The international platform of Ludwig-Maximilians University's Center for Economic Studies and the Ifo Institute

CESifo Working Papers
www.cesifo.org/wp

'By a Silken Thread': Regional Banking Integration and Pathways to Financial Development in Japan's Great Recession

Mathias Hoffmann
Toshihiro Okubo

CESIFO WORKING PAPER NO. 4090
CATEGORY 7: MONETARY POLICY AND INTERNATIONAL FINANCE
JANUARY 2013

CESifo
Center for Economic Studies & Ifo Institute

CESifo *Working Paper No. 4090*

'By a Silken Thread': Regional Banking Integration and Pathways to Financial Development in Japan's Great Recession

Abstract

How do financial development and financial integration interact? We focus on Japan's Great Recession after 1990 to study this question. Regional differences in banking integration affected how the recession spread across the country: financing frictions for credit-dependent firms were more severe in less integrated prefectures, which saw larger decreases in lending by nationwide banks and lower GDP growth. We explain these cross-prefectural differences in banking integration by reference to prefectures' different historical pathways to financial development. After Japan's opening to trade in the 19th century, silk reeling emerged as the main export industry. The silk reeling industry depended heavily on credit for working capital but comprised many small firms that could not borrow directly from larger banks. Instead, silk merchants in Yokohama, the main export hub for silk, provided silk reelers with trade loans. Many regional banks in Japan were founded as local clearing houses for such loans, and regional banks continued to account for above-average shares in lending in the formerly silk-exporting prefectures long after the decline of the silk industry. Using the cross-prefectural variation in the number of silk filatures in 1895 as an instrument, we confirm that the post-1990 decline was worse in prefectures where credit constraints were tightened through low levels of banking integration. 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, as is the case in modern Japan.

JEL-Code: F150, F300, F400, G010, N150, N250, O160.

Keywords: financial development, financial integration, Japan, Great Recession, Lost Decade, banking integration, regional business cycles, transmission of financial shocks, misallocation of credit, trade credit, export finance, silk industry.

Mathias Hoffmann
University of Zurich / Dept. of Economics
Chair of International Trade and Finance
Switzerland – 8032 Zurich
mathias.hoffmann@econ.uzh.ch

Toshihiro Okubo
Keio University
2-15-45 Mita Minato-ku
Japan - Tokyo, 108-8345
okubo@econ.keio.ac.jp

December 2012
We are grateful for feedback from and discussions with Sascha Becker, Linda Goldberg, Pierre-Olivier Gourinchas, Takeo Hoshi, Masaki Nakabayashi, Joe Peek, Bent Sorensen, Pascal Towbin, FrankWestermann and seminar participants at the University of Bonn, Hitotsubashi University, Keio University, RIETI, University of Muenster, University of Osnabrück, University of Tübingen, the 3rd Bundesbank Workshop on Money, Finance and Banking in East Asia, the conference on "Financial globalization, financial crises and the (re)-regulation of banking" at the University of Zurich, the Austrian National Bank Workshop on "Financial Markets and Real Economic Activity" and the EEA-ESEM meetings 2012 in Malaga.

Introduction

How do financial development and financial integration interact? We focus on Japan's Great Recession after 1990 to study this question. First, we show that differences in banking integration between prefectures affected the regional spread of the crisis. Prefectures with many credit-dependent, small manufacturing firms grew much more slowly after 1990 if their banking sector was weakly integrated with the rest of the country. The financially least integrated and most credit-dependent prefectures also saw the largest declines in lending by nationwide banks. Hence, the regional segmentation of Japan's banking market significantly influenced the way in which the recession affected different parts of the country. 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 follows 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 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. Increasing our main measure of financial integration by one standard deviation would have increased post-1990 growth rates by around 0.4 percentage points per annum for the average

prefecture. We identify the lending behavior of the large, nationwide banks as the transmission channel from the financial shock to the real economy: these banks restricted their lending most severely in prefectures where they traditionally had the lowest market share (i.e. in the least financially integrated prefectures).

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. Hence, these regional banks essentially acted as clearing houses for loans that were ultimately provided by the Yokohama export merchants. As a result of their central role in this system of export finance for the silk reeling firms, 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 Recession, 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 lit-

erature 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.

We use the bursting of Japan's big property and stock market bubbles of the 1980s as an identifying shock to banks' lending behavior that tightened the financial constraints faced by credit-dependent households and firms. Besides being of interest in its own right, the Japanese experience during the 1990s and 2000s is important for at least two reasons, as follows. First, the workings of the financial accelerator and the balance sheet channel (see Bernanke (1983), Gertler and Gilchrist (1994) and Bernanke and Gertler (1989)) are plausibly much stronger in a major crisis

[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.

than in a "normal" downturn. Second, the Japanese crisis had very persistent effects on economic activity, leading to what is often referred to as the 'Lost Decade'. This provides us with a long period of observation after the crisis, allowing us to study its longer-term impact. Our use of the Japanese crisis as an identifying shock follows Peek and Rosengren (2000), Amiti and Weinstein (2011) and Imai and Takarabe (2011). Peek and Rosengren (2000) and Imai and Takarabe (2011) focus on common lender effects and on how integrated banking markets can accelerate the spread of a crisis. By contrast, our analysis emphasizes how a lack of regional banking integration can worsen a recession in particularly credit-dependent sectors and regions. 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 between prefectures to identify the impact of financial constraints on real economic activity.

This focus on the regional dimension of Japan's Great Recession is relatively novel in the literature.[2] The Japanese experience 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.

The paper therefore also contributes a regional perspective to the literature on banking crises and financial integration (Dell'Ariccia, Detragiache and Rajan (2008) and Kroszner, Laeven and Klingebiel (2007)). These studies examine the aftermath of banking crises in a large cross-section of countries. Our focus here is on the regional implications of a common (countrywide) shock over time.

We also add a regional dimension to the literature on the role of international banking in the cross-country transmission of shocks (Cetorelli and Goldberg (forthcoming) and Peek and Rosen-

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

gren (2000, 1997)). 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 these results is as evidence of relationship lending: banks withdraw from regions with which they have relatively weak ties. Our results are quite analogous: in fact, city banks reduced their lending in particular in prefectures in which they traditionally had a low market share. We add to this by showing that this effect was stronger in areas with many small firms. Our results also relate to recent findings by Cetorelli and Goldberg (forthcoming), who show that the internal liquidity management of US banks operating internationally actually exacerbated the transmission of domestic (i.e. US) liquidity shocks to foreign economies, leading to a reduction in lending.

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 seems to have 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). Evergreening may help explain our findings in this paper. First, Caballero, Hoshi and Kashyap (2008) show that manufacturing was one of the sectors that was least affected by evergreening. Our focus here is on small manufacturing firms—the ones that were therefore most likely to be deprived of the credit from which the (generally large) 'zombies' benefited. Furthermore, it seems that evergreening was particularly pervasive within *Zaibatsu*—the tight industrial conglomerates that encompass industrial firms and banks—and that it was conducted in particular by large banks. One of our findings is that large banks withdrew from areas where they traditionally had a low market share and where there were many small manufacturing firms. Clearly, this is consistent with the possibility that large banks withdrew credit 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 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 nonbank credit provided by the

[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'.

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 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

[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)).

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 and presents details about small business finance and the regional segmentation of the banking sector in Japan. It also introduces the data. Section 3 presents our basic stylized facts: the fallout from the crisis was particularly strong in regions where banking markets were not very integrated with the rest of the country and where there were many credit-dependent, small manufacturing firms. Section 4 acknowledges the potential endogeneity of our banking integration measures and introduces our instrument: we show that the importance of silk reeling in a prefecture in the late 19th century is a powerful predictor of the prefecture-level importance of regional banks in the late 20th century, and we proceed to demonstrate that these long-standing differences in financial integration significantly affected regional differences in macroeconomic transmission during the Great Recession of the 1990s. Section 5 discusses our results further and concludes.

Identification: small business finance and regional banking in Japan

To identify how cross-prefecture differences in financial integration affected the regional spread of the Great Recession, we adopt the approach of Rajan and Zingales (1998) in arguing that access to finance should matter more where dependence on credit is stronger. Hence, it should be the interaction between dependence on finance and access to finance that determines how severely the crisis hits a region. Our conjecture at the outset is that access to finance is worse in financially less integrated regions because there are barriers to the free flow of credit from outside the region in

response to credit demand shocks.[7] As argued by Rajan and Zingales (1998) and Guiso, Sapienza and Zingales (2004), focusing on such interactions strengthens the identification of the effects of the treatment (in their case, financial development; in our case, our measure of financial integration) because unobserved confluent factors can easily be controlled for: if regional differences in financial integration are time invariant, or only evolving very slowly (as we would expect), then it is impossible to separate their effect from a fixed effect in a panel setting if the marginal impact of financial integration on the outcome (e.g. growth or volatility) is fixed. If, however, the marginal impact of financial integration on the observed outcome depends on other characteristics (such as the dependence on external finance of households or firms), then the interaction allows us to separate the effect of financial integration from any first-order confluent factor that would be captured by the fixed effect.

As our primary measures of a prefecture's dependence on external 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] In this respect, we differ from Rajan and Zingales (1998), who 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.

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, also often referred to as 'second-tier' regional 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

[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.

confined in their lending to their prefecture of origin and only to firms below a certain equity (and employment) threshold. Hence, by virtue of the legal 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 ('zenkoku ginko', 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]

Clearly, the share of lending by regional vs. city banks could be a function of the local demand for credit. We note at the outset, however, that aggregate (countrywide) variation in the demand for credit (stimulated e.g. by variations in monetary policy or by an asset market boom as happened during the 1980s) should *a priori* affect banks of all types in a similar manner, leaving the cross-regional pattern of their lending shares largely unaffected.[12] Furthermore, in all our regres-

[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.

[12]This is a commonly used identifying restriction in credit-supply equations (see Kashyap and Stein (2000)).

sions, we use precrisis (i.e. pre-1990) lending shares as measures of financial integration. This should alleviate the most direct feedbacks of the crisis on the lending shares of individual banks.[13] Still, it could be the case that the lending share of regional banks is relatively high simply because there are many small businesses or because these businesses are doing particularly well. To the extent that Shinkins or other regional banks offer the best financing conditions for small firms, they would then be the first preference of these businesses. This would increase the share in total prefecture-level lending accounted for by the regional banks. Conversely, bias might exist in the opposite direction if nationwide banks withdraw from an area where growth prospects are poor, whereas regional lenders have no choice but to keep on lending locally. Our discussion of the historical roots of the cooperative banking sector will provide us with an instrument that allows us to address such issues of simultaneity. We now turn to our econometric implementation.

Econometric implementation

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

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

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. We chose

$$AggShock_t = Post1990_t$$

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 post-1990 growth rates.

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

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

an indicator of the prefecture-level demand for, or dependence on, credit. Our conjecture—based on Rajan and Zingales (1998) —is that the link between credit dependence and aggregate GDP growth is negative: when the crisis dummy 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. This is our second main specification. In this specification, the marginal effect of credit dependence is a continuous linear function of financial integration so that

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

and we would expect that—conditional on the number of credit-dependent firms in the prefecture—growth should be higher if financial integration is high, so that $\alpha_0 > 0$.[14]

A couple of remarks are in order on this specification. Regression (2) is a differences-in-differences (DD) specification in which the interactions with the intervention (the aggregate shock) vary only by prefecture (k) and not by time. This approach emphasizes the spirit of our analysis:

[14]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.

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. [15] 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.

After a description of our data, we discuss our baseline results that are based on the above specifications. We then discuss the different historical origins of regional versus nationwide banks. This discussion will allow us to suggest an instrument with which to address the potential endogeneity of FI in the above regressions.

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.[16] We define small and medium manufacturing enterprises (SMEs) as having fewer than 300 employees.[17] 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.

[15] 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.

[16] 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.

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

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*).

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. As we saw in the map on the left, many of these regions have no shading, i.e. they are regions with a low city bank lending share and, often, a high SME share in value added and/or employment. We now explore this link more formally and present our first regression results.

Baseline results

Table 2 presents our first set of results: Panel A for the measure of small business importance based on value added 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. The effect is large: 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. Even though this estimate is for all prefectures and is significant only at the 10 percent level, it is economically quite sizable: the average SME share (based on valued added) is 16 percent, and the range is

from about 8 percent in prefectures such as Nagasaki and Tokyo to 25 percent in prefectures such as Saitama and Shiga. According to our regressions, these most SME-intensive prefectures have seen a $(25-16)*0.08 \approx 0.7$ percent lower annual growth rate than the average prefecture over the 15 years following the bursting of the housing and stock market bubbles. The orders of magnitude for the employment-based measure of SME importance are similar.

Once we split the sample into two groups of 23 prefectures according to the levels of financial integration, based on our measure of 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. Our first main result is that the interaction between dependence on credit *and* low banking integration aggravated the recession as it spread across the country. Our interpretation of this finding is that credit-dependent small firms faced more severe credit constraints in regions where cross-regional banking flows were limited.[18]

[18]To further illustrate the quantitative importance of this effect, consider two prefectures such as Yamanashi and Fukushima, both of which have below-median levels of financial integration. According to Table 1, small manufacturing firms account for 20 percent of GDP in Yamanashi and 17 percent of GDP in Fukushima. According to our estimate, the growth differential between the prefectures should be $0.12 \times (0.2-0.17) = 0.036$ or 0.36 percent per year, *ceteris paribus*. Compounded over the 15 years from 1991 to 2005, this amounts to a 5.5 percent difference in per capita income. Conversely, consider two prefectures such as Nara and Fukuoka, both of which have very high levels of financial integration. Nara also has a rather high share of small businesses in GDP (around 18 percent), whereas Fukuoka has a rather low share (around 10 percent). According to our model, this difference in the incidence of small firms should not matter for post-1990 growth, *ceteris paribus*, because both prefectures have high levels of financial integration. In fact, according to the data, the growth differential between the financially integrated prefectures was much smaller: Fukuoka grew just 0.2 percent per year faster than Nara in the period after 1990. Conversely, with regard to the pair of financially less integrated prefectures, Fukushima grew 0.7 percent per year faster than Yamanashi over the period

In Table 3, we further explore this result. We start, in columns I and II, with regressions of prefecture-level GDP growth on interactions of the *Post*1990 dummy with our measures of banking integration and SME importance, respectively. Interestingly, regions with a high (low) lending share of city (regional) banks grew more slowly overall after 1990, possibly a reflection of the fact that the city bank share is particularly high in the big centers that were hit most severely by the housing price declines. We will return to this point shortly. Also, as we established before, prefectures with a high SME share had lower growth rates after 1990. Starting in columnIII, we report different versions of the regression specification (2) in which we now also include our main term of interest—the interaction between banking integration and SME importance. Our previous results are confirmed: the negative effect of credit dependence on post-1990 growth appears stronger in prefectures with low levels of banking integration.

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

1991–2005. The difference-in-difference of growth rates between the two pairs, therefore, is 0.5 percent per year, of which around 70 percent ($100 \times 0.036/0.05$) is explained by the interaction between low financial integration and high credit dependence.

low levels of interregional banking integration lead to a deeper recession in areas with many small, finance-dependent firms.

We note that our results do not imply that less integrated prefectures necessarily grow more slowly overall. Indeed, our estimates suggest that more financial integration would, if anything, lead to lower growth rates if there were no regional differences in credit dependence: the coefficient α_1 on the first-order term for financial integration is always significantly negative for the regional bank lending share and positive for the city bank lending share. It is the interaction between credit dependence (small firm importance) and low levels of financial integration that is associated with lower post-1990 growth. To appreciate this effect quantitatively, consider the last specification in Table 3 (column 8) and an average prefecture. According to Table 1, the average share of small firms in GDP is 16 percent. Increasing financial integration by one standard deviation (according to Table 1, this is 9 percent in terms of city bank lending share) implies a predicted increase in the prefecture's annual post-1990 growth rate of 0.45 percentage points. The numbers are similar for the specifications that use regional banks' lending share: increasing the lending share of regional banks by 10 percentage points would lower the growth rate of the average prefecture by 0.35 percentage points. We believe these are quite sizable effects. As we noted before, the effects will be even stronger for particularly credit-dependent prefectures. According to specification $VIII$, for a prefecture with a small firm share of 20 percent in value added (roughly one standard deviation above average), the predicted effect of increasing the city bank lending share by 10 percentage points would be a growth rate gain of 0.8 percentage points per year.

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

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

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.[19]

[19]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.

Dynamic effects

Our results so far suggest that post-1990 growth was lower, *ceteris paribus*, in areas with low financial integration and many credit-dependent firms *on average*. In Figure 2, we look at the role of banking integration in the *dynamics* of growth during the 'Lost Decade'. We split prefectures into four groups based on pre-1990 characteristics: above/below-median banking integration and above/below-median small business importance. Then, within each financial integration group, we look at the cumulative growth differential between the high-SME (i.e. high credit dependence) and the low-SME (low credit dependence) subgroups. The results in the figure show that, irrespective of the degree of banking integration, prefectures with many small manufacturing firms generally grew less than 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

To shed light on the transmission of the Great Recession to credit-dependent prefectures, Table 5 repeats the regressions from Table 3 but now with lending as the dependent variable.[20] Our interpretation of the previous results was that low financial integration would make small firms' access to credit more difficult in the Great Recession. The results in Table 5 are consistent with this notion: the first five columns provide results for total lending, while in columns VI–X and XI–XV we distinguish between lending by city banks and lending by regional banks.

[20] 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'.

In each panel, the first two columns show the results for small firm importance and financial integration, but without the interaction term: the results show that lending declined more strongly in areas with a high lending share of city banks. Furthermore, the first two columns in the next two panels (V and VI, and XI and XII) show that it is indeed city bank lending that declined most strongly in the areas that had high market penetration by city banks. This is essentially a version of the findings in Imai and Takarabe (2011), who report that lending declined most strongly in areas with many city banks because of a common lender effect: city banks were heavily affected by the land price decline in the core areas, and also cut back their lending in more provincial areas.

The last three columns of each panel report the results after adding the interaction term between small firm importance and our financial integration measure. High financial integration does seem to lead to more lending in areas of high credit dependence. Conversely, lending growth seems lower, *ceteris paribus*, in areas with many credit-dependent firms and low levels of financial integration. The corresponding columns in the second and third panel show that, in particular, the lending by city banks declined in credit-dependent but financially less integrated regions. Conversely, the countrywide decline in city bank lending because of the bursting of the asset bubble seems to have been considerably mitigated in areas where city banks traditionally had a high market share and where there are many small firms. Finally, the growth in lending by regional banks seems quite unaffected by the degree of financial integration or the importance of small firms.

On the one hand, these findings suggest that Japan's financial crisis constituted a major credit supply shock and that this shock spread very unequally across prefectures. It strongly affected regions with many credit-dependent firms and low levels of financial integration—understood here as a locally low market share of banks that operate nationwide. On the other hand, we do *not* think that our results are best interpreted as a simple credit crunch: *a priori*, we would expect a credit crunch to affect credit supply rather uniformly across different types of banks. We find that this is clearly not the case. Rather, the decline in lending in the least integrated and most credit-dependent prefectures is predominately explained by nationwide banks cutting back on their lending. Peek and Rosengren (2000, 1997) 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. Our results are the first to document the relevance of this channel for intranational effects, i.e. the regional dimension of Japan's Great Recession: regions in which nationwide banks had relatively weak standing experienced the largest declines in credit and economic activity.[21]

Our results are related to an important strand of the 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)). These authors argue that big banks would often defer action on bad loans in the hope that the situation of borrowing firms might improve or that the government would take action to bail out the banks or their borrowers. Caballero, Hoshi and Kashyap (2008) show that this 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 actually very much consistent with this pattern. First, Caballero, Hoshi and Kashyap (2008) document their finding based on a set of publicly listed (and therefore rather large) firms. In fact, they argue that evergreening was particularly pervasive within *Zaibatsu*, the tight-knit industrial conglomerates that encompass industrial firms and banks. Second, Caballero, Hoshi and Kashyap (2008) show that manufacturing was one of the sectors that was least affected by evergreening. Our focus here is on small manufacturing firms—the ones that were therefore most likely to be deprived of the credit from which the 'zombies' benefited.[22]

[21] One possible explanation of this pattern is relationship lending: banks withdraw first from markets in which they have relatively few long-standing credit relationships in order to keep on lending to large, long-standing customers. Small banks also tend to lend to small businesses (see Berger et al. (2005) for the US and Uchida, Udell and Watanabe (2008) for Japan). The evidence we present in the second part of the paper is also consistent with the view that relationship lending matters here: we show that the market share of regional banks vs. nationwide banks at the prefecture level has 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.

[22] 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 large borrowers. 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 our results do not preclude the possibility that regional banks for their part also engaged in some evergreening. However, this does not affect the empirical relevance of the channel we are investigating here: if regional banks evergreen inefficient small firms, depriving more efficient competitors 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 actually help explain the pattern we see here by increasing the importance

Our findings so far suggest that cross-prefectural variation in financial integration played a major role in the transmission of Japan's crisis to its regions: low financial integration had the most adverse effects in the most credit-dependent areas. The reason for this was that nationwide banks reduced their lending particularly strongly in areas where they historically had relatively weak standing.

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 the setup of our regression should alleviate the most immediate concerns: 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 sources of potential endogeneity. We acknowledge, however, that it may not fully solve the problem—in particular, to the extent that 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 affected 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

of financial integration for productive small firms' access to credit and therefore for growth in the region.

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 external credit dependence (measured by small business importance) and the integration of the region's banking sector into the national economy. We argue next that cross-regional differences in the importance of regional vs. nationwide banks ultimately reflect long-standing differences in local financial development 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 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]

[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.

[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

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 high-quality, 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. Furthermore, 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) 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

(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.

[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.

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 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

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

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 and, essentially, clearing houses 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, 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

[27] Miwa and Ramseyer (2006) argue that, even when they started to make direct loans to the silk reelers, banks 'piggy-backed' on the informational advantage of the Yokohama silk brokers, e.g. by only complementing loans that were made by the silk brokers. 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 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).

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 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

[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.

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)

[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

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.

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 (Greater Tokyo, comprising Tokyo, Chiba, Kanagawa and Saitama; the Kansai region, comprising Osaka, Hyogo and Kyoto; and Aichi) 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 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

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.

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.[32] 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.[33] 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.

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 instru-

[32] 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.

[33] 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.

ment 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 (1862–1912) have argued that one of the factors that favored the emergence of silk as an export staple was that silk reeling, mechanized or not, was not particularly intensive in terms of fixed capital.[34,35] 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)).[36]

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

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

[35]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.

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

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.[37] 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 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

[37] 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.

asymptotic bias.[38]

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 a prefecture to Yokohama as the first open port after 1858.[39] 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 financial (and, in particular, banking) integration in the 1980s, the spread of the Great Recession and the silk industry. Our

[38] 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.

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

instrument, however, is purely cross-sectional, whereas our main regressions here are based on a panel. Clearly, this helps us overcome the limited coverage of our cross-section (with 46 prefectures, excluding Okinawa) and allows us to control for common time variation and unobserved heterogeneity at the prefecture level. However, we also check our results based on what Bertrand, Duflo and Mullainathan (2004) have called a "before–after" regression, i.e. a cross-sectional regression of average post-1991 growth rates on pre-1991 characteristics. We report the results for such regressions in Table 9, 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. This suggests that the basic patterns in the data that we document in this paper, including the link between silk and regional banking sector integration, are discernible even in a simple cross-sectional regression that does not allow us to control for common time variation or unobserved heterogeneity across prefectures.

We conduct further robustness checks in Table 10, where we examine alternative measures of credit dependence at the prefecture level. Two concerns could be raised about our results so far: first small firm importance could be could be measured with error and it may therefore be a noisy proxy for credit dependence in a local economy. Secondly, small firm importance could itself be endogenous. For example, many firms might remain small because there are poor growth prospects in their prefecture. This might then also lead nationwide banks to withdraw credit from these areas, invalidating our identification. We address these concerns in several ways. First, we consider alternative measures of credit dependence that plausibly are less affected by measurement error and endogeneity. Second, in the next sub-section, we explicitly instrument for industrial structure

(and hence credit dependence).

As our first alternative measure of credit dependence, we use the rank of a prefecture in the cross-sectional distribution of small firm importance.[40] This allows us to deal with potential measurement error that arises from using small-firm importance as a potentially imperfect measure of credit dependence.

Second, we build on Rajan and Zingales (1998) to construct an exogenous measure of external credit dependence at the prefecture level. 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.

Table 10 presents our results based on both IV and OLS. The results strongly confirm our previous findings: in areas with high levels of credit-dependence, the downturn was much worse if the area had a low degree of banking integration with the rest of the country.

In our final subsection, we now turn to instrumenting for industrial structure explicitly.

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 in-

[40] This follows the classical approach by Durbin (1954), who advocated the use of rank indicators as an instrument in error-in-variables models.

terpret 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).[41] 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 11, we regress our measures of external finance dependence on the total number of filatures 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.[42] As Japan learned to produce and export high-quality silk, it also developed its manufacturing sector.[43] We exploit this insight to separate the long-term impact of silk

[41] 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.

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

[43] 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.

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 11 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 a measure of dependence on working capital and trade credit, and therefore as an instrument for banking sector integration during the 1980s.[44]

In Table 12, we repeat our Panel IV regressions, but 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 specifi-

[44]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.

cations. We conclude that, while the specific institutions of the silk industry have had an impact on the rise of manufacturing at large, our main conclusion remains intact: the downturn of the 1990s was deeper and more prolonged in areas with many credit-dependent firms and low levels of banking sector integration with the rest of the country. These were essentially the silk regions that were the main powerhouses of Japan's rise as an export nation from the late 19th century onward. Hence, the regional spread of the Great Recession was determined by an invisible silken thread that links the silk regions of the 19th century, their specific financing institutions and their specific pathway to financial development to cross-regional differences in financial integration and industry structure in the late 20th century.

Conclusion

This paper has explored the regional 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 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.

References

Acemoglu, Daron, and Simon Johnson. 2005. "Unbundling institutions." *Journal of Political Economy*, 113(5): 949–95.

Ahn, JaeBin, Amit K. Khandelwal, and Shang-Jin Wei. 2011. "The role of intermediaries in facilitating trade." *Journal of International Economics*, 84(1): 73–85.

Amiti, Mary, and David E. Weinstein. 2011. "Exports and Financial Shocks." *The Quarterly Journal of Economics*, 126(4): 1841–1877.

Atsumi, Toshihiro. 2010. "Silk, regional rivalry, and the impact of the port openings in nineteenth century Japan." *Journal of the Japanese and International Economies*, 24(4): 519–539.

Bekaert, Geert, Campbell R. Harvey, Christian Lundblad, and Stephan Siegel. 2007. "Global Growth Opportunities and Market Integration." *Journal of Finance*, 62(3): 1081–1137.

Berger, Allen N, and Gregory F Udell. 1995. "Relationship Lending and Lines of Credit in Small Firm Finance." *The Journal of Business*, 68(3): 351–81.

Berger, Allen N., Nathan H. Miller, Mitchell A. Petersen, Raghuram G. Rajan, and Jeremy C. Stein. 2005. "Does function follow organizational form? Evidence from the lending practices of large and small banks." *Journal of Financial Economics*, 76(2): 237–269.

Bernanke, Ben. 1983. "Non-Monetary Effects of the Financial Crisis in the Propagation of the Great Depression." *American Economic Review*, 73: 257–76.

Bernanke, Ben, and Mark Gertler. 1989. "Agency Costs, Net Worth and Business Fluctuations." *American Economic Review*, 79: 14–31.

Bernhofen, D. M, and J. C Brown. 2004. "A Direct Test of the Theory of Comparative Advantage: The Case of Japan." *Journal of Political Economy*, 112(1): 48–67.

Bernhofen, D. M, and J. C Brown. 2005. "An Empirical Assessment of the Comparative Advantage Gains From Trade: Evidence from Japan." *The American economic review*, 95(1): 208–225.

Bertrand, Marianne, Esther Duflo, and Sendhil Mullainathan. 2004. "How much should we trust Differences-in-Differences Estimates?" *Quarterly Journal of Economics*, 119 (1): 249–275.

Caballero, Ricardo J., Takeo Hoshi, and Anil K. Kashyap. 2008. "Zombie Lending and Depressed Restructuring in Japan." *American Economic Review*, 98(5): 1943–77.

Cetorelli, Nicola, and Linda Goldberg. forthcoming. "Banking Globalization and Monetary Transmission." *Journal of Finance*.

Cragg, John G., and Stephen G. Donald. 1993. "Testing Identifiability and Specification in Instrumental Variable Models." *Econometric Theory*, 9(02): 222–240.

Davis, Donald R., and David E. Weinstein. 2002. "Bones, Bombs, and Break Points: The Geography of Economic Activity." *American Economic Review*, 92(5): 1269–1289.

Dehejia, Rajeev, and Adriana Lleras-Muney. 2007. "Financial Development and Pathways of Growth: State Branching and Deposit Insurance Laws in the United States, 1900–1940." *Journal of Law and Economics*, 50: 239–272.

Dell'Ariccia, Giovanni, Enrica Detragiache, and Raghuram Rajan. 2008. "The real effect of banking crises." *Journal of Financial Intermediation*, 17(1): 89–112.

Do, Quy-Toan, and Andrei A. Levchenko. 2008. "Comparative advantage, demand for external finance, and financial development." *Journal of Financial Economics*, 86(3): 796 – 834.

Durbin, J. 1954. "Errors in Variables." *Revue de l'Institut International de Statistique / Review of the International Statistical Ins titute*, 22(1/3): pp. 23–32.

Federico, Giovanni. 1997. *An Economic History of the Silk Industry, 1830-1930. Cambridge Studies in Modern Economic History*, Cambridge University Press.

Feldstein, Martin, and Charles Horioka. 1980. "Domestic Saving and International Capital Flows." *Economic Journal*, 90(358): 314–29.

Fisman, Raymond, and Inessa Love. 2003. "Trade Credit, Financial Intermediary Development, and Industry Growth." *Journal of Finance*, 58(1): 353–374.

Fisman, Raymond, and Inessa Love. 2004. "Financial Development and Intersectoral Allocation: A New Approach." *Journal of Finance*, 59(6): 2785–2807.

Fujino, Shozaburo, Shiro Fujino, and Akira Ono. 1979. *Estimates of long-term economic statistics of Japan since 1868, vol. 11 Textile Industry (Chouki Keizai Toukei, 11 Senni Kougyou).* Toyo Keizai Shinpou Sha, Tokyo, Japan.

Gertler, Mark, and Simon Gilchrist. 1994. "Monetary Policy, Business Cycles, and the Behavior of Small Manufacturing Firms." *Quarterly Journal of Economics*, 109 (2): 309–40.

Glaeser, Edward L, Hedi D. Kallal, Jose A. Scheinkman, and Andrei Shleifer. 1992. "Growth in Cities." *Journal of Political Economy*, 100(6): 1126–52.

Grossman, Richard S., and Masami Imai. 2008. "The evolution of a national banking market in pre-war Japan." *Explorations in Economic History*, 45(1): 17 – 29.

Guiso, L., P. Sapienza, and L. Zingales. 2004. "Does Local Financial Development Matter?" *Quarterly Journal of Economics*, 119(3): 929–969.

Hoshi, Takeo, and Anil Kashyap. 2000. "The Japanese Banking Crisis: Where Did it Come from and How Will it End?" *NBER Macroeconomics Annual 1999*, 14: 129–201.

Hoshi, T., and A. Kashyap. 2004. "Japan's Economic and Financial Crisis: an Overview." *Journal of Economic Perspectives*, 18: 3–26.

Hosono, K., K. Sakai, and K. Tsuru. 2007. *Consolidation of Banks in Japan: Causes and Consequences.* National Bureau of Economic Research Cambridge, Mass., USA.

Imai, M., and S. Takarabe. 2011. "Bank Integration and Transmission of Financial Shocks: Evidence from Japan." *American Economic Journal: Macroeconomics*, 3(1): 155–183.

Jayaratne, Jith, and Philip E. Strahan. 1996. "The Finance-Growth Nexus: Evidence from Bank Branch Deregulation." *Quarterly Journal of Economics*, 111 (3): 639–70.

Kano, Masaji, and Yoshiro Tsutsui. 2003. "Geographical segmentation in Japanese bank loan markets." *Regional Science and Urban Economics*, 33(2): 157 – 174.

Kashyap, Anil K., and Jeremy C. Stein. 2000. "What Do a Million Observations on Banks Say about the Transmission of Monetary Policy?" *American Economic Review*, 90(3): 407–428.

King, R. G, and R. Levine. 1993. "Finance and Growth: Schumpeter might be right." *The Quarterly Journal of Economics*, 108(3): 717.

Kleibergen, Frank, and Richard Paap. 2006. "Generalized reduced rank tests using the singular value decomposition." *Journal of Econometrics*, 133(1): 97–126.

Kroszner, Randall S., Luc Laeven, and Daniela Klingebiel. 2007. "Banking crises, financial dependence, and growth." *Journal of Financial Economics*, 84(1): 187–228.

Li, M. L. 1982. "Silks by Sea: Trade, Technology, and Enterprise in China and Japan." *The Business History Review*, 56(2): 192–217.

Ma, D. 2004. "Why Japan, not China, was the First to Develop in East Asia: Lessons from Sericulture, 1850-1937." *Economic Development and Cultural Change*, 369–394.

Miwa, Y., and J. M Ramseyer. 2006. "Japanese Industrial Finance at the Close of the 19th Century: Trade Credit and Financial Intermediation." *Explorations in Economic History*, 43(1): 94–118.

Morgan, Donald P., Bertrand Rime, and Philip E. Strahan. 2004. "Bank Integration and State Business Cycles." *Quarterly Journal of Economics*, 119 (4): 1555–85.

Naito, T. 2008. "A Business Model of Silk Filature Financing by Local Banks: The Case of the Koide Bank." *Japanese Research in Business History*, 25: 11–32.

Nakabayashi, M. 2001. "The Rise of the Modern Silk Reeling Industry and Financial Institutions: The Formation of the Institution of Providing Advances on Documentary Bills." *Japanese Yearbook on Business History*, 18: 119–139.

Nakabayashi, M. 2009. "Imposed Efficiency of the Treaty Port: Japanese Industrialization and Western Imperialist Institutions." *ISS Discussion Paper Series*.

Nakabayashi, Masaki. 2006. "The Rise of a Factory Industry: Silk Reeling in Suwa District." In *The Role of Tradition in Japan's Industrialization*. Vol. Volume 2 of *Japanese Studies in Economic and Social History*, , ed. Masayuki Tanimoto. Oxford University Press.

Peek, J., and E. S Rosengren. 2000. "Collateral Damage: Effects of the Japanese Bank Crisis on Real Activity in the United States." *The American Economic Review*, 90(1): 30–45.

Peek, Joe, and Eric S. Rosengren. 1997. "The International Transmission of Financial Shocks: The Case of Japan." *The American Economic Review*, 87(4): pp. 495–505.

Peek, Joe, and Eric S. Rosengren. 2005. "Unnatural Selection: Perverse Incentives and the Misallocation of Credit in Japan." *The American Economic Review*, 95(4): pp. 1144–1166.

Petersen, Michell A., and Raghuram G. Rajan. 1997. "Trade Credit: Theories and Evidence." *The Review of Financial Studies*, 10(3): pp. 661–691.

Rajan, Raghuram G., and Luigi Zingales. 1998. "Financial Dependence and Growth." *The American Economic Review*, 88(3): 559–586.

Rajan, Raghuram G., and Rodney Ramcharan. 2011. "Land and Credit: A Study of the Political Economy of Banking in the United States in the Early 20th Century." *Journal of Finance*, 66(6): 1895–1931.

Spiegel, Mark M., and Nobuyoshi Yamori. 2006. "Determinants of Voluntary Bank Disclosure: Evidence from Japanese Shinkin Banks." In *Japan's Great Stagnation*. , ed. Michael Hutchison and Frank Westermann, 103–128. Cambridge, MA: MIT Press.

Staiger, Douglas, and James H. Stock. 1997. "Instrumental Variables Regression with Weak Instruments." *Econometrica*, 65(3): 557–586.

Stock, James H., and Motohiro Yogo. 2005. "Testing for Weak Instruments in Linear IV Regression." In *Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothenberg*. , ed. Donald W. K. Andrews and James H. Stock, 80–108. Cambridge: Cambridge University Press.

Uchida, Hirofumi, Gregory F. Udell, and Wako Watanabe. 2008. "Bank size and lending relationships in Japan." *Journal of the Japanese and International Economies*, 22(2): 242–267.

Yamazawa, Ippei. 1975. "Silk export and Japanese economic development (Kiito Yushutu to Nihon no Keizai Hatten)." Department of Economics, Hitotsubashi University, Tokyo, Japan. Department Bulletin Paper 19.

Yamazawa, Ippei, and Yuzo Yamamoto. 1979. *Estimates of long-term economic statistics of Japan since 1868.* Vol. 14 of *Foreign trade and balance of payments*, Toyo Keizai Shinpou Sha, Tokyo, Japan.

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: Robustness – 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		-1.31	
			(-2.72)		(-2.89)		(-2.99)	
$...SME^k \times CityBankShare^k$				0.68		0.72		0.81
				(3.12)		(3.20)		(3.90)
$...RegionalBankShare^k$	0.03		0.27		0.23		0.17	
	(0.82)		(3.04)		(3.23)		(2.53)	
$...CityBankShare^k$		-0.05		-0.15		-0.16		-0.08
		(-2.38)		(-4.56)		(-4.15)		(-1.80)
$...SME^k_{VA}$	-0.09	-0.07	0.33	-0.45	0.29	-0.47	0.31	-0.52
	(-3.87)	(-2.85)	(2.19)	(-3.55)	(2.35)	(-3.66)	(2.64)	(-4.16)
Controls:								
X^k : $...Lending/GDP$					-0.0006	0.0003		
					(-1.31)	(0.60)		
$...CoreArea$							-0.01	-0.01
							(-1.75)	(-2.96)
Z^k_t:								
$\Delta LandPrice_t \times CityBankShare^k$							0.15	0.19
(sample ends 2003)							(3.27)	(2.07)
R^2	0.56	0.57	0.57	0.57	0.57	0.57	0.58	0.58

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. 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). Z^k_t is the interaction of $CitibankShare^k$ and $\Delta LandPrice_t$, the percentage change in land prices in the core prefectures from Imai and Takarabe (2011). The sample period is 1980-2005 (2003 for regressions VII and $VIII$ involving $\Delta LandPrice$). 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 growth after 1990

Interactions of $Post1990_t$	Δlog(Total lending)					Δlog(City Bank lending)					Δlog(Regional Bank lending)				
with pre-1991 variables:	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV
$...SME^k_{EMP} \times RegionalBankShare$			-1.85					-4.49					2.66		
			(-1.14)					(-2.35)					(1.44)		
$...SME^k_{EMP} \times CityBankShare$				0.72	0.83				1.47	1.63				-0.94	-1.03
				(1.52)	(2.17)				(1.68)	(1.90)				(-0.91)	(-1.01)
$...RegionalBankShare$	0.07		0.32			0.12		0.72			0.09		-0.26		
	(1.08)		(1.27)			(1.11)		(2.59)			(1.16)		(-1.02)		
$...CityBankShare$		-0.13		-0.21	-0.19		-0.22		-0.40	-0.36		-0.07		0.04	0.02
		(-4.94)		(-3.18)	(-3.30)		(-5.41)		(-4.03)	(-3.70)		(-1.63)		(0.34)	(0.19)
$...SME^k_{EMP}$	-0.03	-0.01	0.50	-0.40	-0.46	-0.10	-0.0703	1.18	-0.86	-0.94	0.09	0.13	-0.67	0.64	0.68
	(-0.54)	(-0.26)	(1.02)	(-1.58)	(-2.16)	(-0.78)	(-0.73)	(2.08)	(-1.61)	(-1.79)	(0.55)	(0.92)	(-1.31)	(1.02)	(1.10)
$...CoreArea$					-0.02					-0.02					0.01
					(-3.93)					(-3.08)					(1.11)
R^2	0.58	0.60	0.58	0.60	0.61	0.79	0.80	0.79	0.80	0.80	0.73	0.73	0.73	0.73	0.73

The Table shows results from the regression $\Delta lending^{X,k}_t = Post1990_t \times \left[\alpha_0 SME^k_{EMP} \times FI^k + \alpha_1 FI^k + \alpha_2 SME^k_{EMP} + \boldsymbol{\alpha}_3' X^k_t\right] + \mu^k + \tau_t + \epsilon^k_t$ where $\Delta lending^{X,k}_t$ is prefecture k lending growth and X stands in turn for total lending (columns $I - V$), city bank lending (columns $VI - X$) and regional bank lending (columns $XI - XV$). $Post1990_t$ is a dummy indicating the period after 1990 (i.e. 1991-2005), SME^k_{EMP} is small-business importance based on employment, FI^k is the measure of financial integration (pre-1991 (1980-90) average regional and city bank share in total lending in prefecture k). $\mu^k$and τ_t are prefecture-fixed and time effects respectively. *CoreArea* is a dummy for the core economic areas (Tokyo, Osaka, Aichi, Kanagawa, Chiba, Saitama, Hyogo and Kyoto prefectures) The sample period is 1980-1996.

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				$\frac{bank\ branches}{population \times area}$ (pre-1990)		Lending/GDP (pre-1990)		
			All (Shinkin+Sogo)		Shinkins only						
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 (log #)	-0.01 (-1.35)		0.01 (0.98)		-0.00 (-0.07)	
mechanized filatures (log #)	-0.02 (-3.57)		0.02 (3.07)		0.03 (4.28)	
output: hand reeled (log tons)		-0.00 (-0.49)		-0.00 (-0.51)		-0.01 (-0.64)
output: machine reeled (log tons)		-0.03 (-3.98)		0.02 (2.96)		0.02 (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: Cross-sectional Regressions

	SME_{VA} (output based)						SME_{EMP} (employment based)					
	$FI =$						$FI =$					
	City Banks		Regional Banks				City Banks		Regional Banks			
			All		Shinkin				All		Shinkin	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
$SME^k \times FI^k$	0.14	0.36	-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 10: 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			
	City Banks		Regional Banks		City Banks		Regional Banks		City Banks		Regional Banks	
Interactions of $Post1990_t$ with ...	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
$CD^k \times FI^k$	0.02	0.02	-0.03	-0.04	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.

Table 11: 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

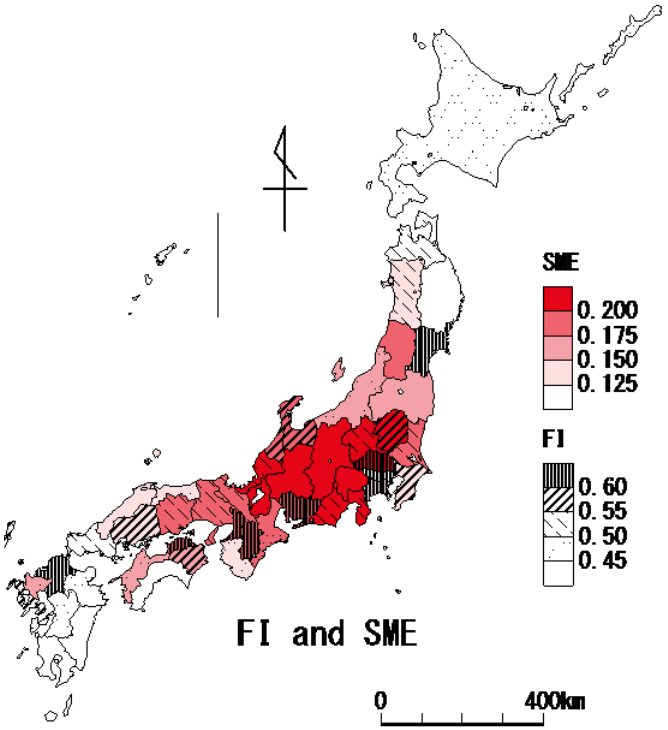
The Table shows cross-sectional regressions of modern-day (1980-90 average) industrial structure (left panel) and 1980-1990 average prefectural lending shares by bank type (right panel) on our two alternative silk-related variables: the minimum (log) distance to one of the four prefectures with the most 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 12: 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



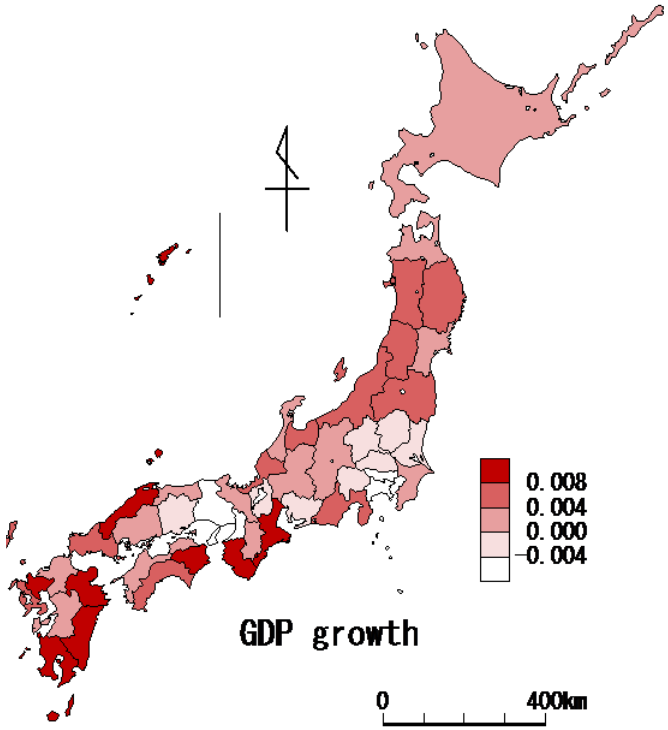
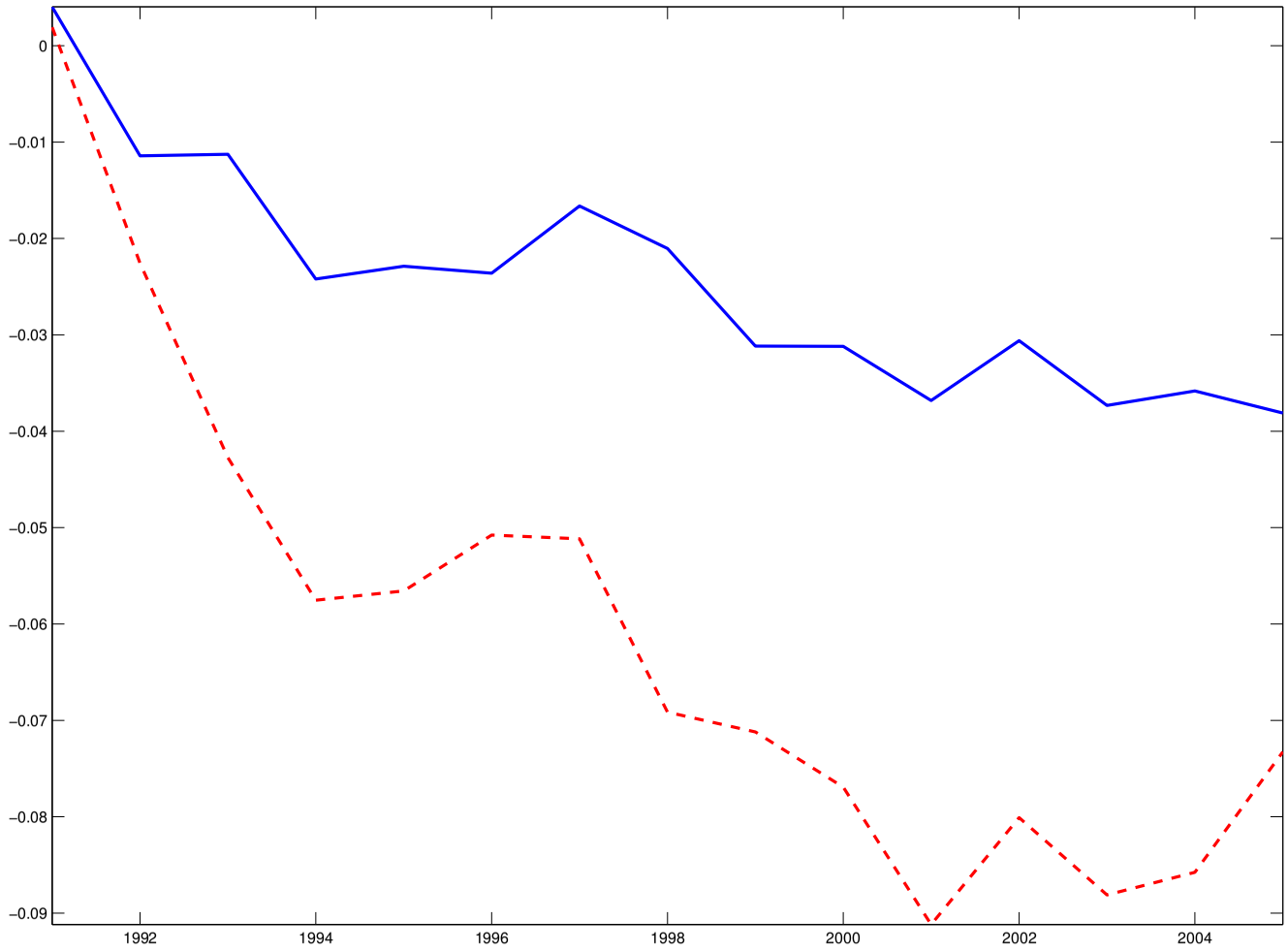
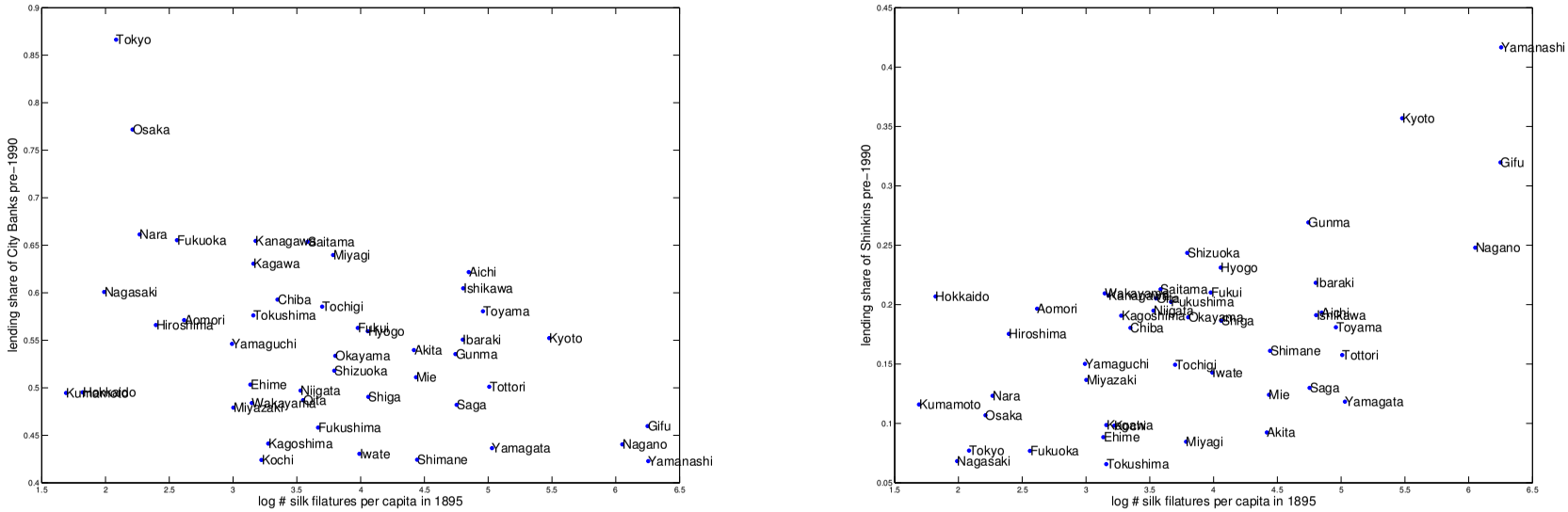


Figure 2: Cumulative Growth Differential (1991-2005) between high and low SME group for prefectures with high (blue, solid line) and low (red, dashed line) levels of banking integration.



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.