at the same time, there were traditionally also a lot of bank-dependent small firms.

Our focus here is on the regional implications of a common (countrywide) shock over time.

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 these borrowers or the banks themselves would eventually be bailed out by the government. This led to the emergence of a class of 'zombie' firms, i.e. insolvent firms that starved other, productive firms of credit and hindered the creation and growth of new firms, and thus stifled growth in the aggregate economy (Caballero, Hoshi and Kashyap (2008)). As we discuss in detail, our results are consistent with evergreening. We find evidence that lending to particularly 'zombie' prone sectors was less pervasive in areas in which city banks had traditionally strong ties to small manufacturers. Conversely, city banks may have withdrawn credit from areas in which they had traditionally weak ties to small manufacturers in order 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 as it did. These historical aspects of our results build on literature showing that Japan's opening to trade was indeed a natural experiment. Bernhofen and Brown (2005, 2004) demonstrate that this opening spurred the development of industries in which Japan had a comparative advantage, with the silk industry as a preeminent example. The role of special institutions involved in trade credit and export finance for the development of the silk industry has been explored by several scholars of Japanese economic history (e.g. Nakabayashi (2001) and Miwa and Ramseyer (2006)).[3] However, to our knowledge, we are the first to identify the persistence of the role of these institutions, and that it led to a regional segmentation in banking markets that lasted for over a century. In explaining these differences in banking market structure, we also relate to 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

[3]The terms 'trade credit' and 'trade finance' are ambiguous in the literature. We follow Amiti and Weinstein (2011) and use the term 'trade credit' to denote financing by suppliers (e.g. by allowing deferred payment of materials). By contrast, the term 'trade finance' refers to the financing of international trade. As we argue below, both concepts are relevant in understanding the development of the institutions financing the silk trade. To further facilitate the distinction between the two concepts, in the remainder of the paper we do not use the term 'trade finance' but instead refer to financing of international trade as 'export finance'.

in environments with low financial development (Fisman and Love (2003)). Most silk reeling firms were located in remote prefectures and were unable 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 run, only mechanized reelers were able to provide the consistently high quality of silk required by international markets (in particular the US). Therefore, only the prefectures in which there was a high concentration of reeling firms (and in which these firms switched to mechanized production quite early) could keep their competitive advantage, and these eventually became the main silk-exporting regions. Furthermore, with Yokohama as the export hub, eventually only regions that were able to export internationally enjoyed continued access to the particular form of credit provided by the Yokohama silk merchants.[4,5]

There are a number of explanations of why the silk industry had such a long-lasting effect on Japan's regional banking landscape. First, the specific type of regional bank that emerged in the silk regions served its purpose well: scholars of Japan's economic and social history have noted that these institutions—many of them organized as cooperatives—successfully resolved the financing frictions faced by the fragmented silk industry, whereas big national banks tended to cater to the financing needs of large-scale, capital-intensive industries such as cotton reeling, railroads and heavy industry (see Miwa and Ramseyer (2006)). As the silk industry remained the foremost export industry until the onset of World War II, it is not surprising that its small-scale, regional institutions shaped Japan's banking landscape well into the 20th century—in fact, until after the war.[6] Heavy regulation of Japanese banking in the post-WWII era—the 'convoy system' and separate legal frameworks for Shinkins (industrial and commercial cooperative banks) and Sogo (mutual) banks—then consolidated this *de facto* separation of regional banking markets for at

[4]As we discuss in detail below, the institutional details of the silk trade resemble those of modern export finance as described in Amiti and Weinstein (2011). In this system, the silk reelers played the role of the 'exporting' firm, the Yokohama-based silk merchants played the role of the 'importer' and regional banks acted as the exporters' 'advising' bank. Large Yokohama banks essentially issued letters of credit on behalf of the Yokohama silk merchants, but they did not generally lend to the silk reelers directly. This is likely to have led to a long-term informational advantage for the regional banks with respect to their customer base of small businesses, thus contributing to banking market segmentation long after the eventual decline of the silk industry.

[5]To our knowledge, no prefecture-level data on silk exports exist, so this argument cannot be directly tested. However, our reasoning implies that early mechanization, if it is linked to export success, should also be linked to the persistence of the regional system of banks. In our empirical analysis below, we show that this is indeed the case.

[6]This is plausible because the regional distribution of economic activity remained remarkably stable after the war (see Davis and Weinstein (2002)).

least the next 40 years.

An important challenge faced by studies in the spirit of Rajan and Zingales (1998) (such as ours) is that access to finance may affect industrial structure in the long run: areas where access to finance is poor will have a comparative advantage in industries with low levels of external finance dependence (see Fisman and Love (2004) and Bekaert et al. (2007)). If this was the case, this could lead us to overestimate the importance of low levels of financial integration for economic activity in areas with high levels of credit dependence: areas with low levels of financial integration would then simply not be very dependent on credit in general. To show that our results are not affected by this objection, we also estimate specifications in which we allow for the possibility that the pre-1990 prefecture-level output shares of small manufacturing firms—our main measure of credit dependence—may be endogenous, in the sense that they were influenced by the path to financial development taken by the prefecture since the late 19th century. We overcome the endogeneity by building on insights from the literature on agglomeration effects and knowledge spillovers (see Glaeser et al. (1992)), using a prefecture's distance to the main silk regions as an exogenous measure of growth prospects in the manufacturing sector in the late 19th century. Using this measure as an additional instrument, we then treat both financial integration and financial dependence as endogenous in our regressions. Our previous results remain valid.

The remainder of this paper is structured as follows. Section 2 provides background on our identification strategy. Section 3 presents results on how financial integration impacted on post-1990 transmission of the crisis. Section 4 discusses the historical background of the regional segmentation of Japan's banking market and introduces our instrument. Section 5 discusses our results further and concludes.

Identification: small business finance and regional banking in Japan

From a theoretical point of view, the effect of regional banking integration during a major crisis such as Japan's is ambiguous. On the one hand, more integrated prefectures are more exposed to bank liquidity shocks that originate outside the region. Higher financial integration would then be associated with a deeper recession and lower post-1990 growth. One the other hand,

higher levels of banking integration improve local access to finance for bank dependent firms and households. Financial integration would then be expected to mitigate the impact of the crisis in particularly bank dependent areas because it lowers barriers to the free flow of credit from outside the region. Our identification builds on Rajan and Zingales (1998) in arguing that the trade-off between costs and benefits of banking integration varies across prefectures. Specifically, given its costs, the benefits from banking integration (in the form of improved local access to finance) should be relatively more important in prefectures where dependence on bank credit is stronger. Hence, the interaction between dependence on bank finance and access to finance should play a key role in determining how severely the crisis hits a region. [7]

As our primary measures of a prefecture's dependence on bank finance, we use the share of small manufacturing firms in the prefecture's output or employment. Our data are from Japan's manufacturing census, and they provide a detailed account of value-added and employment according to firm size in the manufacturing sector.

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 which 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 by bank type from the Bank of Japan. These data allow us to distinguish between lending by 'city banks' (i.e. nationwide and first-tier regional banks), second-tier regional mutual banks (Sogo banks), industrial credit associations (Shinkins), and agricultural, fishery and other credit cooperatives. Our data set also contains prefecture-level lending by the post office and by *Shoko Chukin*, a government-sponsored bank lending to small businesses nationwide.

Until the onset of the Great Recession of the 1990s and the ensuing banking crisis, Japan's banking system was clearly regionally tiered and segmented (Hoshi and Kashyap (2004); Kano

[7] We differ from Rajan and Zingales (1998) in two respects. First, Rajan and Zingales (1998) focus on the level of financial development more generally. However, as we will argue and illustrate in more detail below, our result suggests that it is mainly the regional segmentation of the banking market (rather than differences in the local development of these markets) that seems to drive our results. Secondly, we will exploit regional variation in the dependence on bank credit whereas Rajan and Zingales (1998) emphasize cross-sectoral differences in external finance dependence, irrespective of whether finance is obtained from banks or e.g. the bond market. In the remainder of the paper, unless otherwise noted, we will use the term credit dependence to mean specifically the dependence on bank credit (and not external finance dependence more generally).

and Tsutsui (2003)). The big city banks are the foremost lenders overall and are the main banks that 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 combined in our measurements; for brevity, we refer to these large banks collectively as city banks. The post office and 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) and industrial credit associations (Shinkins).[8]

Many of the regional lenders are cooperative or mutual banks. Below we discuss in detail the origins of many of these banks in the development of cooperatives in the silk reeling sector in the late 19th century. From the outset, they were set up mainly to lend regionally, not nationally. Furthermore, constrained by regulation and statutes, they largely continued to operate regionally until the end of the 1980s. During the postwar era and well into the 1990s, government regulation under the convoy system restricted these regional banks from opening branch networks outside their prefecture of origin (see Hoshi and Kashyap (2000) and Hosono, Sakai and Tsuru (2007) for details). The situation was similar before World War II: while a national banking market had started to develop during the late 19th century, regional banking integration in the prewar era remained limited.[9]

The group of industrial credit associations (Shinkins) allows us to illustrate the regional segmentation in Japan's banking sector. Shinkins are cooperative banks that lend exclusively at a regional level and to their members, which are small businesses. Their historical roots are in the industrial and commercial cooperatives founded in the late 19th century—in particular, those in the silk industry. An industrial cooperative law governing the operation of such credit cooperatives was enacted in 1900. The Shinkins' operation today is governed by the Shinkin Bank 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

[8]Our data set also provides detail on lending by other nonagricultural cooperatives by prefecture, and we also include this item in our measure of regional bank lending.

[9]Grossman and Imai (2008) study the impact of banking integration on spreads between borrowing and lending rates and on their cross-prefectural dispersion during that period. While they find that regional markets gradually became more integrated during the 1920s and 1930s, they conclude that significant regional fragmentation ultimately persisted. They ascribe this to the very anticompetitive banking regulations of the period.

employment) threshold. Hence, by virtue of the legal restriction faced by Shinkins, their lending is a) particularly likely to be directed at small businesses and b) very clearly restricted to their prefecture of origin. Hence, we expect the lending share of Shinkin banks to be a good measure of regional segmentation (see Kano and Tsutsui (2003) and the literature surveyed therein). The situation is similar for second-tier regional banks (Sogo banks), which also lend mainly locally but are generally not quite as severely restricted by their governing statutes.[10]

Our two main measures of regional banking integration therefore are the share of regional banks (Sogo banks, Shinkins and other credit cooperatives) and the share of nationwide banks (i.e. city and first-tier regional banks) in prefecture-level lending. We refer to the former as the 'regional bank' share and to the latter as the 'city bank' share. By construction, the regional bank 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 nationwide (government-sponsored) banks, and so the joint share of Sogo banks and Shinkins 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. [11]

Econometric implementation

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

$$\Delta gdp_t^k = \alpha AggShock_t \times SME^k + \mu^k + \tau_t + \epsilon_t^k \tag{1}$$

[10]The separating line between first- and second-tier banks started to blur in the late 1980s and 1990s. Many second-tier (Sogo) banks were purchased by first-tier regional banks or city banks throughout the 1980s. In the Bank of Japan data set that we use, Sogo banks no longer appear as a separate item after 1990. Furthermore, since the mid-1980s, some of the Sogo banks have had access to the interbank market, whereas Shinkins have not.

[11]Our interpretation of these lending shares as measure of financial integration is further buttressed by their high correlation with a widely used macroeconomic indicator of financial integration, that is, 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 term with our regional and city bank lending shares. The coefficient of the interaction terms is significant in both specifications, and is negatively signed for the city banks' lending share and positively signed for the regional banks' lending share.

where Δgdp_t^k is GDP growth in period t in prefecture k, SME^k is a measure of the precrisis (i.e. before 1990) importance of small businesses (termed 'small business/firm importance') in prefecture k and $AggShock_t$ is a measure of the aggregate shock that hit the economy in 1990. The terms $\mu^k$and τ_t are prefecture-fixed and time effects, respectively, and ϵ_t^k is the error term. Most of our result are based on choosing

$$AggShock_t = Post1990_t$$

where $Post1990_t$ is a dummy that is zero until 1990 and one from 1991 onward. This specification allows us to focus on the effects of the crisis on average post-1990 growth rates. For robustness, below we also report some of our results based on alternative measures of the aggregate shock, such as the land price decline in the core prefectures

Specification (1) allows the impact of the aggregate shock on prefecture-level GDP growth to vary as a function of small business importance in a given prefecture. As we have discussed, this is an indicator of the prefecture-level demand for, or dependence on, bank credit. Our conjecture—based on Rajan and Zingales (1998) —is that the link between bank dependence and aggregate GDP growth is negative: when the crisis dummy variable changes 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 method of testing this hypothesis is to split the sample into one group of prefectures with high financial integration and another group with low financial integration, and 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

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

where FI^k is one of our measures of financial integration discussed above, and 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. Z_t^k is a vector of additional controls that may vary by time and prefecture, and $\boldsymbol{\beta}$ the associated vector of coefficients.

In this specification, the marginal effect of credit dependence is given by

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

and our conjecture is that higher financial integration would mitigate the effect of bank dependence on post-crisis growth, so that $\alpha_0 > 0$.[12] Regression (2) allows us to capture the trade-off between positive (better local access to finance) and negative effects (potentially larger exposure to bank liquidity shocks) of banking integration in fexiible way. Note in particular that the marginal effect of higher financial integration, $\alpha_0 SME^k + \alpha_1$, can be negative for sufficiently negative values of α_1, even if $\alpha_0 > 0$. Thus, whether higher financial integration is associated with lower or higher post-1990 GDP growth overall will depend on the specific prefecture-level characteristics.

Regression (2) is a differences-in-differences (DD) specification in which the interactions with 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 run. Rather, we argue that there are long-standing differences in the degree of financial integration or small business importance that have long-term effects. We want to focus on those. [13] 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) significantly improves the reliability of DD estimates.

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

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

Data

Our data are at the prefectural level. There are 47 prefectures in Japan. We drop Okinawa prefecture, which had a special status as a US territory until the early 1970s and still remains economically separate from the mainland in many ways. Hence, there are 46 prefectures in our sample. Nominal prefectural GDPs are taken from the *Annual Report on Prefectural Accounts* (Cabinet Office of Japan). We obtain per capita values using population data from the same source. We deflate using the countrywide consumer price index, obtained from the Ministry of Internal Affairs and Communications of Japan. The importance of small manufacturing firms in terms of employees and value added at the prefectural level is taken from the *Manufacturing Census of Japan* by the Ministry of Economy, International Trade and Industry.[14] We define small and medium manufacturing enterprises (SMEs) as having fewer than 300 employees.[15] The lending data by bank type (City and first-tier regional bank, Sogo banks, Shinkin, Shoko Chukin, etc.) at the prefecture level are taken from the *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 largely 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. Specially, data on the number of silk filatures in the late 19th century are taken from *Zenkoku Seishi Kojo Chosa* (*Survey of Silk-reeling Factories throughout Japan*). Filatures are classified by whether they used mechanized-reeling or hand-reeling equipment and by total production per year (again: by machines, by hand and in total), all at the 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. Prefecture-level data on population in 1895 are from the *Nihon Teikoku Minseki Kokouhyo* (*Registered Household Tables of Imperial Japan*).

[14] 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 the 1980s and 1990s.

[15] Note that this cut-off is also consistent with the 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 averages over the period 1980–1990 of city bank lending shares and of our measure of SME importance (by valued added). The last two columns report post-1990 (1991–2005) prefectural GDP growth rates and the growth rates of lending by city banks. We also highlight the core economic areas that may differ from the rest of the country: these include Greater Tokyo (Tokyo, Chiba, Saitama and Kanagawa—with Yokohama as the major city), the Kansai region (Osaka, Hyogo—with Kobe as the major city—and Kyoto) and Aichi prefecture (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 55 percent, ranging from just over 40 percent in prefectures such as Kochi, Kagoshima, Gifu and Nagano (the latter two of which are silk prefectures, as we will see later) to over 70 or even 80 percent in Greater Tokyo and other core prefectures. The GDP share of small manufacturing firms is around 16 percent, ranging from around 10 percent in remote prefectures such as Hokkaido (in the north) and Kagoshima (in the southwest) to almost 25 percent in Gifu, Shiga and Saitama.

Post-1990 GDP growth (per capita) was particularly low (or strongly negative) in some of the core areas, which were particularly exposed to the bursting of the stock market and property bubbles. Prefectures such as Tochigi, Gunma and Yamanashi even 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 Miyazaki and Saga in the west.

A visual 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 the geographical dispersion of SME importance and financial integration (the city bank lending share). Clearly, the city bank share is highest in the core areas: the Greater Tokyo and Kansai 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 areas surrounding 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 significant variation in GDP growth rates across prefectures, and again many areas in central Japan have relatively low growth rates.

Baseline results

Table 2 presents our first set of results: Panel A for the measure of small business importance based on value added and 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 affected more severely by the crisis. Increasing the share of small manufacturing firms in employment or output by just one percentage point lowers the average growth rate by between 0.07 and 0.08 percent but the effect is significant only at the 10 percent level.

However, once we split the sample into two groups of 23 prefectures according to the levels of financial integration, based on our measure of the lending shares of regional and city banks, we find that the previous estimate of $0.07 - 0.08$ masks considerable heterogeneity across prefectures. In the group with low financial integration (i.e. a high regional and low city bank share), post-1990 growth depends much more strongly on SME importance: the estimated coefficient is consistently between -0.12 and -0.15 and is highly significant in all specifications. Increasing the prefecture-level share of small manufacturing firms in value added by one standard deviation (around 0.05) lowers that prefecture's output growth rate by between $0.12 \times 0.05 = 0.006$ and $0.15 \times 0.05 = 0.0075$. This suggests that in the least financially integrated parts of the country, some of the most credit-dependent prefectures may have experienced growth rates that were between 0.6 and 0.75 percentage points lower than that of a prefecture with an average level of credit dependence. Conversely, in regions whose banking sectors are highly integrated with the rest of the country, there appears to be no significant link between small business importance and the depth of the recession. This is our first main result. Our interpretation of this finding is that

bank dependent small firms faced more severe credit constraints in regions where cross-regional banking flows were limited.

In Table 3, we report results for the 'full' regression specification (2). Again the negative effect of credit dependence on post-1990 growth appears stronger in prefectures with low levels of banking integration. We control for cross-prefecture total lending in a prefecture relative to its GDP as a measure of financial depth (columns V and VI) and include a dummy indicating whether a prefecture is a core economic area (Tokyo, Osaka, Aichi, Kanagawa, Chiba, Saitama, Hyogo and Kyoto prefectures) in columns VII and $VIII$. The core dummy is highly significant, suggesting that the core areas were indeed hit more severely by the crisis.

We emphasize that our results do not imply that financial integration is unequivocally good for post-1990 growth. In all regressions in Table 3, the coefficient α_1 on the first-order term for financial integration is significantly negative for the regional bank lending share and positive for the city bank lending share. However, the coefficient on the interaction between credit dependence (small firm importance) and financial integration shows that the trade-off between costs and benefits of banking integration is more favorable for regions with high levels of bank dependence. To appreciate this effect quantitatively, consider the basic specification in column IV of Table 3 and a prefecture with an average share of small firms in GDP, which according to Table 1, is 16 percent. For this prefecture, the marginal effect of an increase in the city bank lending share by one standard deviation (9 percent) actually leads to a decrease in the prefecture's annual post-1990 growth rate of only 0.37 percentage points. Conversely, for a prefecture with an around 11 percent share of small firms in GDP (roughly one standard deviation below the national mean), the marginal effect of an increase in the lending share of city banks would have led to an annual growth loss of 0.7 percentage points. For a prefecture with a small firm share of 21 percent (one standard deviation above the national mean), the marginal growth loss from a one standard deviation increase in the city lending share is virtually zero. The numbers are similar for the specifications that use regional banks' lending share. Hence, while the overall marginal effect of an increase in financial integration may still be negative, the negative growth effects that may be associated with high levels of bank dependence are strongly mitigated by higher levels of financial integration.

Robustness and alternative measures of the aggregate shock

In Table A.1 in the appendix, we report on a number of additional robustness tests. We control for geographical features by including the share of lowland in a prefecture's area and its ruggedness (defined as the share of of surface area with a steepness gradient above 15 degrees) into the interactions. These data are from the Japan Statistical yearbook. We also control for differences in sectoral composition by including measures of sectoral specialization into the interaction. Finally, we include a set of dummies for Japan's eight regions ((Hokkaido, Tohoku, Kanto, Chubu, Kansai (Kinki), Chugoku, Shikoku, and Kyushu), . This does not affect our results.

The interaction between SME and FI could be picking up some non-linearity in the impact of small firm importance on post-1990 growth that is related to financial integration but not explained by it. For example, it could be the case that for some other reason the impact of small firms on local growth was particularly strong in the areas where the silk reeling industry first started (and where, for reasons we discuss later) regional banking also happened to be predominant. We therefore include quadratic terms in both FI and SME in the interaction. However, these quadratic terms are not significant, whereas our estimate of the coefficient on the interaction of $SME \times FI$ remains significant and quantitatively unchanged.

In Table A.2 we also report report results based on an alternative measure of the aggregate shock, the price of land in the main city prefectures as constructed by Imai and Takarabe (2011). In these specifications we also control for local land price movements. Again, this does not affect our results. Note that, of course, all signs change because the shock now is the decline in the price of land (whereas our previous dummy indicator for the crisis increases after 1990). We corroborate the findings by Imai and Takarabe: the first order effect of financial integration is negative, in the sense that more financially integrated prefectures were more exposed to the shock. However, our previous result holds up: the negative impact of financial integration in transmitting the shock was considerably mitigated in areas with many bank dependent firms. Again the findings are robust with respect to different sets of controls.

Financial integration and local financial development

Our results so far may raise the question of whether it is really the segmentation of banking markets that drives our results or whether we just pick up general differences in local financial development among the prefectures. We explore this point in Table 4, which reports the same basic regression as Table 3, but now we also include an interaction variable between credit dependence (SME) and various measures of financial development (FD): in column I, our measure of FD is the density of financial intermediaries' branches in a prefecture. The coefficients of SME and $SME \times FD$ are both insignificant, whereas the coefficient of financial integration (FI) remains essentially unchanged vis-à-vis the specifications in Table 3.

A popular indicator of financial development is lending relative to GDP. Once we choose this indicator as our measure of FD (column *II*), we do indeed find significant coefficients with the expected signs: higher pre-1990 levels of lending relative to GDP mitigated the impact of the credit dependence of growth. However, the interaction between SME and FI remains significant, if only at the 10 percent level. Note also that lending/GDP will be affected by the ability of the financial system to raise funds both locally and from outside the region. The latter, however, would correspond to our notion of financial integration. We therefore decompose

$$\frac{Total\ Lending}{GDP} = \underbrace{\frac{CityBank\ Lending}{GDP}}_{FI} + \underbrace{\frac{Regional\ Bank\ Lending}{GDP}}_{\text{Local component of FD (LFD)}} .$$

The first term is a proxy for the ability of the financial system to raise funds from outside the region. It can therefore be interpreted as just another indicator of banking integration. The second term proxies for the system's ability to raise funds locally, and we therefore refer to it as the purely *local* component of financial development (LFD). Column *III* reports a regression in which lending by city banks relative to GDP is our measure of financial integration and in which FD is chosen to be just the purely local component of financial development, LFD. The regression clearly suggests that it is mainly the cross-sectional variation in the ability of the financial system to raise funds from outside the prefecture that accounts for the significance of lending/GDP in the regression in column *II*. In our last specification (column *IV*), we let our baseline measure of integration (the

share of city banks in local lending) compete against the local component of financial development. The results, again, suggest that it is indeed primarily variation in the ability to raise funds from outside—financial integration —that matters for our results.[16]

Dynamic effects

In Figure 2, we look at the role of banking integration in the dynamics of growth during the 'Lost Decades'. 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 did 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 large: in the least financially integrated areas, the cumulative growth difference until 2005 between the high- and low-SME groups amounts to an almost 8 percent difference in per capita GDP; in the most financially integrated areas, the effect is only around three percent. Furthermore, for the least integrated areas, the maximum cumulative growth differential between low- and high-SME groups was almost nine percent in 2001.

Transmission channels

In Table 5, we repeat our previous regressions but now with various measures of lending growth as the dependent variable: total prefecture-level lending, lending by city banks and the relative

[16]Clearly we cannot rule out the possibility that the ability of a region to raise funds from outside could itself be a hallmark of the level of sophistication of the region's financial system. However, it would then still make sense to distinguish between the purely local and the common (i.e. integration-related) components of financial development: even when interpreted this way, our results suggest that there is regional segmentation in the banking market in the sense that funds raised by local banks cannot be intermediated with the same technology as can funds intermediated by nationally integrated banks.

growth of lending by city and regional banks.[17] Our regressions in columns $I - III$ show the same general pattern as that previously documented for GDP growth. The negative spillovers from the aggregate shock on local lending that come with high levels of financial integration are substantially mitigated in prefectures with many small manufacturing firms, as can be seen from the positive coefficient on $SME \times FI$. The second and third columns show that it is indeed city banks' lending (and not lending by regional banks) that is driving this pattern in aggregate lending.

These results are in line with Imai and Takarabe (2011), who find that lending dropped particularly strongly in very integrated areas. However, we also find that city banks reduced their lending substantially less in areas where they used to have a high market share before the crisis and in which, at the same time, there were many bank-dependent small manufacturing firms. This aspect of our results does not appear consistent with a simple credit crunch explanation of the transmission of the country-wide shock, since that would suggest that nationwide banks cut back their lending quite uniformly.

Instead, we believe that the persistence of bank lending relationships provides a plausible explanation of this pattern. An influential literature has argued that small banks may have a comparative advantage in lending to small firms (see Berger et al. (2005) for the US and Uchida, Udell and Watanabe (2008) for Japan). With an average duration of more than 30 years, bank lending relationships are very persistent in Japan (see Uchida, Udell and Watanabe (2008)). Hence, in areas where, for historical reasons, there are a lot of regional banks that specialize in lending to small businesses, we would expect that large nationwide banks have relatively weak ties to such local businesses. It is then possible and consistent with our results that nationwide banks reduce their lending first in these areas.[18] Conversely, city banks may have kept on lending in areas where their links to small, particularly bank dependent firms were relatively tighter. Plausibly that would most

[17] Our prefecture lending data set ends in 1996. Note also that lending by Sogo banks after 1991 is no longer reported as a separate item in our data set but is included in the definition of 'zenkoku ginko' (the nationwide or 'city' banks). As Sogo banks account for a small share of total lending by 'zenkoku ginko', we continue to refer to this category as 'city banks' and to the remainder as 'regional banks'.

[18] The evidence we present in the second part of the paper is also consistent with this view: we show that the market share of regional banks vs. nationwide banks at the prefecture level has deep 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 (if it is a cooperative, they may even be a member) rather than with a local branch of a nationwide bank.

likely be the case where a) local market penetration by city banks is high and b) where there are traditionally also many bank-dependent small manufacturing firms.[19]

To buttress this interpretation, we obtain data on small firms' main banking relationship from the 2004 *Basic Survey on Small and Medium Enterprises*. For each prefecture, this survey gives us the fraction of firms (across all sectors) with lesss than 300 employees that have a city or a regional bank as their main bank. A univariate regression of the 2004 share of small firms reporting a main banking relationship with a city bank on the pre-1990 lending share of city banks yields a coefficient of 0.62 and a t-statistics higher than 6 with an R^2 of roughly 0.5. This suggests that areas with a high share of lending by nationwide banks, these banks also have tighter relationships with small firms.[20] In the regressions reported columns $IV - VI$ of Table 5, we use the share of small firms having a city bank as main bank as our measure of city bank penetration of local banking markets. The results are very similar to our previous ones, suggesting that regions in which nationwide banks had relatively weak ties with the most bank-dependent parts of the local economy experienced relatively larger declines in credit and economic activity.

This interpetation ties in with Peek and Rosengren (2000, 1997) who show that Japanese banks that operated internationally predominantly cut back on lending in foreign markets following the crisis—markets that they had often only recently entered and to which they had weak ties. Our results are the first to document the relevance of this channel for the regional dimension of Japan's Great Recession.

Our results may raise the question, why small firms in regions with a low share of nationwide banks were not able to obtain credit from regional banks instead. We believe that the lack of regional diversification in regional banks' balance sheets is part of the explanation. Specifically, given that mutual and cooperative banks are generally very small, medium-sized SMEs can represent a major risk in the locally highly concentrated credit portfolios of these regional banks. For ex-

[19] We emphasize that our findings do not imply that city banks were more likely to lend to small firms than regional banks after the crisis or that city banks even had a preferential lending policy towards small manufacturing firms. Since our results – both for GDP growth as well as for city bank lending growth – are based on a difference-in-difference setup, they only suggest that city banks *ceteris paribus* lent more in areas with many small manufacturing firms than they would otherwise have done.

[20] No contemporaneous (pre-1990) data on banking relationships are available. However, given the extreme persistence of bank lending relationshipsin Japan we would expect the 2004 data to be closely related to actual bank lending relationships in the period before 1990.

ample, the statues of Shinkins (credit associations) – which only lend tho their members – require member firms to have no more than 300 employees or 900 million yen in capital. For firms that are close to these thresholds, it will therefore be difficult to obtain additional credit from regional banks during a recession. However, it will also be hard for these firms to switch from a regional to a nationwide bank in the midst of a crisis – and in particular so in prefectures in which nationwide banks had traditionally weak ties to small manufacturing businesses. We would therefore expect greater benefits of a strong presence of integrated, nationwide banks in areas where many SMEs are relatively large and close to the membership thresholds of credit associations. The regressions in columns $VII - IX$ of Table 5 suggest that this is indeed the case. Here, we measure SME using the share in prefecture level output of the relatively bigger ($100 - 300$ employees) firms. Indeed the coefficients on the interaction $SME \times FI$ are now substantially bigger than in our previous regressions for lending growth. The same holds true for coefficients in output growth regressions (not reported).

It is also interesting to relate our results to a recent literature that has emphasized the role of evergreening in banks' credit decisions during Japan's Great Recession. Peek and Rosengren (2005) and Caballero, Hoshi and Kashyap (2008) 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 evergreening behavior led to the creation of 'zombie' firms that were effectively bankrupt but, due to their ongoing preferential access to finance, could keep more productive competitors out of the market or at least make it difficult for them to access credit. We emphasize that our results are 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. Second, Caballero, Hoshi and Kashyap (2008) show that manufacturing was one of the sectors that was least affected by evergreening. It is therefore plausible that prefectures with a high share of small manufacturing firms saw relatively less evergreening overall.[21] Hence, if areas with many small manufacturing

[21] Peek and Rosengren (2005) discuss how 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 borrowers that are large relative to their balance sheets. The small firms that are our focus here, however, are likely to be small borrowers for city banks. They may still be relatively big borrowers from the perspective of a small regional bank, however, and

firms were less prone to evergreening we should see higher growth in these areas— provided that these small firms had continued access to finance. This is what we find in the data: in prefectures with many small manufacturing firms and and a traditionally high market share of the city banks the negative effect of bank dependence on credit and output growth is mitigated. Our weak-ties story is therefore consistent with evergreening if city banks disproportionately lent to 'zombie'-prone sectors in areas where they had weak ties to small manufacturers or if they withdrew funds from 'weak-tie' areas to prop up large 'zombie' borrowers in the core prefectures.[22]

Endogeneity issues

Clearly, both small business importance and (in particular) the prefecture-level lending shares of city and regional banks could be endogenous. Note that all regressions presented so far use SME and lending shares that are time averages from the period *before* the bursting of the bubble (i.e. over the period 1980–1990). This clearly limits the immediate feedback from post-1990 GDP growth on small firm importance and bank lending shares and therefore eliminates many potential sources of endogeneity. However, using pre-1990 averages may not fully solve the problem if bank lending behavior 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 could 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 experienced lower growth after the recession. Furthermore, the recession may then still have af-

our results do not preclude the possibility that regional banks for their part also engaged in some evergreening. However, this would actually support the empirical relevance of the channel we are investigating here: if regional banks evergreen inefficient small firms, depriving more efficient competitors of credit, then we expect that better access for 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 also 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.

[22] We check this proposition using prefecture-level lending by sector from the Bank of Japan. While these data are only available over a shorter time-span (1984-1996), they provide support for this mechanism: the post-1990 share of lending to manufacturing in a prefecture is positively and marginally significantly related to the interaction $FI \times SME$ in panel regressions such as the ones we have used in the tables so far. Conversely, the coefficient on $SME \times FI$ is negatively signed (though insignificant) in the regression of the share of local lending to non-tradeable sectors (construction and real estate, services, wholesale and retail) that according to Caballero, Hoshi and Kashyap (2008) were more prone to zombie lending. This suggests that the share of zombie lending was higher outside the high FI, high manufacturing-SME prefectures.

fected small firms more severely, but it would not be for the reason that these firms had limited access to credit but rather because the region had poor growth prospects anyway. In the same way, 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; on the other hand, low growth prospects may limit firm growth, keeping firms small.

We now turn to identifying the determinants of cross-regional differences in banking integration in Japan. This analysis will deliver a powerful predictor of the lending shares of regional and city banks in the 1980s. We argue that this predictor is very plausibly uncorrelated with growth opportunities for the period after 1990 and therefore constitutes a valid instrument for financial integration in our regressions above. In an extension, we then also address the potential endogeneity of small firm importance.

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 bank dependence 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 that 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 Japan's first and (until the onset of World War II) foremost export good.[23] The international circumstances of Japan's entry into the world market for

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

raw silk were propitious. Silkworm pests had severely reduced French and Italian silk output by the mid-19th century. The opening of the Suez Canal also substantially increased access to European markets. Furthermore, and most importantly, the increased industrialized use of silk in the US had opened up a new market on the other side of the Pacific (see Federico (1997) and Li (1982)).[24]

Unlike other industries that started to emerge with the opening of the treaty ports, e.g. cotton mills and machinery, the silk industry was highly fragmented—and largely remained so until its decline on the eve of World War II. While sericulture had started to spread throughout Japan during the Tokugawa period, the mountainous areas of central Japan were climatically best suited for raising silkworms. This initially led sericulture to be particularly concentrated in these areas. In the early days, silk growing and reeling was largely a cottage industry, with 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 hand-reeled silk. The depression therefore 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 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. 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 silkworm farming and silk reeling. This was the case for two reasons. First, though not particularly capital intensive, mechanization required *some* capital, which not all small hand reelers could raise (Nakabayashi (2006)

[24] While China was historically the leading producer of silk, with its best produce outstripping 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 assist in 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 particularly important competitive advantage for Japan, as silk weaving became increasingly industrialized, in particular in the US (Li (1982)). Note also that the US maintained high tariffs on woven silk but strongly depended on imports of silk thread for its weaving factories. Hence, it was reeled silk thread that became Japan's main export staple.

and Miwa and Ramseyer (2006)).[25] Second, and most importantly for this paper, the separation of reeling and cocoon growing 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 toward 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, which was brought about by the separation of sericulture from the increasingly mechanized process of silk reeling, had a considerable impact on regional financial development. Smaller filatures were largely unable to borrow from the new, western-style banks that 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 among the small silk reeling firms, most of which were located in remote and inaccessible parts of the country.[26] A key role was therefore played by the Yokohama silk brokers, who not only acted as intermediaries between the international market for silk thread (largely based in Yokohama, as foreigners were not allowed to travel the country by themselves) and the reelers, but also organized the whole production and marketing chain. Importantly, these brokers had detailed knowledge of market conditions in Yokohama. They also travelled to the silk regions frequently and therefore had an informational advantage when it came to knowledge of local conditions in the silk reeling areas and the borrower quality of small silk reeling firms. It was these silk brokers who extended trade credit to small filatures so they were able to buy cocoons. The growing financing needs of the silk business soon also led to the emergence of the first local banks. Often, these banks were founded by silk reelers' cooperatives and/or with the help of the Yokohama merchants. However, these banks did not effectively raise the capital required for the loans 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

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

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

working of this system of silk finance as follows. A silk reeling firm would promise to sell its entire production for the year to a Yokohama silk merchant, obtaining in return a documentary bill issued by a Yokohama bank on behalf of the silk merchant. At this stage, the merchant would then either make a working capital loan to the silk reeler directly, or the silk reeler would obtain such a loan from his regional bank against presentation of the documentary bill. This advance on the documentary bill would allow the reeler to purchase cocoons and to reel the silk. A couple of months later, once the silk had been reeled and transported to Yokohama, the Yokohama bank would issue a bill of acceptance to the reeler, who would then be able to fully discount the documentary bill with his regional bank, thus obtaining final payment for the merchandise and clearing the working capital loan received earlier. The regional bank would then settle payment of the documentary bill with the Yokohama bank, which would, in turn, pass the silk on to the merchant after receiving payment.

In this system, while the Yokohama wholesalers would refinance themselves from city banks in Yokohama, or directly based on promissory notes discounted by the Bank of Japan, the Yokohama banks would generally not lend to the reelers directly. As Nakabayashi emphasizes, 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 mainly acted as local intermediaries for the documentary bills issued by Yokohama banks on behalf of the silk merchants.[27]

The financing institutions of the silk trade were in fact very similar to the modern institutions of export finance as they have recently been described in e.g. Amiti and Weinstein (2011). In the terminology of export finance, the regional banks acted as the 'advising' bank of the silk reeler (the 'exporter'). The Yokohama banks acted as 'issuing' banks for 'letters of credit' (the documentary bills) drawn on the Yokohama merchant (the 'importer').[28] Very much like modern export finance,

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

[28]In this context, it is important to note that, as a treaty port, Yokohama was an almost extraterritorial market for silk in which the silk merchants acted as *de facto* importers. Once in Yokohama, the silk would usually be sold on directly to the foreign trading companies, whose representatives were not allowed to source silk outside Yokohama directly. Nakabayashi (2009) studies the price dynamics for silk in the Yokohama market and the New York market, showing that these two markets were very highly integrated. Hence, market segmentation mainly existed between the Yokohama

this system was designed to overcome the many possible frictions that could occur in any stage of the process: the financing friction faced by the silk reeler who needed working capital to produce silk, the informational friction arising from the uncertainty about the quality of the silk the reeler might produce, the risk of damage to the silk during transport from remote prefectures such as Nagano and Gifu to the port of Yokohama and, finally, the possibility of the silk merchant failing to pay for the silk upon its arrival in Yokohama.[29]

Like modern export finance, this system allowed the 'advising' banks in the silk region to remain predominantly local: the bank raised deposits locally and lent locally to the silk reelers. In this system, international (or out-of-region) transactions by the local banks could remain limited to the settlement of the documentary bills with the Yokohama banks. Hence, the Yokohama banks, from the outset, transacted with local banks in many prefectures—they were financially integrated with the whole country. Conversely, local banks in the silk reeling regions could remain predominantly regional.

The growth of the silk industry is a case in point for recent literature that has emphasized 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)). We go beyond these papers in arguing that relatively easy access to trade credit through the Yokohama silk brokers also had an important feedback effect on the development of the banking system in the silk reeling regions.

The informational advantages that come with trade credit relationships (see Petersen and Rajan (1997)) also provide a related but distinct explanation for why the banking system in the silk

market and the silk-producing regions within Japan, and the Yokohama silk merchants acted as export intermediaries for the many small silk reeling firms. The importance of such trade intermediaries in modern-day emerging markets such as China has recently also been emphasized by Ahn, Khandelwal and Wei (2011).

[29]Note that this system did not require the Yokohama banks that issued the letters of credit to acquire much information about individual exporters. It was the Yokohama silk merchants and, as we will discuss shortly, the local banks that gathered information about the quality of individual silk reelers. It is conceivable that this network of local lending relationships, with its customer base of small silk filatures, may have endowed the regional banks with an important competitive advantage relative to their nationwide competitors— even long after the silk industry had eventually declined and been displaced by other small-scale manufacturing industries. However, this network of long-standing relationships may in turn have made it difficult for these small firms to switch to nationwide, integrated lenders when credit dried up during the recession of the 1990s. We believe that this is just one possible but potentially powerful channel that illustrates how the *de facto* segmentation of banking markets may have persisted even after technology and regulation had removed any formal barriers to banking flows between prefectures.

regions developed very much along regional lines. As we have argued, mechanization was important for improving quality and for competing in the US market. However, mechanization also led to a separation of cocoon growing from silk reeling, thus making trade credit for working capital a necessity. Silk reelers reacted to this challenge by forming regional cooperatives. These cooperatives were at the forefront of mechanization, and they also acted as local financial intermediaries.

Specifically, cooperatives played a key role in attaining the consistent quality levels required for the US market by organizing a process called re-reeling. Japan's high humidity levels during the summer carried the risk that reeled silk would curl or get sticky during transport. Therefore, the thread was reeled a second time. Whereas the first round of reeling would usually take place in a decentralized way in the individual small reeling firms—initially often still by hand—a second round of mechanical reeling was performed centrally in larger filatures that were operated by the cooperatives. Not only did the centralized mechanical re-reeling allow small reelers to improve the quality of their silk without having to invest in mechanized filatures of their own, but the centralized reprocessing 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 reputations in the New York silk market by the late 19th century. However, the quality control system also allowed the cooperatives to acquire much information about their member firms. This information, in turn, allowed the silk cooperatives to act as intermediaries and provide trade credit to their members (e.g. by providing advances on the documentary bills drawn on Yokohama merchants).

By the turn of the century, the role of the cooperatives had become so important that they were regulated by law in the first industrial cooperative act of 1900. For the first time, this law also regulated the role of industrial credit cooperatives. These industrial credit cooperatives were the direct precursors of modern-day Shinkins (cooperative banks), which (along with the Sogo—mutual—banks) are the main regional banks that we are studying here and which, to the present day, mainly raise capital from and lend to their local membership of small businesses.

Mechanization and the development of the trade credit and export finance system fed on each

other: with high-quality silk came access to the Yokohama export market and, therefore, access to trade credit. The consistent quality of the raw silk was an important part of the credit relationship between the Yokohama silk merchants and the reelers and their cooperatives (see Nakabayashi (2006)). The most reputed producers of silk (e.g. the *Kaimeisha* cooperative from the Suwa district, Japan's silk heartland, in Nagano prefecture) also had access to the most reputed Yokohama silk merchants—those with the best refinancing options.[30] Access to trade credit (and export finance) fostered the growth of the silk industry, and it was the most reputed, high-quality 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 system of trade credit and export finance that was specific to the highly fragmented 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 limited role.[31] This reasoning provides us with our instrument: we use the number of silk filatures per capita in a prefecture in 1895 as an instrument for the lending share of regional banks in a prefecture during the 1980s.[32]

Figure 3 plots the (logarithmic) number of filatures per head in 1895 against the average prefecture-level lending share between 1980 and 1990 of regional and city banks. There is a clear positive relation between regional bank lending shares and the number of silk filatures per capita in 1895, whereas the link is clearly negative for city banks. Table 6 provides further analysis of this link. The coefficient of a regression of lending shares on silk filatures is significant for all three bank types. We also run the same regression with a set of controls: the pre-1990 relative GDP of a prefecture, a dummy for the core prefectures and the (logarithmic) distance to Yokohama, as the first and biggest open port. These are the controls we also include later in our IV regressions. The link

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

[31]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 the cotton reeling industry: cotton mills were hugely capital intensive, and many of them actually raised capital on the new stock exchanges and imported much modern machinery. Not so silk reeling. This industry remained relatively labor intensive and was highly fragmented, characterized 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.

[32]The data on silk filatures are from the *Statistical Yearbook of the Empire of Japan* published by the cabinet office.

between the importance of silk reeling and lending shares remains unaffected by these controls, and the individual t-statistics in the regressions with controls are all greater than four in absolute value.

The last set of columns in Table 6 also report regressions of indicators of a prefecture's general level of financial development on our silk instrument, again with and without controls. There is no significant link between silk and the density of bank branches in a region. Total lending relative to GDP is negatively correlated with the instrument, but it is much less significant than in the regressions for the integration indicators. Once we also include our financial integration measure, silk becomes insignificant in the regression for lending/GDP. This suggests that lending/GDP is correlated with silk mainly via the correlation with regional financial integration.[33] We think that these findings are important for the interpretation of our results: the silk regions were not necessarily financially less developed than other regions at the onset of the recession of the 1990s. Instead, we are claiming 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, in contrast to the nonsilk regions, in which larger, countrywide banks came to dominate the market. Both routes to development seem to have served the specific needs of the industries that developed in these regions at the time.[34] What is important for our analysis is that these different pathways to financial *development* influenced the transmission of the Great Recession of 1990 because they led to different levels of financial *integration*: the regional model of banking in the silk reeling regions in the 19th century 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 present the results, we discuss potential challenges to instrument validity.

[33] Conversely, if we include lending/GDP in our regression for the integration indicators, it is insignificant, whereas silk is even more significant. These results are available upon request.

[34] After all, with regard to silk reeling, Japan did come to dominate the world market 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, second, 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 feedbacks from post-1990 growth rates to pre-1990 lending shares. We think that it is very unlikely that post-1990 prefecture-level growth expectations feedback on the development of the financial sector and the silk industry before 1900.

Second, even to the extent that preexisting 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 produced the incentives for mechanization. We address these two issues in turn.

Scholars of economic history who have studied industrialization during the Meiji period 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.[35,36] 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 aimed at the improvement of silk quality. 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 US (see Nakabayashi (2009)).[37]

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

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

[37]As a prime example, Nakabayashi (2009) reports the attempt of the Meiji government to install a role-model plant in the village of Tomioka in Gunma prefecture in the 1870s. This plant was very successful in training skilled workers but did not become economically viable. Instead, it was in the Suwa area in the neighboring Nagano prefecture and in Aichi

Table 7 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 vs. 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 it is always the variable measuring mechanization—be it the number of filatures or the machine-reeled output—that is significant, whereas the variables related to hand reeling are all insignificant for all bank types.[38] This suggests that mechanization plays a special role in explaining the link between silk and the regional fragmentation of banking markets. This is 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 improved silk quality, thus signaling borrower quality to the Yokohama silk merchants.

IV results

Table 8 now presents our IV results. As 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.

Our instruments are relevant in all specifications reported here and for all three of our measures of financial integration. At the bottom of the table, we report the first-stage F-statistics for the regression of the interaction term of the post-1990 dummy with $SME \times FI$ on the instruments. The value of this first-stage F-statistic is above 10 throughout, which provides a first indication as to the strength of the instruments with respect to the individual endogenous regressors (Staiger

prefecture that mechanization quickly took hold in the 1880s, following the decline in the relative price of hand-woven silk.

[38] Note that this result is not because of a generally very low share of hand production: on average, machine-reeled silk accounted for approximately three quarters of prefecture-level output of silk in 1895, and the range is from around five 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 the prefecture-level output of hand-reeled and machine-reeled silk is quite low: no higher than 0.3.

and Stock (1997)). However, these values can be misleading with respect to the overall instrument strength and with respect to identification if there is more than one endogenous variable, as is the case here. We therefore also report the Kleibergen–Paap (2006) rank test for underidentification. For all specifications reported in Table 8, we strongly reject the null of underidentification. The Kleibergen and Paap (2006) statistics are also all well beyond the critical values tabulated by Stock and Yogo (2005), suggesting that our instruments are also sufficiently strong to avoid large asymptotic bias.[39]

The first set of regressions in Table 8 shows the results without further controls. The magnitude of our main coefficient of interest—the interaction between the post-1991 dummy, the *SME* share and our measure of financial integration—is generally 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.

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-stage results very much intact. Furthermore, our coefficient of interest in the IV regression remains stable relative to the specifications without controls 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 colinearity between financial integration, the role of manufacturing and relative GDP. Note that relative GDP is not close to being significant (except for the Shinkin regression), whereas our coefficient of interest remains significant at the 10 percent level for city banks' lending shares, or not too far below that level (with t-statistics above 1.40) for the regional banks' lending shares. Our main results hold and our main coefficient of interest remains stable vis-à-vis the previous specifications without controls. Clearly, relative GDP is likely to be endogenous, so this regression is a rather unfair test of our model. For example, the property bubble in the 1980s is likely to have fueled growth expectations 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

[39]The critical values from Stock and Yogo (2005) apply to the Cragg and Donald (1993) statistic, which is identical to the Kleibergen and Paap (2006) rank test if the errors are homoscedastic.

a prefecture to Yokohama as the first open port after 1858.[40] 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.

These results suggest a strong link between the degree of regional banking integration in the 1980s, the spread of the Great Recession and the silk industry. Our main specification, which is based on a panel, helps us overcome the limited coverage of our cross-section by allowing us to control for common time variation and unobserved heterogeneity at the prefecture level. However, our instrument is purely cross-sectional. We therefore 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 the results for such regressions in Table A.3, one based on OLS and one based on IV. Besides our interaction variable of interest, $SME^k \times FI^k$, we include the first-order terms SME^k and FI^k and the core dummy as a control. In all cases and for all three measures of banking integration and the two measures of small firm importance (based on value added and employment), the coefficient of $SME^k \times FI^k$ has the same sign as before. Given that we estimate five coefficients from a 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, by both OLS and IV. Note also that, in spite of the limited sample size, the F-statistics for the individual first-stage regressions as well as the Kleibergen–Paap rank statistics in most cases indicate that our instruments are relevant.

Table A.4 illustrates that our results are also robust to alternative measures of credit dependence. First, we use the rank of a prefecture in the cross-sectional distribution of small firm importance. This allows us to deal with potential measurement error that arises from using small-firm importance as a potentially imperfect measure of credit dependence (see Durbin (1954)). Second, we build on Rajan and Zingales (1998) to construct an exogenous measure of external credit dependence at the prefecture level.[41] Both the IV and OLS results confirm our previous findings.

[40] The cross-sectional correlation between relative GDP and distance to Yokohama is -0.47.

[41] The Rajan–Zingales measures pertain to manufacturing industries in the US. 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 a measure of the average external finance dependence of manufacturing in a prefecture. Finally, we scale this measure with the share of manufacturing in local GDP.

Credit dependence and long-term growth prospects

As a final exercise, we address the concern that 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 hand 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) and 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 for 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 at large) 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. We therefore require an exogenous (with respect to finance) measure of the growth potential of the credit-dependent industries of a prefecture (and of its plausible future industry structure).

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 sectors dependent on external finance in these regions were likely to be constrained by limited access to finance (because these industries would not have access to the same preferential trade finance arrangements enjoyed by the silk industry in its early days).[42] 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 9, we regress our measures of external finance dependence on the total number of fila-

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

tures per head of population and a set of controls. This link is highly significant and positive; silk regions are particularly manufacturing intensive. Given that manufacturing is credit dependent, this is the opposite of 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 channels other than finance. In fact, it is well documented in the literature, that, as hosts to 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.[43] As Japan learned to produce and export high-quality silk, it also developed its manufacturing sector.[44] We exploit this insight to separate the long-term impact of silk production on manufacturing from that on finance. Specifically, we conjecture that interindustry (Jacobian) externalities that may lead to the emergence of manufacturing clusters are a direct function of proximity. Therefore, we use a prefecture's minimum distance to one of the four prefectures with the highest number of mechanized filatures in 1895 (Kyoto, Nagano, Gifu and Shizuoka) as an exogenous measure of growth expectations in the manufacturing sector at the end of the 19th century.

The remaining columns of Table 9 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 (logarithmic) number of total filatures per head, we can disentangle the two effects quite clearly. In the regression where industry structure is the dependent variable, the distance variable has a much larger coefficient than does the number of filatures per head, and it is also much more highly significant. Conversely, where our financial integration measure is the dependent variable, the picture is exactly the opposite: the coefficient of distance is small and insignificant, whereas that of the number of filatures is both large and significant. This suggests we can use the logarithmic 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

[43] See e.g. Yamazawa (1975), Ma (2004), Nakabayashi (2006) and Atsumi (2010).

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

a measure of dependence on working capital and trade credit, and therefore as an instrument for banking sector integration during the 1980s.[45]

In Table 10, we repeat our Panel IV regressions, now treating both SME importance and financial integration as endogenous variables. Based on our discussion from before, we instrument SME, FI and their interaction using the distance to the main mechanized silk filatures, the number of filatures and the interaction of these two, respectively. We again include our set of controls: a core area dummy and the 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 stays significant and quantitatively stable vis-à-vis our baseline OLS specifications. Hence, while the specific institutions of the silk industry also have had an impact on the rise of manufacturing at large, all our previous conclusions remain intact.

Conclusion

This paper has explored the regional spread of Japan's Great Recession following the bursting of the stock market and housing bubbles in the early 1990s. We showed that an important determinant of how severely a prefecture was hit during the 'Lost Decade' was its degree of integration into the national banking market. Clearly, Japan is a highly financially integrated economy, and it seems surprising that cross-regional differences in financial integration are sufficiently large to account for substantial regional heterogeneity in the responses to the common shock of the bursting bubbles. However, we recognized that until at least the onset of the crisis, there was a highly regionally fragmented banking system whose historical roots go back to the rise of silk reeling as Japan's first main export industry. This regional fragmentation has had a considerable impact on access to finance by small, credit-dependent manufacturing firms. We showed that the impact of the crisis on areas with many credit-dependent firms was exacerbated in prefectures with low pre-1990 levels of banking integration. As a transmission channel, we identified a drop in lending by

[45] Our line of argument is similar to that of Acemoglu and Johnson (2005), who, in a different setting, report that both colonial settler mortality and English legal origin individually have prognostic power for measures of property rights and contracting institutions today. However, when both are included as regressors simultaneously, English legal origin mainly affects contracting institutions whereas settler mortality affects property rights but not contracting institutions.

nationwide banks in credit dependent-prefectures, in which these banks traditionally had a small market share.

We then identified the deep historical and economic origins of this regional segmentation of the banking market. We argued 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 to 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 because 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. The many small firms in the silk reeling industry could not, however, borrow directly from the larger banks in the major port cities. Instead, silk finance was largely provided by small regional, often cooperative banks who made operating loans against so-called 'documentary bills' issued by larger Yokohama banks on behalf of reputed Yokohama silk dealers. Therefore, regional banks provided a loan for which the Yokohama merchant was ultimately liable, and it was ultimately the Yokohama silk merchants who had to monitor the quality of the credit relation with the silk reelers. In this system, which shares many features with the institutions of modern export finance, the regional banks remained heavily focused on their regions of origin long after the eventual decline of the silk industry: the banks raised deposits locally and lent locally to the silk reelers. International (or out-of-region) transactions by the local banks remained limited to the settlement of the documentary bills with the Yokohama banks. Hence, the Yokohama banks, from the outset, transacted with local banks in many prefectures—they were financially integrated with the whole country. Conversely, local banks in the silk reeling regions remained predominantly regional. To a large extent, the regional tiering of Japan's banking system in modern times has its origins in this particular system of export finance in the silk sector.

We showed that the prefecture-level number of 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) 100 years later, at the onset of Japan's Great Recession, and therefore of the degree of

financial integration in modern times. Using the number of silk filatures as an instrument for financial integration, we corroborate our results: given the role of small firms in the regional economy, the effects of the recession of the 1990s were worse in less financially integrated areas.

Our findings also support the view that regional differences in financial integration can be the outcome of different historical pathways to financial development. The cooperative, regional banking model overcame the specific financing and trade frictions faced by the silk reeling industry, whereas direct finance from the large Yokohama banks or through bond issuance was prevalent in other, less fragmented export industries (e.g. cotton). We therefore did not find that the historical silk regions are now generally less financially developed. However, they turned out to be significantly less financially integrated with the rest of the country when a big shock hit 100 years later. Our findings therefore also shed light on the trade–finance nexus: they provide a case study for how comparative advantage in one industry, silk reeling, can have an impact on a region's particular pathway to financial development after the country's exogenous opening to trade.

Finally, our results illustrated that regional variation in *de facto* financial integration can persist within a country even if there are no formal barriers to capital flows, as is clearly the case for modern Japan. These *de facto* differences could take many forms. One possible way in which such regional segmentation could occur is through banking relationship networks: the traditional regional tiering of Japan's banking market may have given regional banks a long-lasting informational advantage vis-à-vis nationwide banks with respect to their customer base of small, credit-dependent businesses. These informational asymmetries may, however, have made it difficult for credit-dependent businesses to switch to nationwide banks during the crisis, when credit became hard to obtain. Our results could have implications for regional business cycle transmission in many countries in which banking markets are traditionally regionally segmented, even though there are no formal limitations to capital mobility between regions. Germany's *Volksbanken* and *Sparkassen* are a case in point, as are Spain's *Caixas* and the historical fragmentation of the US banking market along state borders, which was removed only during the 1980s.

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Table 1: Japanese prefectures: descriptive statistics

	Prefecture	City bank share in total lending	SME share in GDP	post-1990 average growth rates of GDP per capita	City bank lending
1	Hokkaido	49.53	9.30	0.35	9.85
2	Aomori	57.13	8.53	0.40	5.86
3	Iwate	43.05	12.26	0.78	12.94
4	Miyagi	63.97	10.77	0.14	9.42
5	Akita	53.97	12.72	0.66	8.93
6	Yamagata	43.65	18.29	0.51	13.22
7	Fukushima	45.81	17.06	0.58	14.27
8	Ibaraki	55.07	19.31	-0.15	12.69
9	Tochigi	58.54	20.70	-0.08	12.33
10	Gunma	53.55	21.17	-0.16	9.93
11	**Saitama**	65.37	24.47	-0.22	9.33
12	**Chiba**	59.28	13.89	0.12	12.87
13	**Tokyo**	86.64	7.98	-0.49	4.16
14	**Kanagawa**	65.46	13.84	-0.67	9.02
15	Niigata	49.71	17.48	0.58	11.60
16	Toyama	58.06	19.30	0.41	8.29
17	Ishikawa	60.47	17.70	0.36	5.82
18	Fukui	56.30	20.94	0.60	6.68
19	Yamanashi	42.29	20.09	-0.14	8.97
20	Nagano	44.05	21.91	0.28	9.85
21	Gifu	45.97	24.68	0.16	8.18
22	Shizuoka	51.80	22.26	0.43	6.61
23	**Aichi**	62.18	18.08	-0.04	7.46
24	Mie	51.11	19.72	0.89	12.54
25	Shiga	49.05	24.86	-0.16	14.61
26	**Kyoto**	55.23	17.85	0.23	6.57
27	**Osaka**	77.18	19.21	-0.40	6.36
28	**Hyogo**	55.96	17.66	-0.72	9.05
29	Nara	66.14	19.67	0.08	9.92
30	Wakayama	48.40	14.95	1.08	11.48
31	Tottori	50.11	12.74	0.02	10.07
32	Shimane	42.43	13.66	1.01	10.25
33	Okayama	53.36	17.90	-0.21	10.52
34	Hiroshima	56.60	14.32	0.31	10.97
35	Yamaguchi	54.63	12.16	0.76	9.23
36	Tokushima	57.62	15.36	0.89	13.14
37	Kagawa	63.06	18.00	0.17	9.63
38	Ehime	50.34	16.87	0.38	12.42
39	Kochi	42.41	10.00	0.52	14.76
40	Fukuoka	65.54	10.49	0.26	8.96
41	Saga	48.21	15.81	1.10	11.45
42	Nagasaki	60.09	7.87	0.41	10.09
43	Kumamoto	49.46	9.96	0.12	13.82
44	Oita	48.69	10.39	0.92	10.58
45	Miyazaki	47.91	10.68	1.01	9.37
46	Kagoshima	44.13	9.48	0.94	9.47
	Mean	**54.55**	**15.92**	**0.31**	**10.08**
	Std. Deviation	**9.16**	**4.74**	**0.46**	**2.51**

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

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

		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	-0.01	-0.12	-0.11	0.02
	(-1.89)	(-4.01)	(-0.08)	(-0.17)	(-3.76)	(-3.69)	(0.34)
R^2	0.55	0.565	0.58	0.60	0.53	0.57	0.56
		Panel B: Based on employment based SME-measure					
	All prefs.	high	low	high	low	high	low
$Post1990_t \times SME^k_{EMP}$	-0.08	-0.15	0.01	-0.006	-0.15	-0.13	-0.03
	(-1.77)	(-3.71)	(0.15)	(-0.08)	(-3.76)	(-3.18)	(-0.37)
R^2	0.55	0.55	0.58	0.60	0.53	0.57	0.56

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 after 1990, SME^k is small-business importance and $\mu^k$and τ_t are prefecture- and time-fixed effects respectively. Sample period is 1980-2005. Regional banks include Sogo banks, Shinkins and nonagricultural credit cooperatives. OLS estimates, t-statistics in parentheses. Standard errors are clustered by prefecture.

Table 3: Interaction terms and additional controls

Interactions of $Post1990_t$ with ...	I Regional	II City	III Regional	IV City	V Regional	VI City	VII Regional	VIII City
$...SME^k \times RegionalBankShare^k$			-1.50		-1.35		-1.42	
			(-2.72)		(-2.89)		(-3.24)	
$...SME^k \times CityBankShare^k$				0.68		0.72		0.74
				(3.12)		(3.20)		(3.78)
$...RegionalBankShare^k$	0.03		0.27		0.23		0.24	
	(0.82)		(3.04)		(3.23)		(3.87)	
$...CityBankShare^k$		-0.05		-0.15		-0.16		-0.13
		(-2.38)		(-4.56)		(-4.15)		(-5.03)
$...SME^k_{VA}$	-0.09	-0.07	0.33	-0.45	0.29	-0.47	0.32	-0.48
	(-3.87)	(-2.85)	(2.19)	(-3.55)	(2.35)	(-3.66)	(2.72)	(-4.06)
Controls:								
X^k : $...Lending/GDP$					-0.0006	0.0003		
					(-1.31)	(0.60)		
$...CoreArea$							-0.01	-0.008
							(-4.00)	(-2.63)
R^2	0.56	0.57	0.57	0.57	0.57	0.57	0.56	0.56

The Table shows results from the regression $\Delta gdp^k_t = Post1990_t \times \left[\alpha_0 SME^k_{VA} \times FI^k + \alpha_1 FI^k + \alpha_2 SME^k_{VA} + \boldsymbol{\alpha}_3' X^k_t\right] + \mu^k + \tau_t + \epsilon^k_t$ where $Post1990_t$ is a dummy indicating the period after 1990 (1991-2005), SME^k_{VA} is small-business importance based on value added, FI^k is the measure of financial integration (regional and city bank share in total lending in prefecture k), as indicated in the column heading. μ^k and τ_t are prefecture-fixed and time effects respectively. The vector X^k captures various prefecture characteristics. In the regressions it is interacted with our crisis dummy $Post1990_t$ and contains prefecture-level $Lending^k/GDP^k$ (1980-90 average) and $CoreArea^k$, a dummy for the core economic areas (Tokyo, Osaka, Aichi, Kanagawa, Chiba, Saitama, Hyogo and Kyoto prefectures). The sample period is 1980-2005. OLS estimates, t-statistics in parentheses. Standard errors are clustered by prefecture.

Table 4: Alternative measures of financial development and financial integration

	I	II	III	IV
	$FI = \frac{City\ Bank\ Lending}{Total\ Lending}$		$FI = \frac{CityBankLending}{GDP}$	$FI = \frac{City\ Bank\ Lending}{Total\ Lending}$
Interactions of $Post1990_t$ with pre1990 variables:	$FD = \frac{\#Branches}{Population \times Area}$	$FD = \frac{Lending}{GDP}$	$FD = \frac{Regional\ Bank\ Lending}{GDP}$	$FD = \frac{Regional\ BankLending}{GDP}$
$...SME^k \times FI^k$	0.78	0.46	0.03	0.81
	(3.00)	(1.73)	(4.07)	(4.52)
$...FI^k$	-0.14	-0.09	-0.004	-0.14
	(-3.89)	(-2.28)	(-6.76)	(-5.55)
$...SME^k_{VA}$	-0.48	-0.45	-0.07	-0.55
	(-3.82)	(-3.73)	(-0.81)	(-4.42)
$...SME^k \times FD^k$	-0.32	0.02	-0.07	0.02
	(-0.43)	(2.61)	(-1.31)	(0.42)
$...FD^k$	0.07	-0.002	0.01	0.00
	(0.54)	(-2.09)	(1.79)	(0.12)
$...CoreArea$	-0.01	-0.01	-0.01	-0.01
	(-2.14)	(-3.43)	-4.85	(-4.01)
R^2	0.56	0.56	0.56	0.56

The Table shows results from the regression

$$\Delta gdp^k_t = Post1990_t \times \left[\alpha_0 SME^k_{VA} \times FI^k + \alpha_1 FI^k + \alpha_2 SME^k_{VA} + \alpha_3 SME^k_{VA} \times FD^k + \alpha_4 FD^k + \alpha_5' CoreArea^k\right] + \mu^k + \tau_t + \epsilon^k_t$$

where where $Post1990_t$ is a dummy indicating the period after 1990 (i.e. 1991-2005), $SME^k_{VA}$is small-business importance based on value added, and FI^k and FD^k are the measures of financial integration and financial development respectively as indicated in the column heading. 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 and Kyoto prefectures). The sample period is 1980-2005. OLS estimates, t-statistics in parentheses. Standard errors are clustered by prefecture.

Table 5: Prefecture-level lending after 1990

	Lending growth								
	total	City Banks	$\frac{\text{City Banks}}{\text{Regional banks}}$	total	City Banks	$\frac{\text{City Banks}}{\text{Regional banks}}$	total	City Banks	$\frac{\text{City Banks}}{\text{Regional banks}}$
	I	II	III	IV	V	VI	VII	VIII	IX
Interactions of $Post1990_t$ with pre-1991 variables	FI =CityBankShare			FI =2002 fraction of SME with city bank as main bank			FI=2002 fraction of SME with city bank as main bank SME=small man. firms 100<x<300 employees		
$...SME^k_{EMP} \times FI^l$	0.67	1.46	2.36	1.27	2.09	2.51	3.33	4.59	3.79
	(2.67)	(2.61)	1.97)	(6.01)	(4.59)	(2.43)	(7.32)	(4.10)	(1.38)
FI^k	-0.18	-0.37	-0.39	-0.31	-0.42	-0.31	-0.25	-0.28	-0.08
	(-3.91)	(-4.60)	(-2.31)	(-7.34)	(-5.15)	(-1.74)	(-8.54)	(-4.70)	(-0.57)
SME^k	-0.40	-0.88	-1.49	-0.11	-0.24	-0.41	-0.22	-0.26	-0.33
	(-2.65)	(-2.47)	(-1.91)	(-2.62)	(-2.25)	(-1.65)	(-2.40)	(-1.13)	(-0.57)
$...CoreArea$	-0.02	-0.02	-0.04	-0.01	-0.03	-0.06	-0.01	-0.03	-0.06
	(-4.06)	(-3.06)	(-2.06)	(-1.87)	(-2.36)	(-2.28)	(-2.29)	(-2.61)	(-2.21)
R^2	0.61	0.80	0.80	0.61	0.80	0.80	0.61	0.80	0.80

Memorandum item: $Fraction\ of\ SME\ with\ City\ Bank\ as\ main\ bank_{2002} = \underset{(tstat=6.49)}{0.6230} \times CityBankShare^k_{1980-90} - 0.25 \qquad R^2 = 0.49$

The Table shows results from the regression $\Delta log(X^k_t) = Post1990_t \times \left[\alpha_0 SME^k_{EMP} \times FI^k + \alpha_1 FI^k + \alpha_2 SME^k_{EMP} + \boldsymbol{\alpha}_3' X^k_t\right] + \mu^k + \tau_t + \epsilon^k_t$ where X^k_t stands in turn for total lending (columns I, IV and VII), city bank lending (columns II, V and $VIII$) and city bank lending relative to regional bank lending (columns III, VI and IX) in prefecture k. $Post1990_t$ is a dummy indicating the period after 1990 (i.e. 1991-2005), SME^k is our measure of bank dependence (small-business importance) , FI^k is a measure of financial integration. In the first panel (columns $I-III$), FI is the pre-1991 (1980-90) average city bank share in total lending in prefecture k. In the second and third panels (columns $IV-VI$ and columns $VII-IX$), FI is the share of small firms in all sectors (less than 300 employees) that report having a city bank as main bank. In the first two panels, SME is the share in value added of small manufacturing firms (less than 300 employees), in the third panel, it is the share in prefecture-level value added of small manufacturing firms in the 100-300 employeee range.$\mu^k$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 memorandum item at the bottom of the table reports the regression of the fraction of small firms reporting a city bank as main bank on our pre-1990 measure of financial integration, the average lending share of city banks in a prefecture in 1980-1990.

Table 6: Modern day (pre-1990) lending and silk filatures

	Financial Integration						Financial Development				
	pre-1990 share in prefecture-level lending by										
	City Banks		Regional Banks				$\frac{\text{bank branches}}{\text{population} \times \text{area}}$		Lending/GDP		
			All (Shinkin+Sogo)		Shinkins only		(pre-1990)		(pre-1990)		
filatures / population (log #)	-0.03	-0.04	0.03	0.03	0.04	0.04	0.01	0.01	-0.61	-0.55	-0.10
	(-3.14)	(-4.70)	(4.22)	(4.11)	(4.96)	(4.53)	(0.87)	(0.87)	(-1.78)	(-1.95)	(-0.29)
Relative GDP (pre-90)		0.19		-0.01		-0.01		0.09		8.56	6.27
		(3.32)		(-0.18)		(-0.24)		(1.68)		(4.21)	(2.88)
Core Dummy		0.07		-0.001		0.02		-0.02		1.92	1.06
		(2.46)		(-0.02)		(0.71)		(-0.57)		(1.88)	(1.02)
Distance to Yokohama (log)		-0.02		0.01		-0.01		0.01		0.55	0.74
		(-1.33)		(0.66)		(-0.93)		(0.74)		(1.25)	(1.75)
City Bank Lending											12.20
											(2.28)
R^2	0.18	0.60	0.29	0.30	0.36	0.40	0.02	0.08	0.07	0.46	0.53

The Table shows regressions of modern-day (pre-1990) average prefectural lending shares by bank type (left panel) and of various (pre-1990) financial development indicators (right panel) on the number of filatures per head of population in a prefecture in 1895. The control variables are relative (pre-199) per capita GDP, the (log) distance to Yokohama and a dummy for the core areas (Tokyo, Osaka, Aichi, Kanagawa, Chiba, Saitama, Hyogo and Kyoto prefectures), t-statistics in parentheses.

Table 7: Mechanization in silk reeling (1895) and regional banking integration in the 1980s.

	FI =Share in prefecture-level lending by					
	City Banks		Regional Banks			
			All (Shinkin+Sogo)		Shinkins only	
hand filatures	-0.01		0.01		-0.00	
(log #)	(-1.35)		(0.98)		(-0.07)	
mechanized filatures	-0.02		0.02		0.03	
(log #)	(-3.57)		(3.07)		(4.28)	
output: hand reeled		-0.00		-0.00		-0.01
(log tons)		(-0.49)		(-0.51)		(-0.64)
output: machine reeled		-0.03		0.02		0.02
(log tons)		(-3.98)		(2.96)		(2.45)
R^2	0.60	0.60	0.24	0.20	0.39	0.23
Controls	yes	yes	yes	yes	yes	yes

The Table shows results from regression of pre-1991 (1980-90) average prefectural lending shares by bank type on various silk industry characteristics in 1895: 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. t-statistics appear in parentheses.

Table 8: Panel IV Regressions with filatures / head in 1895 as instrument

Interactions terms	City Banks	Regional Banks		City Banks	Regional Banks		City Banks	Regional Banks	
of $Post1990_t$ with ...		All	Shinkin		All	Shinkin		All	Shinkin
$SME^k_{VA} \times FI^k$	0.89	-1.57	-1.94	1.04	-1.41	-1.42	0.86	-1.46	-1.65
	(2.15)	(-2.18)	(-2.08)	(1.69)	(-1.50)	(-1.42)	(1.84)	(-1.81)	(-1.76)
FI^k	-0.18	0.43	0.40	-0.20	0.28	0.27	-0.16	0.31	0.33
	(-2.21)	(2.00)	(1.96)	(-1.58)	(1.28)	(1.28)	(-1.86)	(1.64)	(1.65)
SME^k_{VA}	-0.57	0.32	0.21	-0.65	0.30	0.17	-0.53	0.32	0.22
	(-2.44)	(1.80)	(1.61)	(-1.81)	(1.39)	(1.20)	(-1.92)	(1.73)	(1.63)
Controls	no	no	no	yes	yes	yes	yes	yes	yes
relative GDP				0.01	-0.01	-0.01			
				(0.33)	(-0.60)	(-2.02)			
Core				-0.01	-0.01	-0.01	-0.00	-0.01	-0.01
				(-1.72)	(-2.38)	(-2.51)	(-0.78)	(-1.58)	(-1.85)
Distance to Yokohama							0.00	0.00	0.00
							(0.93)	(1.03)	(2.71)
R^2	0.69	0.69	0.69	0.70	0.70	0.70	0.70	0.70	0.70
1st-Stage F-stat for $SME^k \times FI^k \times Post1991_t$	303.29	288.56	407.01	420.48	279.43	479.21	383.56	297.11	439.05
Kleibergen-Paap rank test	**77.26**	**37.53**	**41.56**	**66.78**	**25.76**	**38.98**	**94.57**	**37.86**	**44.68**
p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The Table shows results from the IV regression $\Delta gdp^k_t = Post1990_t \times \left[\alpha_0 \widehat{SME^k \times FI^k} + \alpha_1 \widehat{FI^k} + \alpha_2 SME^k + \boldsymbol{\alpha}'_3 X_t\right] + \mu^k + \tau_t + \epsilon^k_t$ where where $Post1990_t$ is a dummy indicating the period starting in 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 appear in parentheses. The bottom of the Table reports information on instrument relevance: the F-statistics associated with the first stage regression of the interaction term on all instruments and the Kleibergen and Paap (2006) (KP) rank statistics and its associated p-value for the hypothesis of under-identification. The KP-statistics appears in boldface (italics) if it exceeds the Stock and Yogo (2005) weak-instrument critical values of 7.03 (4.58) (see Table 5.2. in Stock and Yogo (2005), for the case of $n = 2$ endogenous variables and $K = 2$ excluded instruments), This suggests that the instruments can be taken to be sufficiently strong to ensure a maximal size of no more than 10% (15%) for a nominal 5% size Wald Test on the IV-estimates.

Table 9: 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
distance to most highly mechanized	-0.03	-0.02	-0.06	-0.03	-0.02	-0.01	-0.01
silk regions (log)	(-6.28)	(-5.41)	(-5.05)	(-5.26)	(-1.35)	(-1.46)	(-1.07)
filatures / population	0.01	0.01	0.00	0.01	-0.04	0.02	0.03
(log #)	(2.04)	(2.87)	(0.31)	(1.87)	(-4.41)	(3.09)	(3.60)
Core Dummy	-0.03	-0.03	-0.05	-0.03	0.08	-0.01	0.01
	(-2.30)	(-2.77)	(-1.39)	(-1.77)	(2.53)	(-0.46)	(0.37)
Distance to Yokohama	-0.01	-0.01	-0.03	-0.02	-0.03	0.01	-0.01
(log)	(-1.68)	(-1.61)	(-2.03)	(-2.32)	(-1.96)	(1.01)	(-0.70)
R^2	0.69	0.68	0.57	0.65	0.56	0.34	0.42

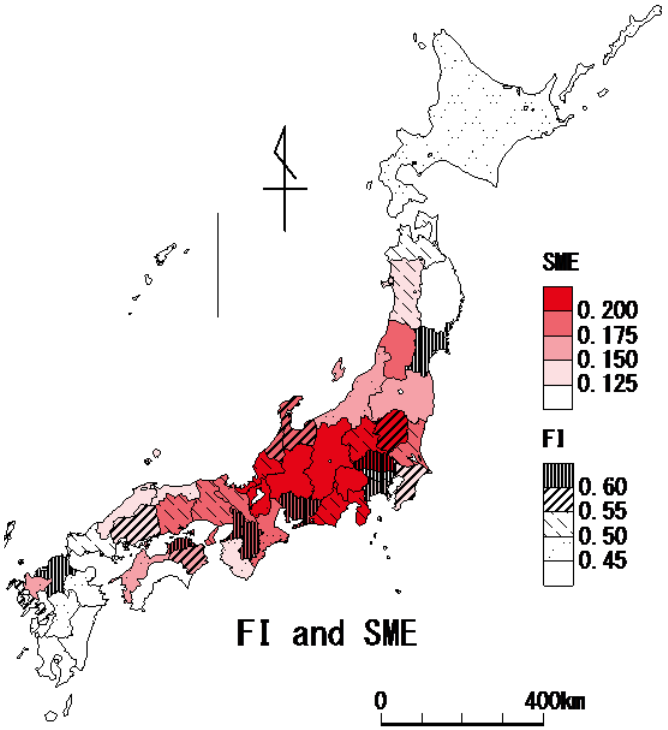
The Table shows cross-sectional regressions of modern-day (1980-90 average) industrial structure (left panel) and 1980-1990 average prefectural lending shares by bank type (right panel) on our two alternative silk-related variables: the minimum (log) distance to one of the four prefectures with the most highly mechanized silk industry in 1895 (Kyoto, Nagano, Gifu and Shizuoka) 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) and a dummy for the Core areas (Tokyo, Osaka, Aichi, Kanagawa, Chiba, Saitama, Hyogo and Kyoto prefectures). t-statistics appear in parentheses.

Table 10: Panel IV Regressions (both credit dependence and financial integration endogenous)

	$CD = SME_{VA}$			$CD = SME_{EMP}$			CD =Manufacturing Share		
Interactions terms of $Post1990_t$ with ...	City Banks	Regional Banks		City Banks	Regional Banks		City Banks	Regional Banks	
		All	Shinkin		All	Shinkin		All	Shinkin
$CD \times FI^k$	1.30	-3.25	-3.98	2.68	-5.35	-5.78	0.77	-1.70	-3.28
	(1.79)	(-1.94)	(-1.88)	(1.98)	(-2.06)	(-2.03)	(1.54)	(-1.67)	(-1.57)
FI^k	-0.24	0.65	0.80	-0.40	0.86	0.93	-0.20	0.50	0.98
	(-1.93)	(1.90)	(1.86)	(-2.08)	(2.00)	(2.00)	(-1.64)	(1.65)	(1.56)
CD	-0.78	0.76	0.53	-1.56	1.30	0.80	-0.44	0.44	0.49
	(-1.93)	(1.83)	(1.72)	(-2.06)	(2.00)	(1.92)	(-1.68)	(1.55)	(1.46)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
1st-Stage F-stat for $CD^k \times FI^k$	384.83	723.66	726.13	335.05	757.38	776.77	240.39	396.09	534.91
Kleibergen-Paap rank test	**33.93**	**10.87**	*8.15*	**19.13**	*9.08*	*8.14*	**23.89**	**12.71**	4.62
p-value	0	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.03

The Table shows results from the IV regression $\Delta gdp_t^k = Post1990_t \times \left[\alpha_0 \widehat{CD^k \times FI^k} + \alpha_1 \widehat{FI^k} + \alpha_2 SME^k + \boldsymbol{\alpha}_3' X^k\right] + \mu^k + \tau_t + \epsilon_t^k$ where where $Post1990_t$ is a dummy indicating the period after 1990, CD^k is our measure of credit dependence and FI^k our regional banking integration measures 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. The bottom of the Table reports the F-statistics associated with the first stage regression of the interaction term on all instruments and the Kleibergen and Paap (2006) rank statistics and the associated p-value for the hypothesis of under-identification. Values of the KP-statistics in boldface or italics indicate that the hypothesis of weak identification is rejected. We reject if the asymptotic bias of the TSLS estimator is less than 5% (KP in bold) or 10% (KP in italics) based on the critical values tabulated in Table 5.1. of Stock and Yogo (2005). Since values for our case of $n = 3$ endogenous variables and $K = 3$ instruments are not directly tabulated, we use the more conservative values for $n = 3$ and $K = 5$ which are 9.53 and 6.61 respectively.

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



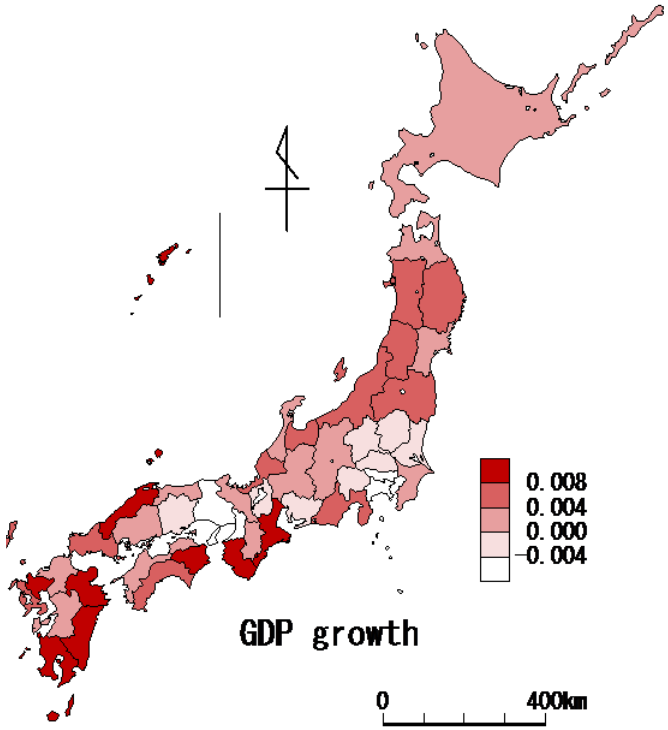
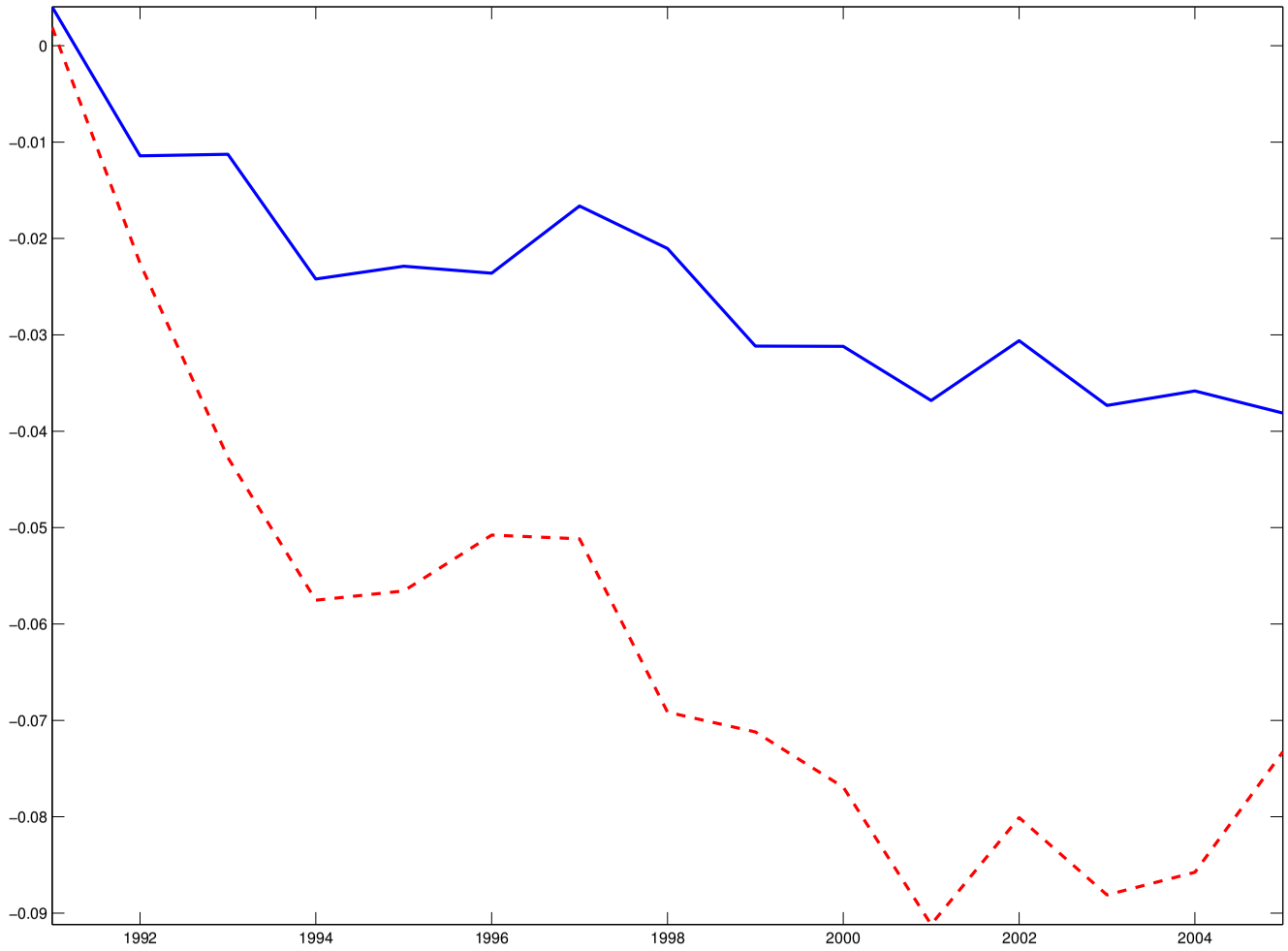
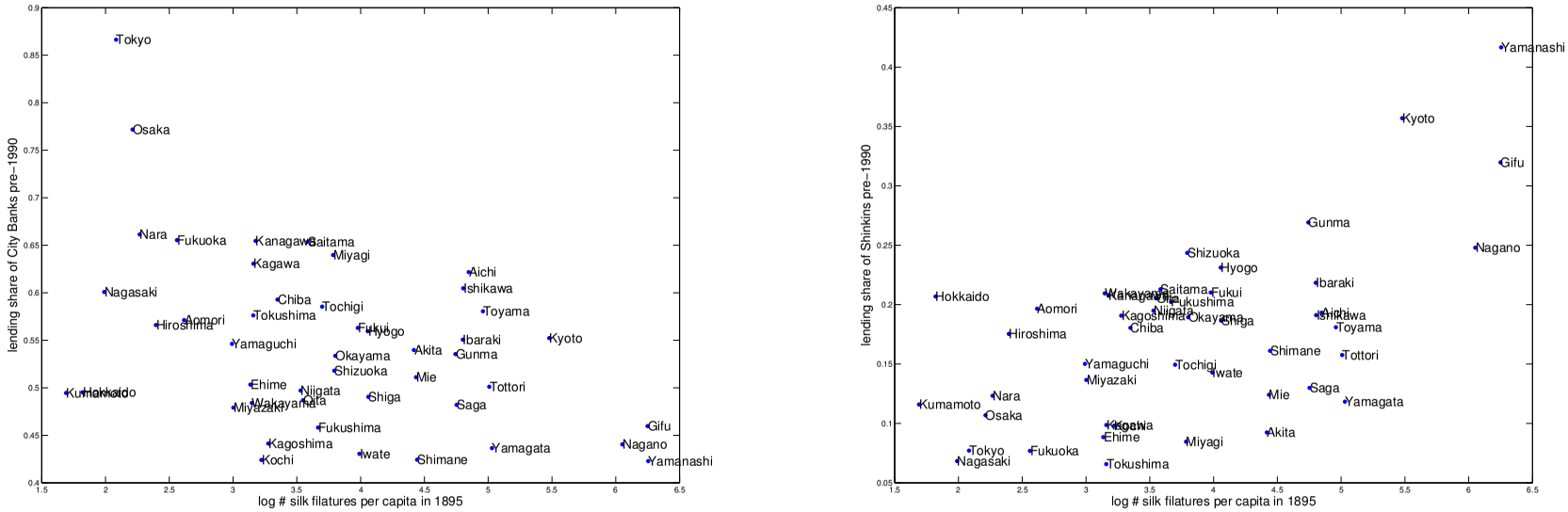


Figure 2: Cumulative Growth Differential (1991-2005) between high and low SME group for prefectures with high (blue, solid line) and low (red, dashed line) levels of banking integration.



NOTES: The figure illustrates our difference-in-difference results. We split prefectures into four groups based on pre-1991 (1980-90 average) characteristics: above/below-median banking integration and above/below-median small business importance. Then, within each financial integration group, we calculate the cumulative growth differential between the high-SME (i.e. high credit dependence) and the low-SME (low credit dependence) subgroups. The blue (solid) line is this cumulative growth differential between high and low SME prefectures for the highly financially integrated group. The red (dashed) line is the cumulative growth differential between high and low SME prefectures for the prefectures with low levels of financial integration. Financial Integration is measured here using the City bank lending shares.

Figure 3: The 'Silken Thread': prefecture-level 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 regional banks.

A. Additional Tables (not for publication):

Table A.1: Robustness – interaction terms and additional controls

Interactions of $Post1990_t$ with ...		I Regional	II City	III Regional	IV City	V Regional	VI City
	$...SME^k \times FI^k$	-1.28	0.66	-0.66	0.47	-1.09	0.55
		(-3.04)	(3.33)	(-1.23)	(2.51)	(-2.06)	(2.78)
	$...FI^k$	0.23	-0.11	0.44	0.02	0.25	-0.06
		(3.59)	(-3.72)	(3.61)	(0.22)	(1.50)	-0.61
	$...SME^k_{VA}$	0.34	-0.39	0.17	-0.14	0.32	-0.11
		(2.88)	(-3.17)	(0.80)	(-0.79)	(1.48)	(-0.59)
	$\left(FI^k\right)^2$			-0.55	-0.12	-0.12	-0.03
				(-1.96)	(-1.61)	(-0.30)	(-0.44)
	$... \left(SME^k_{VA}\right)^2$			-0.22	-0.62	-0.12	-0.69
				(-0.38)	(-1.33)	(-0.28)	(-1.49)
Controls:							
X^k :	$...CoreArea$	-0.003	-0.003			-0.003	-0.004
		(-0.57)	(-0.44)			(-0.53)	(-0.79)
	$...Share\ Lowland\ Areas$	0.01	0.01			0.01	0.01
		(0.62)	(1.01)			(0.62)	(0.94)
	$...Share\ of\ steep\ areas$	0.003	0.004			0.003	0.003
		(0.44)	(0.61)			(0.58)	(0.45)
	...Min. distance to core	0.002	0.002			0.002	0.002
		(1.04)	(0.91)			(1.05)	(0.76)
	$...Sectoral\ Specialization$	0.02	0.02			0.02	0.02
		(1.99)	(1.59)			(2.28)	(1.44)
Z^k_t:							
Region Fixed Effect		Yes	Yes	Yes	Yes	Yes	Yes
R^2		0.57	0.56	0.56	0.56	0.57	0.56

The Table shows results from the regression $\Delta gdp^k_t = Post1990_t \times \left[\alpha_0 SME^k_{VA} \times FI^k + \alpha_1 FI^k + \alpha_2 SME^k_{VA} + \boldsymbol{\alpha}'_3 X^k_t\right] + \boldsymbol{\delta}' Z^k_t + \mu^k + \tau_t + \epsilon^k_t$ where $Post1990_t$ is a dummy indicating the period after 1990 (1991-2005), $SME^k_{VA}$is small-business importance based on value added, FI^k is the measure of financial integration (regional and city bank share in total lending in prefecture k), as indicated in the column heading. $\mu^k$and τ_t are prefecture-fixed and time effects respectively. The vector X^k captures various prefecture characteristics. In the regressions it is interacted with our crisis dummy $Post1990_t$ and contains $CoreArea^k$, a dummy for the core economic areas (Tokyo, Osaka, Aichi, Kanagawa, Chiba, Saitama, Hyogo and Kyoto prefectures), topographical features (the share of lowlands and steep (gradient above 15 degrees) areas in a prefectures total sufrace area), the minimal distance to one of the core prefectures and a index of sectoral specialization. Z^k_t contains fixed effects for the eight regions of Japan (Hokkaido Island, Tohoku, Kanto, Chubu, Kansai, Chugoku (all on Honshu Island), Shikoku Island, and Kyushu Island). The sample period is 1980-2005. OLS estimates, t-statistics in parentheses. Standard errors are clustered by prefecture.

Table A.2: Robustness – other shock indicators and control for local shocks

Interactions of $\Delta LandPrice_t$ with ...		I Regional	II City	III Regional	IV City	V Regional	VI City	VII Regional	VIII City
	$...SME^k \times FI^k$			2.20	-1.12	2.18	-1.11	1.76	-0.93
				(2.29)	(-3.02)	(2.34)	(-3.00)	(2.22)	(-2.51)
	$...FI^k$	-0.08	0.12	-0.42	0.28	-0.42	0.27	-0.31	0.21
		(-1.16)	(3.48)	(-2.68)	(5.39)	(-2.74)	(5.16)	(-2.42)	(3.89)
	$...SME^k_{VA}$	0.21	0.19	-0.40	0.81	-0.40	0.80	-0.51	0.55
		(3.89)	(3.64)	(-1.54)	(3.49)	(-1.61)	(3.49)	(-2.25)	(2.35)
Controls:									
X^k :	$...CoreArea$	0.03	0.02	0.03	0.02	0.03	0.02	0.001	0.002
		(4.51)	(3.02)	(5.41)	(3.34)	(5.33)	(3.22)	(0.12)	(0.20)
Extended Set of Controls		no	no	no	no	no	no	yes	yes
Z^k_t:									
$\Delta LocalLandPrice^k_t$						0.006	0.005	0.005	0.004
						(1.94)	(1.75)	(1.78)	(1.34)
Regional Fixed Effects		no	no	no	no	no	no	yes	yes
R^2		0.56	0.57	0.57	0.57	0.57	0.57	0.57	0.57

The Table shows results from the regression $\Delta gdp^k_t = \Delta Landprice_t \times \left[\alpha_0 SME^k_{VA} \times FI^k + \alpha_1 FI^k + \alpha_2 SME^k_{VA} + \boldsymbol{\alpha}'_3 X^k_t\right] + \boldsymbol{\delta}' Z^k_t + \mu^k + \tau_t + \epsilon^k_t$ where $\Delta Landprice_t$ is the change in land prices in the core prefectures from Imai and Takarabe, $SME^k_{VA}$is small-business importance based on value added, FI^k is the measure of financial integration (regional and city bank share in total lending in prefecture k), as indicated in the column heading. $\mu^k$and τ_t are prefecture-fixed and time effects respectively. The vector X^k captures various prefecture characteristics. In the regressions it is interacted with $\Delta Landprice_t$ and in teh baslein specification contains $CoreArea^k$, a dummy for the core economic areas (Tokyo, Osaka, Aichi, Kanagawa, Chiba, Saitama, Hyogo and Kyoto prefectures) and, where indicated, an extended set of controls (for topography (share of lowlands and steep areas in a prefecture), minimum distance to the core, and sectoral specialization as in Table A.1). Z^k_t contains the change in local (prefecture-level) land prices as an additional (non-interacted) control for local shocks and, where indicated, a set of regional dummies. The sample period is 1980-2003. OLS estimates, t-statistics in parentheses. Standard errors are clustered by prefecture.

Table A.3: Robustness — Cross-sectional Regressions

	SME_{VA} (output based)						SME_{EMP} (employment based)					
	$FI =$ City Banks		$FI =$ 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	0.36	-0.35	-0.77	-0.29	-0.98	0.16	0.56	-0.52	-0.85	-0.44	-1.08
	(1.33)	(1.71)	(-2.12)	(-1.52)	(-1.68)	(-1.55)	(1.12)	(1.70)	(-2.22)	(-1.78)	(-1.94)	(-1.87)
FI^k	-0.04	-0.08	0.06	0.18	0.05	0.22	-0.04	-0.10	0.07	0.16	0.06	0.18
	(-2.36)	(-2.01)	(2.15)	(1.50)	(1.59)	(1.52)	(-1.97)	(-2.01)	(2.18)	(1.92)	(1.79)	(1.90)
SME^k	-0.10	-0.23	0.07	0.15	0.03	0.11	-0.12	-0.34	0.12	0.19	0.05	0.14
	(-1.79)	(-1.94)	(1.48)	(1.25)	(0.79)	(1.25)	(-1.51)	(-1.88)	(1.72)	(1.43)	(1.16)	(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
	(-2.73)	(-1.06)	(-4.58)	(-1.99)	(-4.79)	(-3.73)	(-2.89)	(-1.32)	(-4.87)	(-3.36)	(-5.03)	(-4.42)
R^2	0.50	0.46	0.46	0.46	0.44	0.46	0.48	0.46	0.45	0.46	0.44	0.46
First-Stage F-stat for $SME^k \times FI^k$		14.21		10.56		17.07		13.13		6.94		12.40
Kleibergen-Paap rank test		3.50		1.32		1.71		4.19		3.04		**3.75**
p-value		0.06		0.25		0.19		0.04		0.08		**0.05**

The Table shows results from the cross-sectional OLS and IV regressions $\Delta gdp^k_{post1990} = \alpha_0 SME^k \times FI^k + \alpha_1 FI^k + \alpha_2 SME^k + \boldsymbol{\alpha}_3' CoreDummy^k + const + \epsilon^k$ where $\Delta gdp^k_{post1990}$ is average post-1990 (1991-2005) GDP growth 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) as indicated in the column headings. *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. t-statistics appear in parentheses. The last two rows of the table report F-statistics associated with the first stage regression of the interaction term $SME^k \times FI^k$ on all instruments and the Kleibergen-Paap (2006) rank statistics and the associated p-value for the hypothesis of under-identification.

Table A.4: Robustness: Panel OLS and IV regressions for alternative measures of credit dependence

	$CD^k = rank(SME^k_{VA})$				$CD^k = RZ^k_{VA}$				$CD^k = RZ^k_{EMP}$			
	$FI =$				$FI =$				FI			
Interactions of	City Banks		Regional Banks		City Banks		Regional Banks		City Banks		Regional Banks	
$Post1990_t$ with ...	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
$CD^k \times FI^k$	0.02	0.02	-0.03	-0.04	0.94	1.57	-1.68	-2.29	1.78	3.11	-4.24	-4.38
	(3.13)	(2.02)	(-3.42)	(-1.98)	(3.18)	(2.33)	(-4.41)	(-2.32)	(2.69)	(2.17)	(-6.84)	(-2.18)
FI^k	-0.07	-0.12	0.13	0.26	-0.09	-0.16	0.16	0.24	-0.10	-0.18	0.19	0.23
	(-3.11)	(-1.99)	(4.15)	(1.74)	(-3.53)	(-2.21)	(4.96)	(2.07)	(-3.00)	(-2.06)	(6.50)	(2.06)
CD^k	-0.01	-0.01	0.01	0.01	-0.60	-0.92	0.40	0.58	-1.12	-1.80	1.07	1.11
	(-3.35)	(-2.12)	(2.89)	(1.91)	(-3.65)	(-2.48)	(3.34)	(2.12)	(-2.99)	(-2.27)	(5.80)	(2.00)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.56	0.70	0.56	0.70	0.56	0.70	0.57	0.70	0.57	0.70	0.57	0.70
1st-Stage F-stat for $CD^k \times FI^k$		592.09		512.27		482.71		372.29		301.52		258.00
Kleibergen-Paap rank test		**88.02**		**28.94**		**72.14**		**67.23**		**61.49**		**90.06**
p-value		0.00		0.00		0.00		0.00		0.00		0.00

The Table shows results from the OLS and IV regressions $\Delta gdp^k_t = Post1990_t \times \left[\alpha_0 CD^k \times FI^k + \alpha_1 FI^k + \alpha_2 CD^k + \boldsymbol{\alpha}'_3 X_t\right] + \mu^k + \tau_t + \epsilon^k_t$ 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 GDP ($rank(SME^k_{VA})$), the value added (RZ^k_{VA}) and the emplyoment-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. Standard errors of OLS regressions are clustered by prefecture. t-statistics in parentheses. The bottom of the Table reports the F-statistics associated with the first stage regression of the interaction term on all instruments and the Kleibergen and Paap (2006) rank statistics and the associated p-value for the hypothesis of under-identification. Values of the KP-statistics in boldface or italics indicate that the hypothesis of weak identification is rejected based on the Stock and Yogo (2005) critical values. See notes on Table 8 for further details.