Credit Channels and the Small Firm Sector in Japan

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Draft for presentation to:
The Japan Economic Seminar
April 19, 1997
Marvin Center, 4th floor
George Washington University

The author gratefully acknowledges the support of the Institute for Monetary and Economic Studies, the Bank of Japan, for this research. Hisashi Nakamura provided indispensable assistance, particularly in penetrating the mysteries of Japanese data sources. Thanks are also due to Kunio Okina, Shigenori Shiratsuka and other colleagues at the Institute for their thoughtful comments and helpful encouragement during the author's stay as a Visiting Scholar during 1996-97.

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April 1997

I. Summary

This study looked for evidence of a "credit channel", amplifying monetary impulses transmitted to the real economy via small manufacturing firms in Japan. It was inspired by several studies that found evidence of such a "financial accelerator" in the United States. The results are largely negative, however: There do not appear to be systematic differences in the cyclical response of small, as compared to large, firms to monetary tightening in Japan.

This leads to a look at differing characteristics of the small-firm sector in the two countries: Specifically, one of the main reasons for believing that small firms are credit-constrained is that they tend to be relatively young firms, lacking a track record that helps to overcome informational asymmetries and to lower the cost of external finance. But, there is some evidence suggesting that the strong correlation between age and size of firm may not apply in Japan, which has startlingly low firm turnover rates compared to other industrial countries. The implication is that, while a credit channel may well exist in Japan, it cannot be identified by using firm size as a proxy for credit access; more direct measures need to be employed, probably using cross-sectional data. An appendix to this paper is devoted to data issues relating to the Ministry of Finance's quarterly survey of corporations, including problems with the size classification based on paid-in capital. These data problems, while important, do not explain away the lack of evidence for a "credit channel" through small firms.

II. Motivation

It is widely believed that overall monetary conditions, and therefore monetary policy, are a powerful influence on economic activity over the business cycle. At least implicitly, judging from the lavish attention devoted to central bank actions by the business world and its media, the proposition that short-term changes in monetary stance affect the economy broadly is accepted with little question. But there is not a corresponding consensus about *how* such influence comes about. Textbook versions of the "channels" of monetary influence that are most popularly understood – mainly, the Keynesian reasoning that links (long-term real) interest rate levels to investment in business equipment and housing, and/or monetarist formulations that call for a stable demand function in measurable forms of "money" – invariably turn out to be unpersuasive in the concrete. Neither econometric nor common-sense estimates of the interest-sensitivity of investment, or of money demand, are large enough to explain the powerful cyclical impact that monetary changes are perceived to have.

This gap has encouraged a revival of interest among economists in alternative formulations, most notably the so-called "credit channels" of monetary influence that operate through changes in corporate balance-sheets and/or bank lending behavior. These ideas have a long history – extending at least back to Irving Fisher's famous 1933 article – and some of their most dramatic development has been in analyses of the Great Depression of the United States (Mishkin 1978; Bernanke 1983) that are more than a decade old by now. However, attempts to apply them to more ordinary business cycle phenomena have become popular mainly in recent years, as economists have thrown off the yoke of the Modigliani-Miller theorem, positing capital market imperfections that make it reasonable for balance-sheet structures to influence companies' investment demand and their access to credit over the monetary policy cycle. Agency costs, arising from asymmetric information available to borrowers as opposed to lenders, are increased in a period when tight

monetary conditions cause asset price decline and balance-sheet deterioration at firms. Whether this is viewed mainly as a change in a bank's propensity to supply credit to firms, or more as a borrower's diminished eligibility on an unchanged supply schedule, is not critical. In either case, it constitutes a "financial accelerator" that can magnify the impact of changes in monetary conditions (and policy) on real economic activity.

The logic points to two main groups of credit-constrained actors – small-sized firms and households – as the most likely to be affected by monetary policy through such a "balance sheet channel". These groups are typically more dependent on bank finance, as opposed to open market capital, and less well collateralized than are large firms. Small firms, in addition, are generally expected to be younger firms without long track records, adding to information asymmetries between borrower and lender. Economists in the United States have had some success in documenting differences, in the behavior of small versus large-sized businesses, that support the idea that the former are indeed more sensitive to monetary conditions than the latter. Further, the evidence suggests that the differences are large enough to explain a significant part of cyclical variation in U.S. aggregate fixed investment, inventory fluctuations, and employment.

If a similar pattern were found for Japan, it would help to explain Japan's experience over the past decade, which involved some of the largest asset-price swings that any economy has witnessed since the Great Depression. Further, balance-sheet impacts were concentrated in Japan's small-firm sector. Japan, like a number of other countries, saw substantial changes in its financial system during the 1980s, and the coincidence of asset bubbles with trends to more "open" financial arrangements was observed in most of these countries at this time. A plausible hypothesis, which is becoming widely accepted at least for the case of Japan, is that a class of firms that had relatively restricted access to credit before the 1980s became more favored after 1980 – not due solely to

deregulation and internationalization, but also to accompanying trends that led banks to seek new clientele to replace cash-rich large firms that were no longer borrowing. The most important such class might well have been small firms that owned land, and these firms would thus have experienced especially large expansions in debt, investment, and overall activity during the bubble and the most stringent cutbacks in the 1990s.[1] This mechanism would have amplified the land-price boom itself, as well as enhancing its impact on credit availability, business capital spending, and the economy as a whole. The episode can thus be viewed as an exceptionally important case of financial influences being propagated in amplified fashion through the small firm sector, in a period when the supply of credit to that sector was shifted disproportionately outward, leading small firms to rely even more heavily than usual on external credit and to become exceptionally vulnerable to its withdrawal when monetary conditions tightened in the 1990s.[2]

III. Empirical verification in other studies

For U.S. firms, a number of studies have found evidence of differing cyclical patterns at small and large firms, consistent with the notion of a credit channel.[3] One of the most comprehensive efforts is Gertler and Gilchrist (1994), which found significant negative effects of tight money on sales (used to represent overall activity), inventories and short-term debt at small manufacturing firms, and did not find them at large firms. The results are clearest in the case of inventory behavior. Descriptively, inventory growth accelerates just prior to recessions for large firms, but not for small; and recession-induced inventory declines are sharper for small firms. Similar, but less pronounced, patterns are found for short-term debt and sales. Structural estimates of investment

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[1] Jeffrey Frankel (19xx) was one of the first to articulate this hypothesis. The Bank of Japan (1996) describes the episode along these lines.

[2] A similar "story" may be true of households that owned land. But, since the household sector as a whole divested itself of land holdings during the bubble – making large net sales to the corporate sector – there was not a major *overall* deterioration of household balance sheets and this sector thus did not play such a large role in propagating the asset "bubble" and its aftermath. Bruner and Kamin (1995) detail the household sector's relatively benign balance-sheet development during the 1980s and 1990s.

behavior showed significant impact of a cash flow variable (interest coverage ratio) at small firms, but not at large firms. A subsequent study by the same authors with Bernanke (1994) found similar results after controlling for industry sector, and after splitting the sample using an alternative proxy for credit access (bank-dependency instead of size). These studies used data from the Quarterly Financial Report for Manufacturing Corporations, a data set that covers most U.S. firms and is based on IRS tax returns. A study by Oliner and Rudebush (1996) found greater sensitivity of fixed investment to internal cash flow at small firms, compared to large ones, using Compustat data (annual, covering listed firms only).

Gertler and Gilchrist (1994) also presented some evidence evaluating the importance of these differences in the economy's overall response to monetary policy changes. Small manufacturing firms (classified by gross asset size, with the size criteria adjusted over time so that "small" firms account for around 30% of sales) contributed 55% to 60% of the drop in total manufacturing sales within the first 4, 8, or 12 quarters following a monetary tightening, and they offset about 20% of the inventory accumulation of large firms after 4 quarters, rising to 50% after 8 quarters. The authors reasoned that the overall cyclical contribution of small firms is likely to be larger than represented by these estimates, since the weight of small firms is greater outside manufacturing than within it.

Some studies have found evidence using variables other than size to proxy for credit-constrainedness. Fazzari, Hubbard and Petersen (1988) showed greater sensitivity of investment to cash flow and liquidity in firms that retain most of their income. These non-dividend-paying firms also tended to be smaller and faster growing than others. Richard Cantor (1990) found greater sensitivity of both fixed investment and *employment* to cash flow in firms with relatively high

leverage, which he interpreted as reflecting differences in access to credit. This result is independent of firm size, but the analysis also found size to have a significant, independent, negative impact on volatility of investment and employment. A paper by Kashyap, Lamont and Stein (1994) documented the influence of liquidity (cash plus marketable securities as a share of total assets) on inventory investment at firms that did not have a bond rating (used as the measure of "access"), but failed to find the same relationship at bond-rated firms. In Japan, Hoshi, Kashyap and Scharfstein (1991) used data from the Japan Development Bank on listed firms to show that liquidity (or cash flow) affects investment at firms that do not have a main bank relationship – a class of firms that is presumed to be more credit-constrained than others – while no such relationship was found for main-bank affiliated firms.

IV. Empirical evidence for Japan

A. Sources of data on Japanese corporations

The **Ministry of Finance's quarterly survey** of corporations *(Hojin Kigyo Tokei)* covers firms of all sizes above ¥10 million capital (which, as of April 1996, is now the minimum size of an incorporated firm in Japan). It includes a broad and consistent set of variables from firms' financial reports, from 1960 to the present, for several size classes of firm, and is thus a natural place to look for evidence of size-based differences in response to financial factors. Data by size and by detailed industry category are also reported, for the most part from 1979 Q4 (Oct-Dec) on. The survey is virtually a complete census in the category of firms above ¥1 billion in capital, but based on selected samples for size classes below that.

There are three main problems with this data set. First, the samples are changed once each year, with the April-June survey. In principle, this should not be a large problem if the samples are

[3] For a review of this literature, see, for example, Bernanke (1993), Calomiris (1993) and Hubbard (1994).

properly selected so as to reflect trends in the population as a whole. However, examination of the data does suggest that changes in the character of the samples, especially the sample of small firms, tend to occur with the April sample changeovers (see Appendix C). Two approaches have been used to minimize this problem: First, the data have been adjusted (more accurately, they have been smoothed) to distribute changes observed in the annual series more evenly across the intervening quarters, applying a modified version of the method that was developed by the Institute for Social Engineering (1976). (See Appendix D.) Secondly, the "small" firm sector used for the comparisons was limited to firms between ¥100 million and ¥1 billion capital size. This eliminates the ¥10 million-to-¥100 million size class, which seems to show the greatest instability due to sampling changes (Appendix C).

A second problem is the method by which the Ministry of Finance estimates population totals in each size class. These estimates *(suikeichi)* are what is actually presented in the published data. They are obtained by multiplying sample statistics for each item by the ratio of the estimated total population to the size of the sample. Even if the samples are carefully selected, there is likely to be some bias toward underrepresentation of smaller firms, which means that there may be a bias toward overestimating the importance of smaller size classes. This problem, however, would not necessarily affect inferences based on growth rates from period to period. And it certainly should not affect interpretation of ratios beween different items (including averages per firm) in the survey, since the latter are essentially sample averages. As one check on whether this problem might be affecting the results, some comparisons were done with inventory/sales ratios.

The third problem is the size classification itself, which is based on book value of capital. Close to 90% of firms are recorded in the smallest category, of ¥10 million to ¥50 million in capital. (This observation refers to the underlying population, which is estimated, presumably rather accurately,

from corporate registry data.) Moreover, the proportion of these smallest firms has actually increased steadily over time, from around 60% in the early 1960s. This trend seems counterintuitive given that the size criterion is set in unchanged *nominal* yen terms over a span of more than 35 years. As a result, the share of (for one example) sales that is accounted for by large (over ¥1 billion or over ¥100 million) firms has not grown since the 1960s. This is not due to changes in sampling procedures: The sample sizes, while they have increased over time, have grown less than the estimated population, especially in the smallest size classes (Table in Appendix C). Thus, there is no reason to think that any bias toward overweighting larger firms has been reduced over time through sample-widening.

One reason for this, at least in the 1990s, is a rise in the minimum capital requirement for incorporation under Japanese law – from ¥350 thousand to ¥10 million – that was decided in 1990 and became effective in April 1996. This change prompted many very small firms that wished to remain incorporated to add to their book capital to bring themselves above the ¥10 million minimum, which happens to coincide with the minimum for inclusion in the MoF quarterly survey and thus enlarged the number of potential reporters. This has led to an accelerated growth in the number of firms in the lowest size class that is particularly noticeable starting in 1992 (Appendix C). But, the relatively rapid growth of very small firms had been a fairly consistent trend for 30 years before that, suggesting that there is more to it than these recent legal changes. Increases in minimum capital requirements for incorporation, from much lower levels, had occurred during those years. But these should not have had the same effect on the survey since the minimum size for inclusion in the MoF survey has always been ¥10 million capital.

The most plausible explanation for this phenomenon is that firms tend to start up with a small amount of book capital (par value times the number of shares), and often have little incentive to

increase it even when their assets and economic activity would warrant moving into a "medium" or "large" size class.[4] Indeed, it is possible that the amount of capital that firms report may be positively related to how recently they were incorporated, rather than to how large they really are. If this were true, the resulting distortion could be important, as it would run exactly counter to the expected *positive* association between age and size of firm that helps to justify using size as a proxy for credit access.

Even considering the faults in this classification, it seems likely that firms in the largest size class, reporting more than ¥1 billion in capital, are indeed "large" firms economically speaking. But the lower size classes should probably be viewed as covering a range that includes both large and small firms. An optimistic interpretation would be that these samples can still be compared to reveal differences between larger and smaller firms on average, although the samples might understate those differences. Ultimately, this assumption has to be believed in order to justfy any economic interpretation of the MoF data by firm size.

The **Bank of Japan's quarterly "Tankan"** survey of roughly 5,000 firms also provides data by size class, based on number of employees. The categories are "small" (50 to 299 employees), "medium" (300 to 999) and "large" (1000 and above) for manufacturing firms and most nonmanufacturers. Somewhat smaller levels are used for wholesale and retail trade, including firms with as few as 20 employees. Classification based on number of employees may not be ideal, but it is relatively easy to measure, and reasonably consistent in its meaning over time. Data by size are available for the most part from 1974 on. However, the Tankan survey does not contain an extensive array of financial data for these firms, limiting its usefulness for present purposes.

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[4] There may be disincentives. For instance, assets transferred from personal to corporate ownership are subject to capital gains taxation at the time of transfer.

Still, some comparisons were done using the BoJ data on inventories, sales and borrowing, as one check to make sure that peculiarities in the MoF survey are not driving the results.

For firms listed on the main stock exchanges, extensive quarterly data are available. The Hoshi, Kashyap and Scharfstein study cited earlier used the **Japan Development Bank's data set** for listed firms which is designed to permit cross-sectional comparisons and allows for following individual firms over time. However, listed firms especially in Japan are predominantly larger firms which by definition have favored access to capital markets, making this source of limited use for studying the characteristics of small or credit-constrained firms. Indeed, it is striking that the authors identified only 24 firms (among the continuously listed set that were used for the study) that did not have a main bank, as compared with 121 firms that did. The findings of the 1991 study are supportive of the credit channels hypothesis, and might be worth updating into the 1990s. But any effort to look at small, as a proxy for credit-constrained, firms necessarily has to get beyond the set of listed companies alone.

B. Comparisons of small versus large manufacturing firms in Japan

First, it is necessary to explain why the study focused on manufacturing firms within the Japanese corporate sector. Clearly, this is not the sector with the most interesting story during the past "bubble" and its aftermath: Manufacturers took on only 20% of the expansion of corporate borrowing between 1980 and 1990, even though they had accounted for 36% of oustanding corporate borrowing in 1980. The remaining 80% of new company borrowing during that decade was concentrated in wholesale and retail trade (24%), real estate (17%), construction (11%), along with a variety of other services. Still, the financial characteristics of small firms within the manufacturing sector are rather different from those of large firms, and their experience in the past 15 years is comparable with that of the nonmanufacturing sector in several ways. On broad financial measures from the MoF survey (See first table in Appendix A), small manufacturers have higher debt levels than larger ones, although not as high as small nonmanufacturing firms do. The importance of land within these companies' balance sheets grew markedly after 1980, as it did at nonmanufacturing firms but not at large manufacturers. And, the reliance of small manufacturers on borrowing from financial institutions also rose sharply between 1980 and 1995 to levels quite similar to those of their non-manufacturing counterparts. This is a sharp contrast with the big reductions in such reliance made by large manufacturers in this period.

1. Time series comparisons

First, long time series were examined for differences in the cyclical patterns of sales, inventories, investment, and borrowing at small, as opposed to large, manufacturing firms using the MoF survey data. “Small” manufacturing firms were defined as those with less than ¥1 billion in capital, a class that averaged about 44% of total sales through the past past 35 years. However, the comparisons were done using a subset, excluding firms below ¥100 million in capital because of the data problems found in that smallest category of firms. While this sacrifices data on an important set of very small firms, it still should provide evidence of size-based differences in firm behavior.

The data were first adjusted to smooth over the annual sample changes, using the method that was developed by the Institute for Social Engineering and is commonly applied by Japanese scholars using these data (Appendix D). They were then seasonally adjusted using the Census X12 Arima method, allowing for estimation of seasonals using data for five years before and five years after each data point. Comparisons were based on quarterly growth rates, except for the inventory sales ratios which were compared as a check on the potential bias mentioned above (section IV.A.) in the MoF's method of estimating industry totals from the sample data.

For inventories (Charts - 1 below), small firms seem to have peaked earlier than large firms in some downturns, but not all. Inventory growth peaked a quarter earlier at small firms in 1974 (Q1 versus Q2), and in 1980 (Q1 versus Q2), and a lot earlier in 1988 (Q1, versus 1989Q3 for large firms). But large firms peaked first in 1968 (Q4 versus 1969Q2 for small firms), and simultaneously in 1985 (Q1). When looked at in terms of the *level* of inventories relative to sales, small firms peaked first in two of the four cases when a peak can be identified at all (1971Q2, versus Q3 for large firms; and 1981Q1, versus Q4 for large firms). In 1975, they both peaked in

Q3, and in the latest cycle large firms peaked earlier: 1992Q4 versus 1993Q1 for small firms. (Note that inventory *growth* peaked early at small firms ahead of the latest downturn, but small firms actually took a bit longer to begin reducing their inventory/sales ratios.) Most importantly, small firms do see inventory growth ahead of recessions, just as large firms do. And, there is no particular pattern of their experiencing sharper inventory reductions during downturns: Depending on the cycle, large firms have made just as rapid, and just as extensive, cutbacks as small firms.

Comparisons of sales and borrowing growth for the two classes of firms were even less impressive (Charts – 2). Out of 7 identifiable downturns, growth of sales (taken as an indication of overall activity) peaked at the same time at both groups of firms in five cycles (1969, 1974, 1980, 1987, 1990). The two exceptions (1976 and 1985) were cases when large firms saw a peak one quarter earlier than small firms. Again, the size of fluctuations is at least as great at large firms as small ones. The borrowing data depict two occasions (1974 and 1979) when small firms clearly did cut back sooner than large ones; but the series is too erratic to interpret seriously: containing a number of extra swings that bear no clear relationship to business cycles.

The results for investment do show somewhat more cyclical fluctuation at small firms (Charts – 2). Indeed, it is only in recent cycles (1986, 1993, 1995) that large firm investment declined, in nominal yen terms, over any six-month period, whereas small firm investment did so in previous cycles as well. And, turns have been led by small firms more often that not. Peaks (measured in growth rates, since levels tend to grow throughout) came first at small firms in three instances (1969Q1, versus 1969Q2 for large firms; 1973Q4 versus 1974Q1; and 1988Q4 versus 1989Q1), simultaneously in one (1979Q3), and earlier at large firms in one (1984Q3, as opposed to 1984Q4 at small firms). Small firms led investment upturns by more: troughing in 1971Q4, versus 1972Q3 at large firms; 1974Q4, versus 1975Q1; 1977Q3 versus 1978Q3; and 1982Q1 versus 1983Q1. Troughs were simultaneous in 1986Q1, and large firms bottomed first in 1993Q3

(versus 1993Q4 at small firms). This unusual lag in small firm investment recovery has been a much-noted feature of the current "post-bubble" recovery. It should be noted that the symmetry of differential behavior at both peaks and troughs, while it is conventional wisdom for Japan, is not necessarily predicted by theory (see Bernanke and Gertler (1989)), and is not what has been found in the United States. Gertler and Gilchrist (1994) based some of their results on the hypothesis, which is maintained in their U.S. data, that balance sheet effects operate asymmetrically to create a difference between small and large firms in downturns, but not upturns. Finally, the investment data from the MoF survey showed three extra downturns at small firms that were not seen at large ones (peaks in 1976Q2, 1982Q2 and 1993Q2). This may indicate data problems, or it may document higher volatility in some sense – but it is not clear that this is a *cyclical* fluctuation pattern that verifies the credit channel hypothesis for small firms.

A look at the BoJ's Tankan survey data indicates that this lack of differentiation between small and large firms is not simply a fault of the size classification in the MoF data. For inventory growth, for instance, smaller firms, classified by number of employees, show no tendency to earlier or sharper cutbacks during downturns compared to large firms. Inventory/sales ratios, if anything, showed milder fluctuations at small firms in downturns (Charts – 3). Cyclical fluctuation in sales is basically similar in all three size classes, consistent with the MoF data. Borrowing from financial institutions does seem to show a regular cyclical pattern at small firms in the Tankan data, much more than at large ones. But reductions are not more severe during downturns, as would be expected if monetary tightening had a bigger impact on small firm balance sheets. Indeed, the BoJ data show virtually no instances of outright decline in borrowing by smaller firms, even during recessions (Charts – 4).

2. Comparisons of cumulative change after monetary tightenings

A second set of descriptive comparisons was based on cumulative changes in the same variables, in periods following the start of monetary tightenings. The definition of a "tightening period" was based on the trend in the overnight call money rate, after examination of several alternative measures of "monetary tightening" (See Appendix B). The precise timing of onset for both tightenings and easings does vary depending on which measure is used: that is, whether interest rates alone are used, or they are combined with exchange rates in a "Bank of Canada-style" index of overall monetary conditions, and whether nominal or real (inflation-adjusted) measures are used for both interest and exchange rates. For a period this long, it seems best to use the simplest measure of tightening, based on the timing of sustained rises in nominal short-term interest rates. A broader, and inflation-adjusted, measure is undoubtedly preferable for more current analysis, and it gives a stronger picture of the *extent* of changes in some periods – most notably, the most recent easing of monetary policy since early 1995. But it becomes difficult to interpret these measures in a time span that includes two externally-imposed "oil shocks" and major changes in exchange-rate regime. Also, the nominal overnight interest rate measure is appealing because it shows the clearest cyclical changes throughout the period covered. On this measure, there were five periods of tightening that could be documented using the MoF survey data: starting in May 1967, November 1972, February 1979, August 1985 and March 1989 (Appendix B). Of these, the last three tightening periods could be examined using the Tankan data by employment size.

The gist of the results can be seen in Charts 5-9 below. There are no consistent differences between small and large firms across these cycles. Both large and small firms experienced **inventory** growth well into tightening periods, followed by a period of flat (in the earlier "growth-recession" cycles) or negative (in the later ones) growth. Cumulative inventory growth does seem to have been curbed at a lower level at small firms. The exception was the episode that began in mid-1985;

in that case inventories fell from the start – but *less* so at small firms than at large ones. **Inventory/sales** ratios generally were restrained about as much at large as at small firms, reflecting the fact that small firms' **sales** growth was more muted during these downturns than that of large firms. The comparisons are similar, whether viewed in the MoF or the BoJ data, indicating that they are not driven by the method of size classification or other peculiarities of sampling. An exception here is the data on **borrowing**, especially in the most recent cycle. Of the two, the BoJ data seem to follow a more plausible pattern, which is a bit of a disappointment given that the strength of the MoF survey is supposed to be its coverage of financial variables.

Investment does show one differential pattern by size that is common to all cycles before 1985, but it is not one predicted by the financial accelerator. That is: The impact of tightening appears to be initially greater at *large* firms, which experienced a relative slowing of investment growth (none of these cycles had outright declines) in the first two years starting 1968Q1, 1972Q4 and 1979Q1. Later on, smaller firms are more affected, so that over a period of 4 or 5 years their investment growth falls behind that of larger firms after tightening. The cycle that started in 1985Q3 shows no clear difference between large and small firms, and in the most recent one small firms' investment was weaker from the start (Charts 7). This last is an oft-noted observation on the post-bubble downturn; it is consistent with a credit channel, and with the Frankel/BoJ version in particular. But it appears to be something new.

3. VAR analysis

As could be expected based on the negative results of these descriptive comparisons, vector autoregression analysis also did not turn up any convincing evidence that small firms are subject to greater impacts from monetary tightening than are large firms. These experiments used a direct measure of "monetary conditions" as one of the endogenous variables in various equations, which allowed experimentation with alternative measures of monetary conditions based on real interest rates, and on a combination of exchange rates along with interest rates as well as the measure based on nominal interest rates alone (See Appendix B on measures of monetary tightness). Some estimates were done using a dummy variable for the start of tightening periods, an approach that is comparable with the descriptive comparisons in Section IV.B.2. above; these showed no significant effects from the monetary variables on either class of firm. For small firms, the only cases where the four lagged values of a monetary conditions variable contributed, independently of sales, were in explaining changes in small-firm borrowing: Here, the real interest rate was signficant at a 10% level of probability and real overall monetary conditions at a 5% level. However, none of the measures helped to explain investment at small firms (or at large ones either). For inventories, one variable – the nominal monetary conditions index – contributed significantly at the 10% level in the case of large firms, but not at small ones. (Results summarized in Appendix A, Table 2)

V. Why are the results different for Japan?

The data available for comparing small versus large firms contain serious problems, as discussed above and detailed further in Appendix C. For instance, the firms classified as having less than ¥1 billion capital in the Ministry of Finance corporate survey may not really be proponderantly "small", given the lack of incentives for increasing paid-in capital as firms grow over time. Since this is the most detailed source of financial data by firm size, lack of faith in its size classification impairs almost any effort to do comparative time-series analysis of firm behavior. Still, this problem does not affect the Bank of Japan's more limited data from its quarterly Tankan survey. And, in cases where Tankan data could be examined, they showed no more of the distinct small-firm cyclical patterns that were found in U.S. firms that the MoF survey did. This makes it hard to put down the lack of results to faulty data alone.

A. Correlation of firm size and "age"

An alternative interpretation would be that firm size does not accurately represent the salient aspect of "credit channel" theory in Japan, as it seems to do in the United States. The notion that small firms are exceptionally vulnerable to the impact of higher agency costs during periods of tight monetary conditions stems from the expectation that information asymmetries are particularly high in the case of small firms. And one of the main reasons for that expectation is that smaller firms are often younger firms lacking a history on which external lenders can base a credit judgment. The positive correlation between age and size of firms is generally assumed rather than documented, but there is some circumstantial evidence suggesting that it may be less true in Japan than in other industrial countries.

Certainly, it is overwhelmingly plausible that new firms tend to be very small, and this has been documented in Japan and other countries.[5] But the degree to which this is reflected in a younger average age of small firms depends, as well, on the frequency with which firms are created and dissolved. In this respect, the data suggest that Japan may be quite different from other industrial countries that have been surveyed. Table 1 below presents some comparisons that have been compiled by the OECD and by Japan's Ministry of International Trade and Industry. Both "birth" and "death" of establishments (or of firms, in some cases as noted in the table) are defined to exclude (as far as data sources allow) takeovers, and also shifting of existing businesses to a new location or industry.

[5] The OECD's Employment Outlook for 1994 found an average size of less than 5 employees for new firms in each of 7 countries surveyed, which without exception was a fraction of the average size of all firms (p. 120). In Japan, the Kokuminkinyukoko's annual survey shows the same thing, at least for the subset of its own client companies: In 1994 the average size was 3.7 for newly established companies; 93% of the total having fewer than 10 employees and 92% having less than ¥50 million in capital.

Table 1
Birth and death rates of firms

OECD comparisons:

	Establishments*: Newly opened	Closed	Years covered
Canada **	19.1	16.3	1984-91
Sweden	16.8	14.6	1987-92
France	14.3	13.2	1984-92
Denmark	14.2	13.6	1984-89
New Zealand	13.7	14.5	1987-92
United States	13.6	9.2	1984-91
Italy**	11.8	9.9	1984-92
Finland	11.2	9.8	1986-91
United Kingdom**	9.2	8.5	1987-91

MITI comparison:

United States**	13.8	11.9	1983-94
Japan	4.4	4.3	1981-94

* Average annual rates of new establishments during each year, and closings during each year, as a percent of the number of firms at the beginning of the period.
** Data are for firms, rather than establishments.
Sources: OECD Employment Outlook, July 1994, p. 117;
Ministry of International Trade and Industry, Small and Medium Enterprise Agency, White Paper on Small and Medium-sized Enterprise, 1996, p. 332, and mimeo update. (Original data from Somusho, Statistics of Establishments.)
U.S. Small Business Administration, The State of Small Business: A Report of the President, 1994. (Original data from state unemployment offices.)

These data are fraught with difficulties and problems of comparison, and the OECD's survey did not include Japan at all.[6] However, the fact that the MITI's comparison found broadly the same birth and death rates for the United States as the OECD's did suggests that the stark difference between Japan and the United States may indeed be real.[7] And, since the OECD survey indicates that the turnover rate in the United States is far from exceptionally high, it appears to be Japan that is the outlier here. The lowest birth and death rates in the OECD survey, those for the United

[6] The OECD (1994) describes these problems in some detail; see especially p. 108.
[7] The MITI used data from the U.S. Small Business Association (1994), which in turn are taken from state unemployment offices, and appear to be conceptually similar to those used by the OECD. For Japanese firms,

Kingdom, are still twice those for Japan. This, on the face of it, would suggest that the age (in the sense of years since start-up) distribution of small firms is not as comparatively "young" in Japan as it would be in countries with higher turnover rates.

B. Balance sheet characteristics of small firms

The second reason for believing that smaller firms are more credit-constrained is their lack of assets that can be used as collateral against loans from outside parties. Collateralizable assets are those whose value can be readily verified, and whose control can be shifted from one owner to another: Primarily, this means they are fixed assets, as opposed to human capital. Data from the MoF survey do show clearly that large firms have much larger fixed assets, relative to the level of liabilities that they have to support, than small firms do (Table 2). The ratios have changed over the years, but not the difference between large and small firms.

However, if one looks at assets in the form of land, alone, the comparison turns out quite differently. Small firms, on average, have significantly more of this particular type of collateral (relative to their total balance sheets) than large firms do. To be sure, land represents only about one-quarter of corporate fixed assets (one-third at small firms alone). But if it is true, as often stated, that Japanese lenders have traditionally shown a strong preference for land relative to other types of collateral, it could be that small firms – as a class – are not as disadvantaged on this ground, either, as is usually assumed. It is difficult to judge the importance of this point without comparative data for the United States. But, at a minimum, it suggests that one needs to look at differences across small firms based on their balance sheet characteristics, rather than using size alone as a proxy for credit constraints.

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the MITI used data from the Management and Coordination Agency's Statistics on Establishments.

In terms of bank dependence, the figures in Appendix A show that small firms indeed have higher ratios of borrowing from financial institutions to total debt, compared to larger firms. However the gap appears to be of recent origin. In 1980, the ratios were little different – actually slightly higher at large firms than at small ones. This is true for both all-industry averages and for manufacturing firms alone. However the gap between size classes in the 1990s is even greater in manufacturing, since bank-dependence of large firms has fallen much more sharply among manufacturing firms than in non-manufacturing. Small firms in both sets of industries, in contrast, have increased their reliance on financial institution borrowing to about one-half their total debt, compared with only 38% in 1980. This may be a clue that balance sheet differences have changed a good deal over the years, and that comparative cyclical relationships may have changed as well. It is consistent with the idea that a credit channel through small firms could have become important in the most recent cycle, even if it is not shown to be a standing feature of postwar Japanese cycles as it is in the United States.

Table 2
Collateral, by firm size

Industry	As % of total liabilities: Fixed assets Dec-80	Dec-85	Dec-90	Dec-95
All (incl mining,ag,etc)	41.6	48.4	49.2	58.5
All, large firms (over ¥1 bil capital)	48.5	59.5	59.7	73.0
All ind., small firms (below ¥1 bil)	35.3	38.8	40.6	48.5
Manufacturing	44.0	51.3	58.2	67.0
Mfg, large firms	47.1	55.5	65.3	78.8
Mfg, small firms	38.8	45.0	48.4	53.4
	Land assets Dec-80	Dec-85	Dec-90	Dec-95
All (incl mining,ag,etc)	7.0	8.4	10.3	14.1
All, large firms	4.9	6.1	7.3	11.2
All ind., small firms	8.9	10.3	12.8	16.1
Manufacturing	6.1	8.1	9.3	12.6
Mfg, large firms	5.1	6.2	7.7	10.6
Mfg, small firms	7.9	10.8	11.5	14.8
	Fixed assets other than land Dec-80	Dec-85	Dec-90	Dec-95
All (incl mining,ag,etc)	34.6	40.0	38.9	44.4
All, large firms	43.6	53.4	52.4	61.8
All ind., small firms	26.4	28.5	27.8	32.4
Manufacturing	37.8	43.2	48.9	54.5
Mfg, large firms	42.0	49.3	57.6	68.2
Mfg, small firms	31.0	34.3	36.9	38.6

All items are industry averages, based on aggregate values in nominal yen
Source: MoF Quarterly Survey of Corporations

C. Role of subsidized credit institutions for small business

Another possible source of difference could be the counter-cyclical contribution made by Japan's specialized financial institutions serving small business. These institutions offer subsidized credit to small firms as part of the Fiscal Investment and Loan Program – one of whose prime justifications has long been precisely the belief that small firms suffer disproportionately in downturns because of their weak access to private credit. These institutions do provide a significant, even if declining, share of lending to very small businesses, judging from data provided in the MITI White Papers (charts below). It is less clear, though, that they offer a counter-cyclical cushion large enough to free small firms from what would otherwise be a major disadvantage in downturns.

There are a number of problems in interpreting these data. The criterion for defining "small" enterprises in bank lending data has changed over the years, and this caused a particularly large break in the series around 1977-78. In these data, "small" is currently defined to include firms with less than ¥100 million or fewer than 300 employees, and used even lower cutoffs in previous decades. Differences in coverage impair comparison with the MoF corporate data, for two reasons. The MoF's quarterly survey, the one that has a sufficient history to be useful here, includes only firms above ¥10 million in capital. The annual survey includes even smaller firms (above ¥1 million capital), but these data are available only from 1980 on. The difference in coverage leads to a much higher level of reported borrowing for firms below ¥100 million in the annual survey, by an average of about 75% in the 1980s and about 50% in the first half of the 1990s. Further, the bank lending data include an unknown amount of lending to unincorporated firms. This relative under-coverage of small firms in the MoF quarterly data accounts (at least, in part) for the fact that *total* lending to small firms reported by banks was several times larger than total borrowing of small firms in the MoF survey during much of the 1960s and 1970s, and remains 60% to 80%

larger in the 1990s. These data cannot, therefore, be used to estimate the actual share of specific lending institutions in total borrowing by small firms.

Hoping, though, that these distortions in the level of the ratio may not completely invalidate the cyclical relationships found, the figures below trace shares and changes of lending by specialized institutions compared to total lending and/or reported borrowing. There seems to be some tendency for that share to increase in downturns (except for 1985). But this would be true even if government institutions' lending remained constant over the business cycle. It makes more sense to look at whether fluctuations in net new borrowing cushion the cycle. Net changes in outstandings were used as a measure of this, and they show no persuasive evidence of offsetting behavior (charts below). Indeed, the correlation between private and subsidized institutions' net lending to small business was a positive .45 over the entire period 1960 to 1994.

VI. Conclusions

In any country, the "venture capital" model of a small firm, destined to either fail or to become large in future years, is unlikely to be the only one that is important. Some smaller firms are essentially sub-contractors to one or more large firms, very likely relying on these larger firms directly, or as guarantors, for access to external finance, and these may remain small indefinitely. Another model might be firms that are spun off from the "down-sizing" of large firms, employing long-service workers at reduced cost by taking them out of the seniority-dependent pay progression. (The MITI's White Paper presents some evidence that the average age of managers at small firms has been rising faster than that at large firms over the past 15 years or so.) Probably all of these models have some applicability in every modern economy, but the relative weight of different types of small firms may not be the same. Certainly, the conventional wisdom in Japan would hold that the first, "venture capital" model of small firms is much less important, and the others more so, in Japan compared to other countries.

Whether for this or other reasons, comparing aggregate time series data for small versus large firms does not produce the kind of differences, evidencing a "credit channel", in Japan that were found in the United States. This does not mean that credit channels are not important in amplifying impacts of changes in monetary conditions, but that the set of actors through which the channel works are not identified by firm size alone. The Frankel/Bank of Japan "story" – a "credit channel" story focused on a part of the small firm sector – remains the most plausible explanation of what happened over the past 15 years in Japan. But demonstrating this probably requires a cross-sectional analysis, one that can identify other features of individual firms more salient than size. Primary among these might be balance sheet characteristics, including ownership of land.

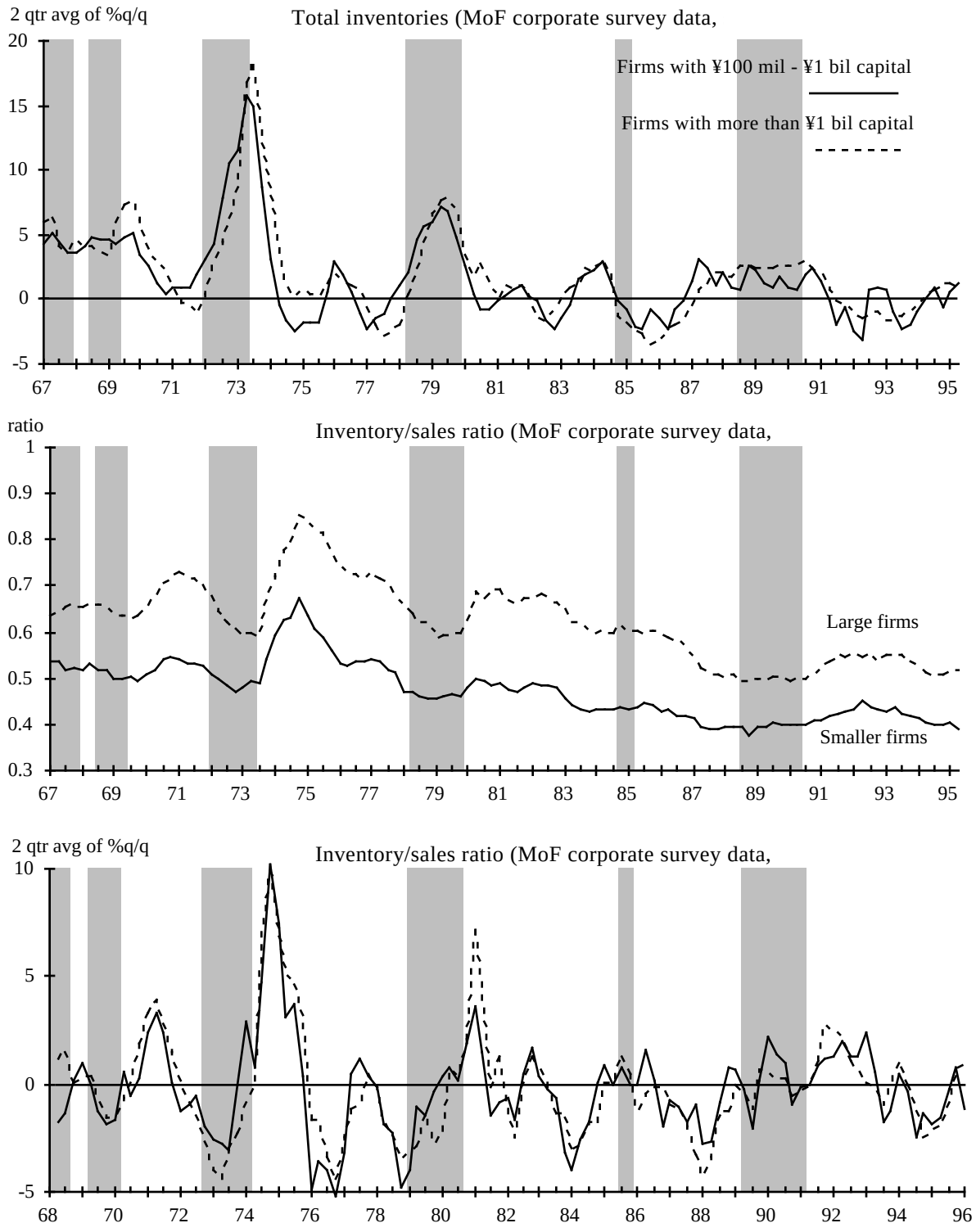
Articles cited

Bank of Japan, "Changes in the Corporate Balance Sheet Structure since 1980 in Japan", Quarterly Bulletin, November 1996 (a translation of "1980 nendai ikou no kigyo no balance-sheet no henka ni tsuite" in Nihon Ginko Geppo, July 1996).
Bernanke, Ben S., "Nonmonetary Effects of the Financial Crisis in the Propagation of the Great Depression", American Economic Review, June 1983.
Bernanke, Ben S., "Credit in the Macroeconomy", Federal Reserve Bank of New York Quarterly Review, Spring 1993 (pp. 50-70).
Bernanke, Ben S. and Mark Gertler, "Agency Costs, Net Worth, and Business Fluctuations", American Economic Review, Vol. 79 No. 1, March 1989, pp. 13-31.
Bernanke, Ben S. and Mark Gertler, "Inside the Black Box: The Credit Channel of Monetary Policy Transmission", Journal of Economic Perspectives, Fall 1995 (pp. 27-48).
Brunner, Allan D. and Steven B. Kamin, "Bank Lending and Economic Activity in Japan: Did "Financial Factors" Contribute to the Recent Downturn", International Finance Discussion Paper #513, Board of Governors of the Federal Reserve System, June 1995.
Calomiris, Charles W., "Financial Factors in the Great Depression", Journal of Economic Perspectives, Volume 7, Number 2 (Spring 1993).
Cantor, Richard, "Effects of Leverage on Corporate Investment and Hiring Decisions", Federal Reserve Bank of New York Quarterly Review, Summer 1990 (pp. 31-41).
Fazzari, Steven, R. Glenn Hubbard, and Bruce Petersen, "Financing Constraints and Corporate Investment", Brookings papers on Economic Activity, 1:1988 (pp. 141-195).
Fisher, Irving, "The Debt-Deflation Theory of Great Depressions", Econometrica, October 1933.
Frankel, Jeffrey, "Japanese Finance in the 1980s: A Survey", in **xxx ...**
Gertler, Mark and Simon Gilchrist, "Monetary Policy, Business Cycles, and the Behavior of Small Manufacturing Firms", Quarterly Journal of Economics, May 1994 (pp. 309-340).
Gilchrist, Bernanke and Gertler, FEDS 94-18.
Hoshi, Kashyap and Scharfstein, "Corporate Structure, Liquidity and Investment: Evidence from Japanese Panel Data", Quarterly Journal of Economics, February 1991.
Hubbard, R. Glenn, "Is There a 'Credit Channel' for Monetary Policy?", NBER Working Paper No. 4977, December 1994.
Institute for Social Engineering, Inc. (Shakai Kogaku Kenkyujo), Hojin Kigyo Tokeino Kodoriyo ni kansuru Chosa Kenkyu, March 1976.
Kashyap, Anil K., Owen A. Lamont and Jeremy C. Stein, "Credit Conditions and the Cyclical Behavior of Inventories", Quarterly Journal of Economics, August 1994 (pp.565-592).
Kuroki, Yoshihiro, "The existence of credit channel on real investment activities a test for the significance of imperfection of Japanese financial and capital markets" (xerox, 1996).
Ministry of International Trade and Industry, Small and Medium Enterprise Agency, Chushokigyo Hakusho, August 1996.
Mishkin, Frederic S., "The Household Balance Sheet and the Great Depression", Journal of Economic History, December 1978 (pp. 9-84).
Mishkin, Frederic S., "Symposium on the Monetary Transmission Mechanism", Journal of Economic Perspectives, Fall 1995 (pp. 3-10).
Ogawa, Kazuo, Shinichi Kitasaka, Tohio Watanabe, Tatsuya Maruyama, Hiroshi Yamaoka and Yasuharu Iwata, "Asset Markets and Business Fluctuations in Japan", in The Economic Analysis, No.136, Economic Planning Agency, Tokyo, October 1994.
Oliner, Stephen D. and Glenn D. Rudebusch, "Is There a Broad Credit Channel for Monetary Policy", Federal Reserve Bank of San Fransisco Economic Review, 1996, Number 1.

Organization for Economic Co-operation and Development, Employment Outlook, Paris, 1994.
U.S. Small Business Association, The State of Small Business: A Report of the President, Washington, D.C., 1994.

Charts – 1 Time series data from the MoF survey of corporations

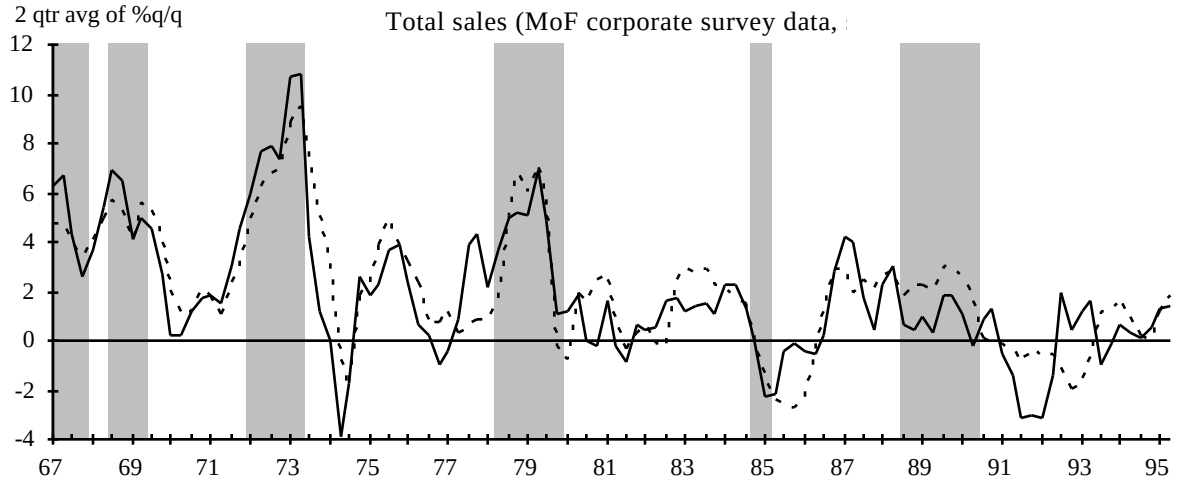
Inventory behavior

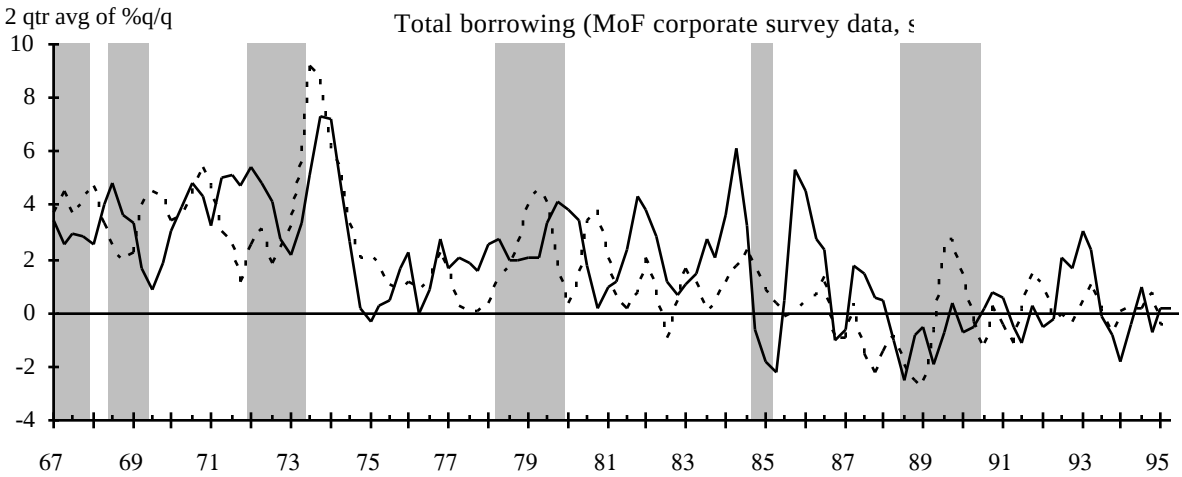


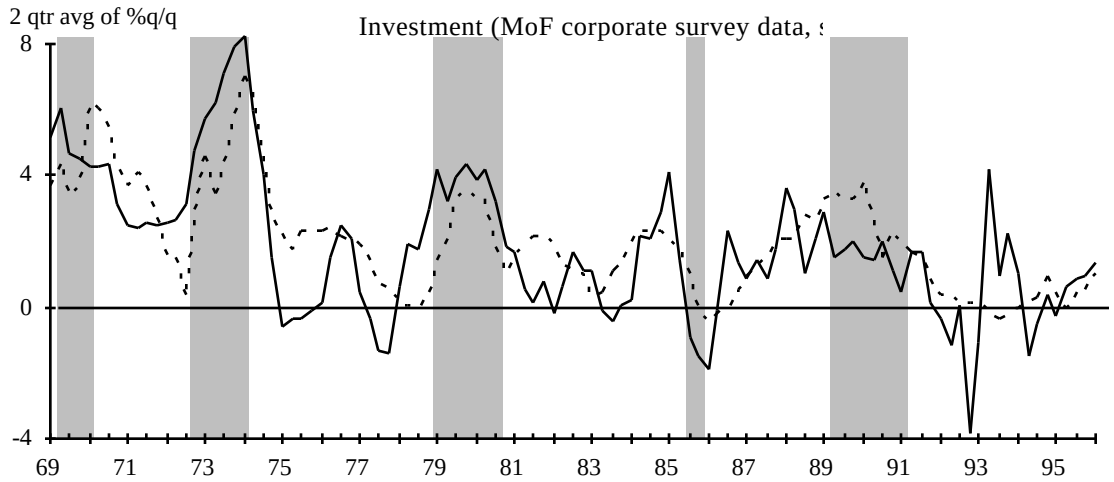
Notes:
Outstanding inventories ("tanaoroshi" total) and borrowing at end-quarter; sales during quarter, as reported in the MoF survey of corporations.
Data have been adjusted to smooth annual variations due to April sample change (see Appendix D).
Seasonal adjustment done with Census X12 Arima method (using 5 year's data before and 5 years after each data point).
Shaded areas represent periods of monetary tightening (see Appendix B)

Charts – 2 Time series data from the MoF survey of corporations, continued

Sales, borrowing and investment



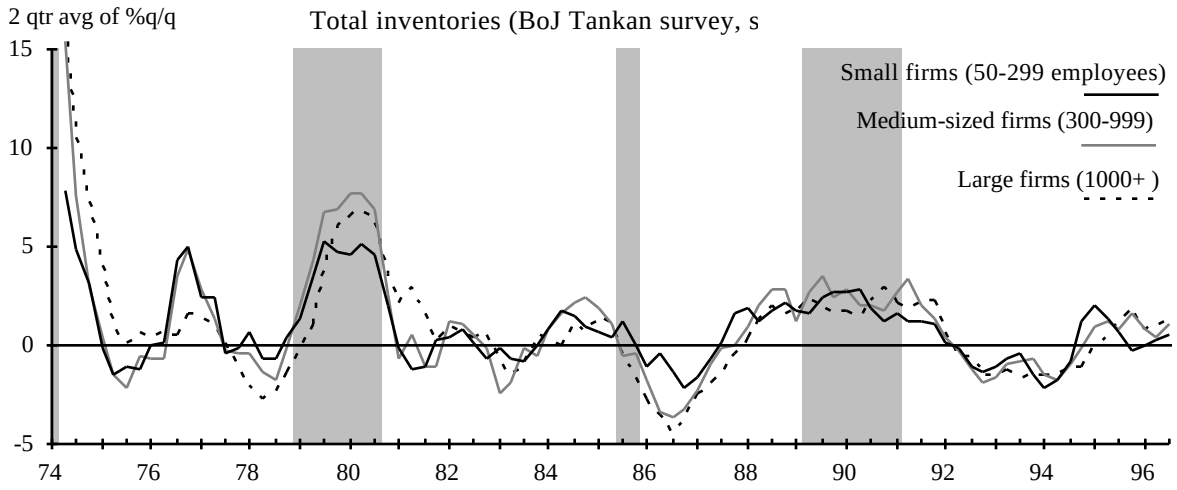


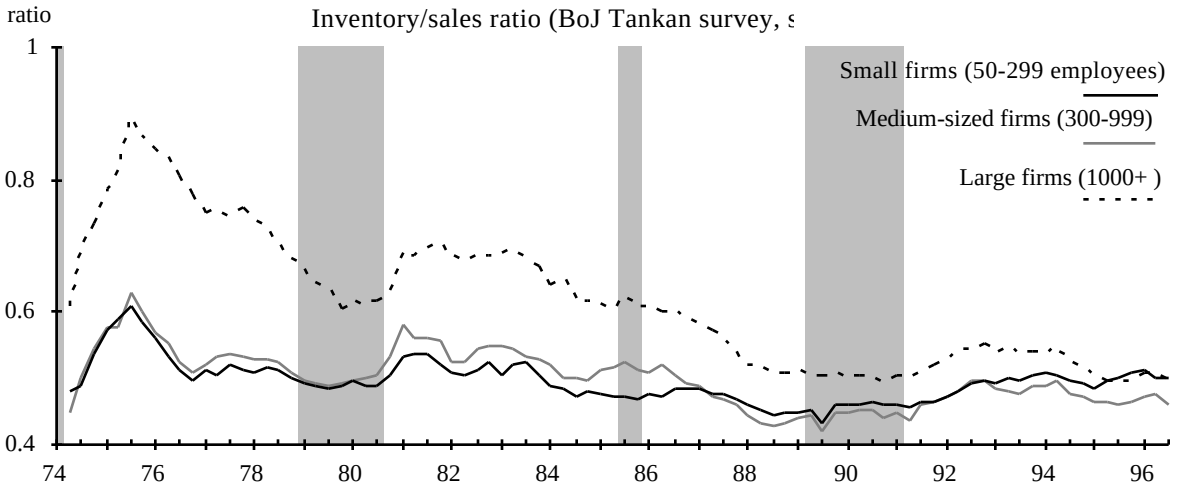


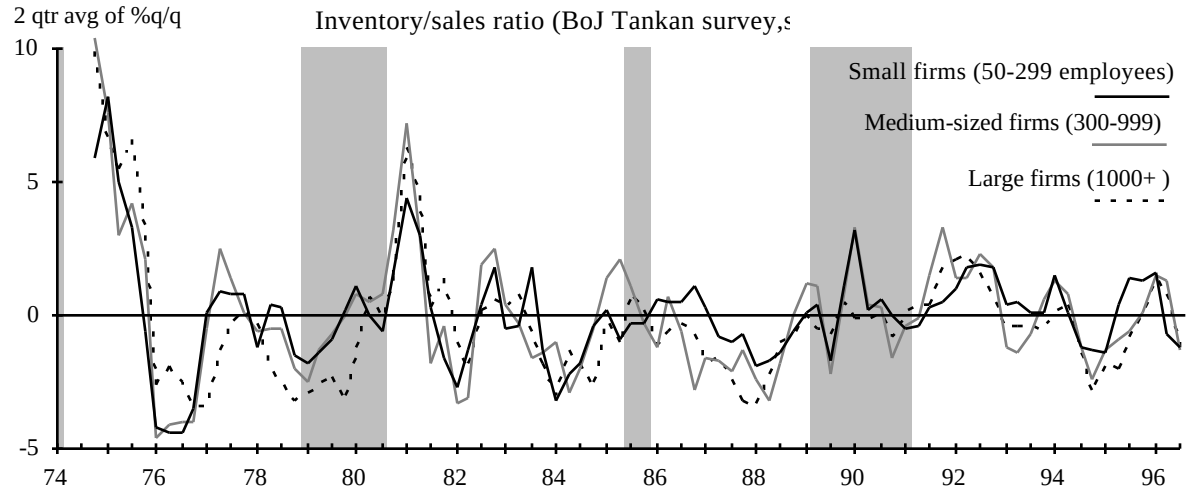
See notes to Charts 1.
Investment series constructed from MoF survey data as follows:
Total investment =business fixed investment + land investment + inventory investment
Business fixed investment = changes in value of tangible fixed assets (excluding land) + depreciation allowances
Land investment = changes in value of land as assets
Inventory investment = changes in value of inventories

Charts – 3 Time series data from the BoJ Tankan survey

Inventory behavior

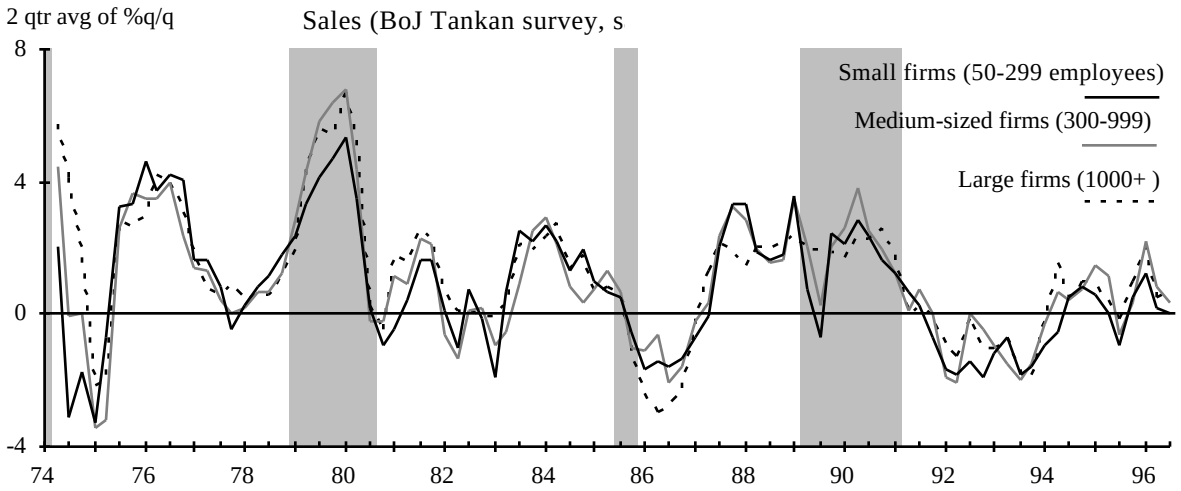


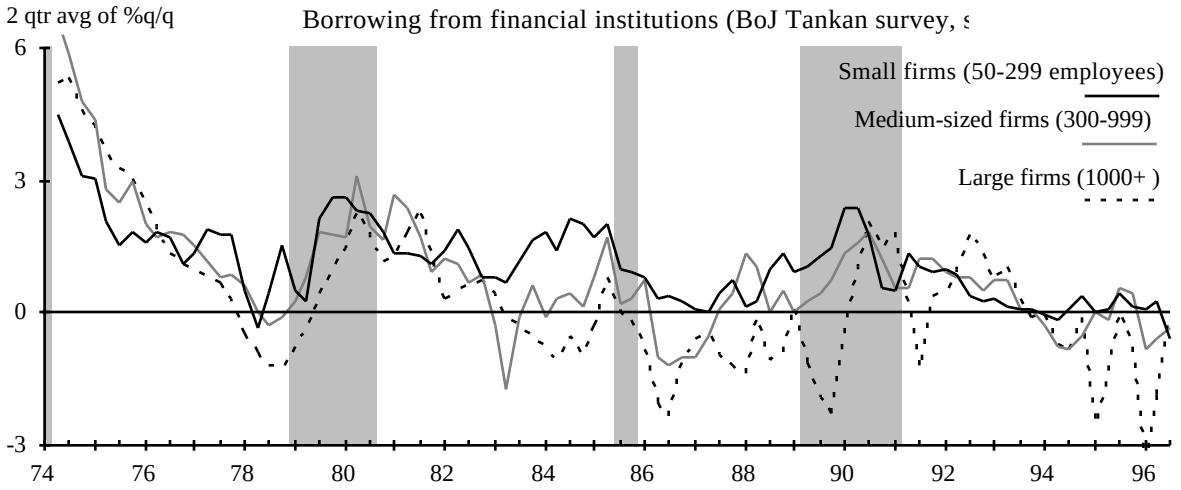




Charts – 4 Time series data from the BoJ Tankan survey, continued

Sales and borrowing



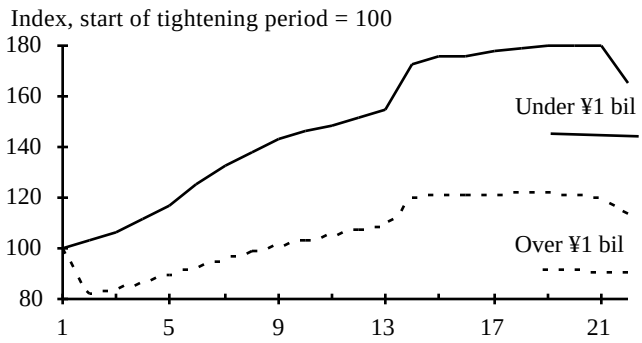


Notes to Charts 3 and 4.: Seasonally adjusted data from BoJ Tankan source.
Shaded areas represent periods of monetary tightening (see Appendix B)

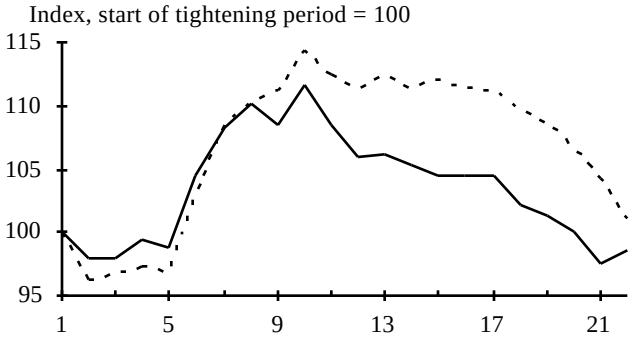
Charts– 5 Cumulative percentage changes from the MoF survey of corporations

Inventory behavior

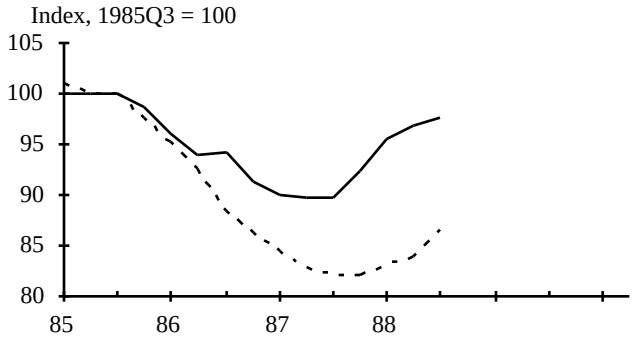
Inventories (MoF): Avg of pre-1985 cycle



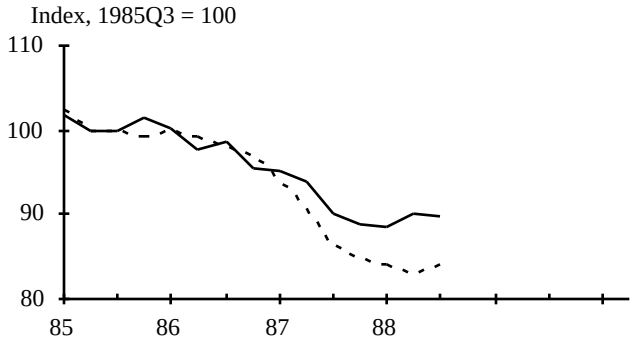
Inventory ratio: pre-1985 cycles (MoF survey



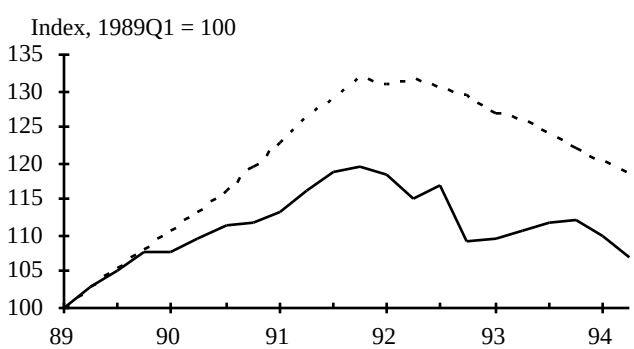
Inventories (MoF survey



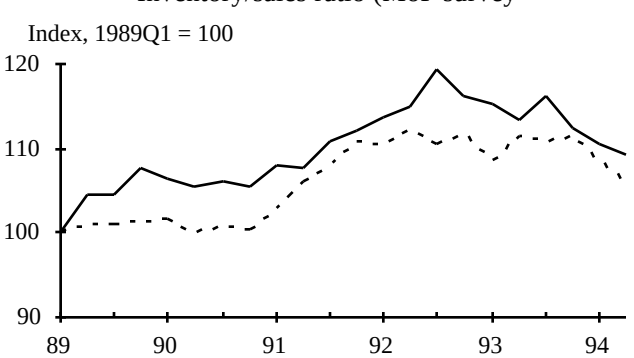
Inventory/sales ratio (MoF survey



Inventories (MoF survey

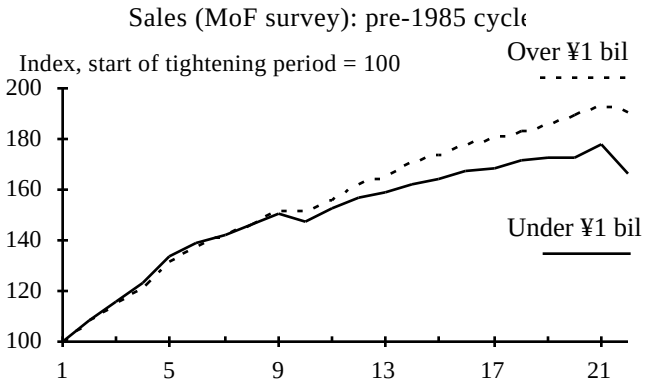


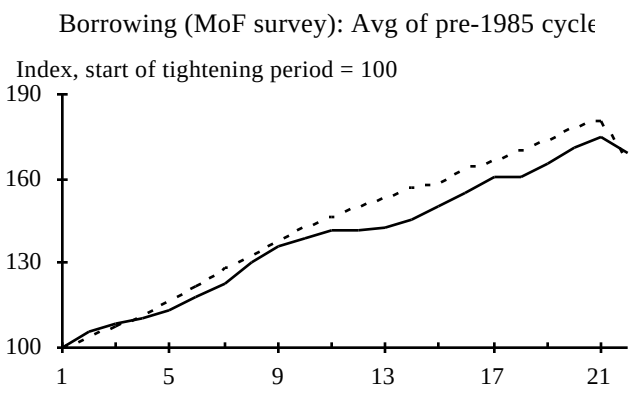
Inventory/sales ratio (MoF survey

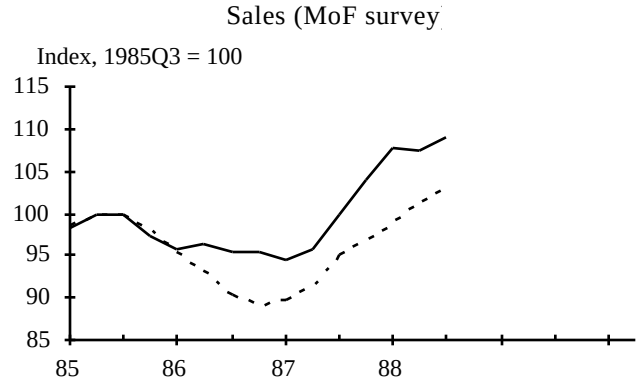


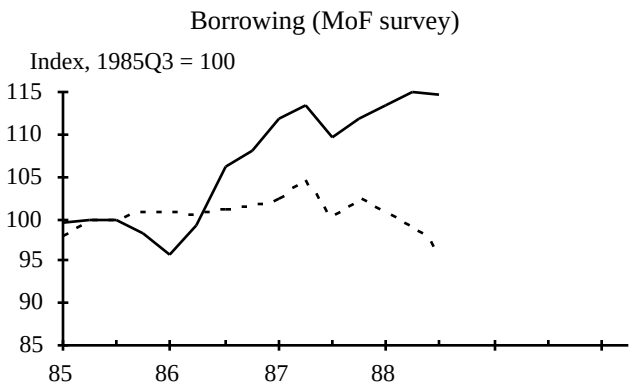
Charts – 6 Cumulative percentage changes from the MoF survey – continued

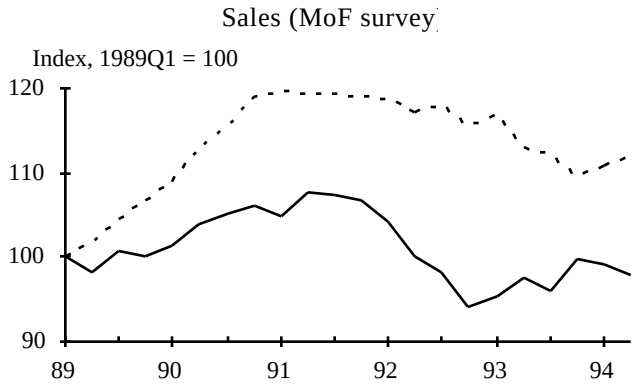
Sales and borrowing

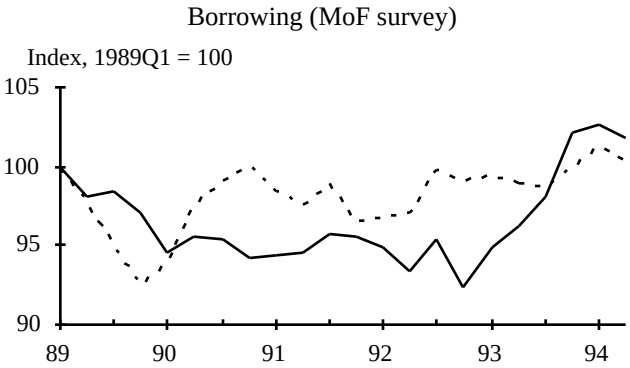






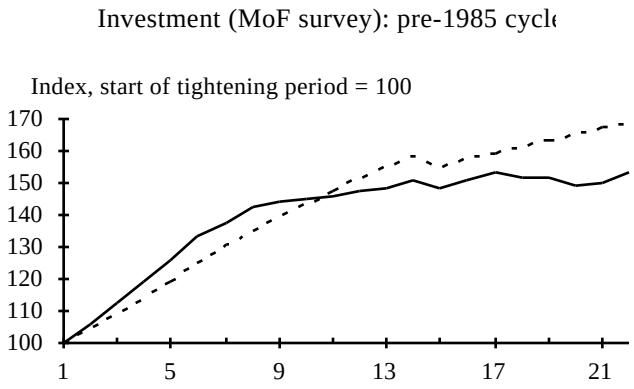


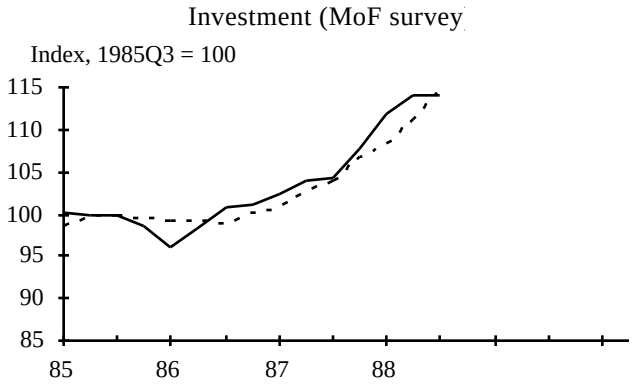


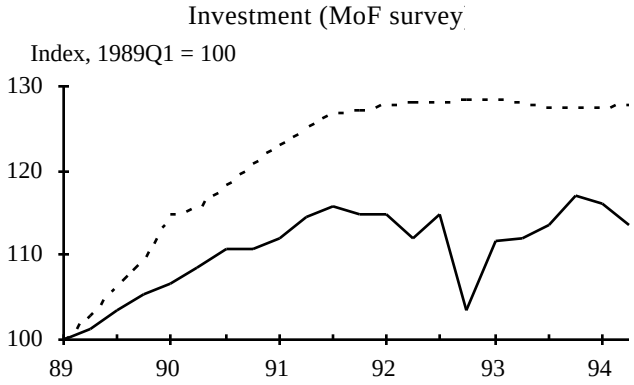


Charts – 7 Cumulative percentage changes from the MoF survey – continued

Investment







Notes to Charts 5 - 7:
Data definitions and sources, same as Charts 1 and 2.
Indexes based on the average for the quarter during which monetary tightening began.

Charts – 8 Cumulative percentage changes from the BoJ Tankan survey

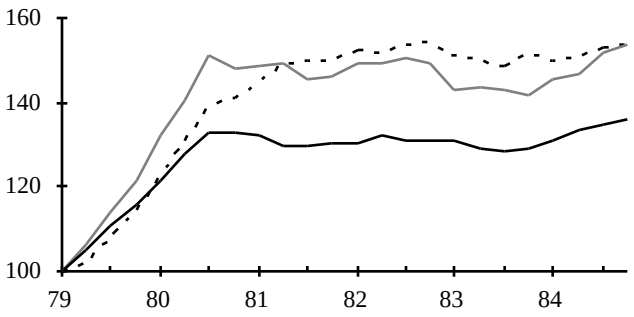
Inventory behavior

Small firms (50-299 employees)

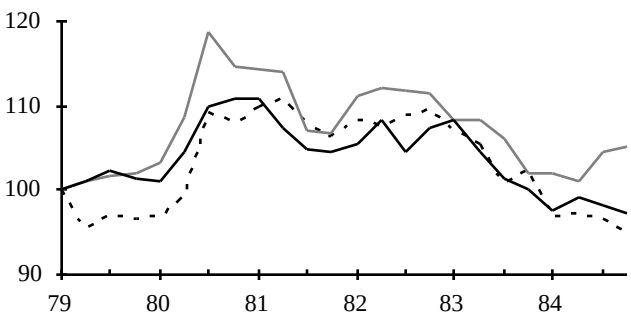
Medium-sized firms (300-999)

Large firms (1000+)

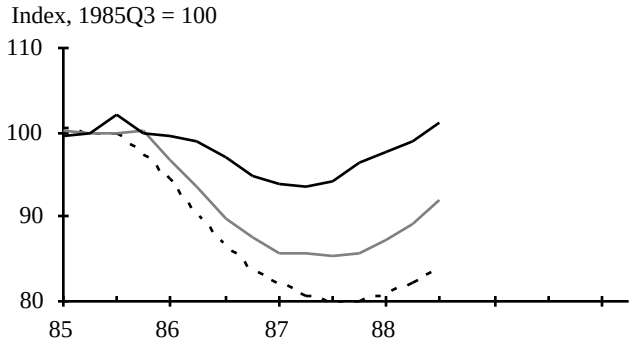
Inventories (BoJ Tankan survey



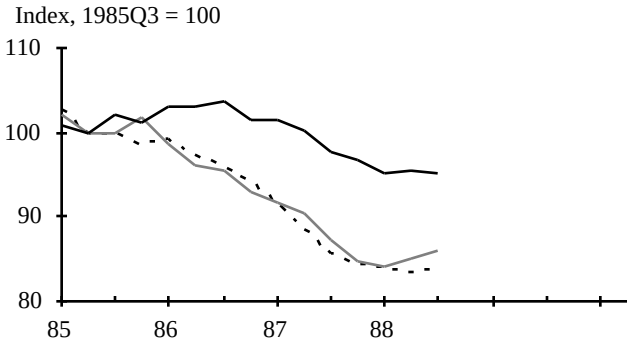
Inventory ratio (BoJ Tankan survey



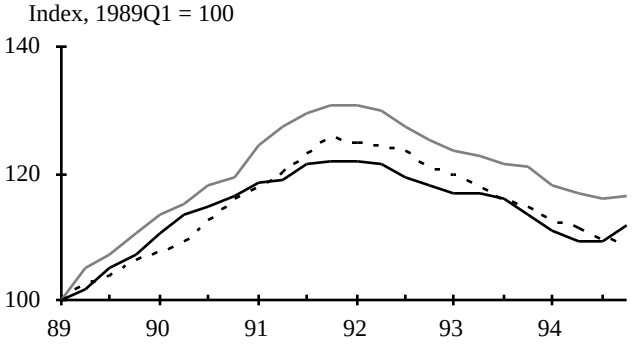
Inventories (BoJ Tankan survey



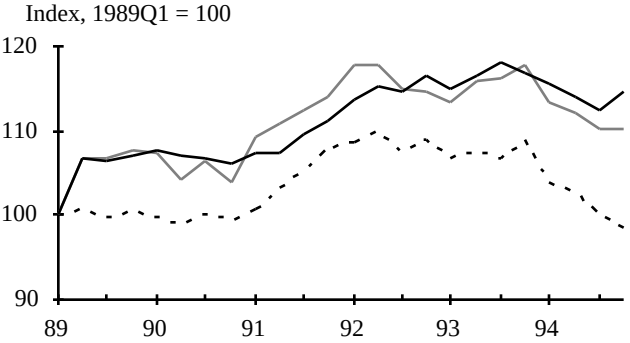
Inventory ratio (BoJ Tankan survey



Inventories (BoJ Tankan survey

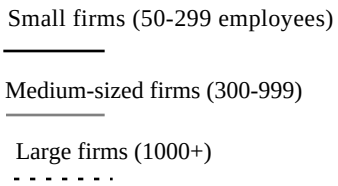


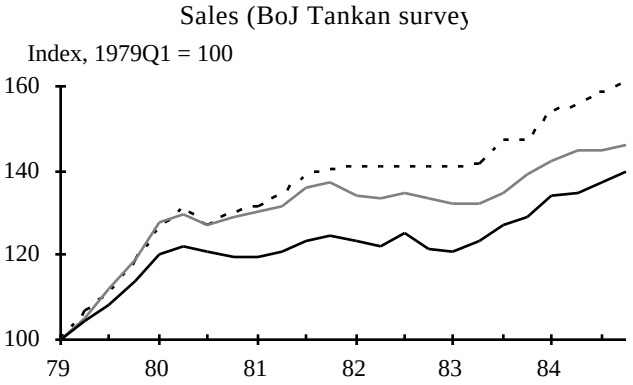
Inventory ratio (BoJ Tankan survey

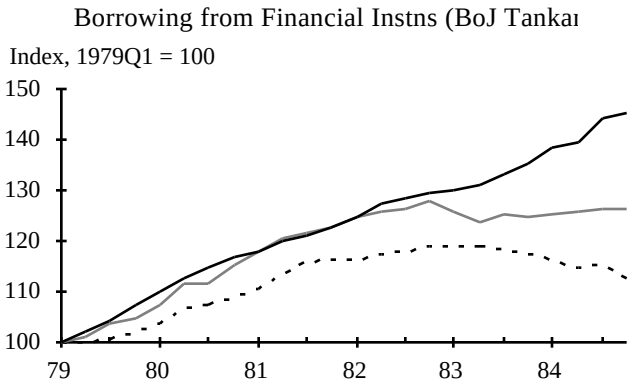


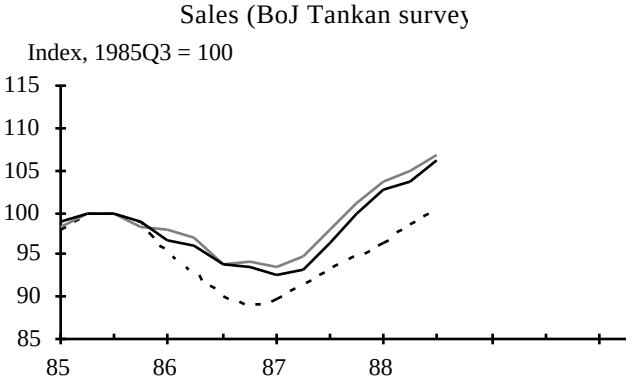
Charts – 9 Cumulative percentage changes from the BoJ Tankan survey, continued

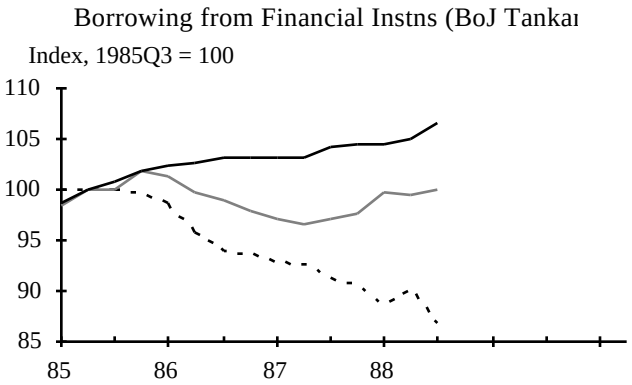
Sales and borrowing

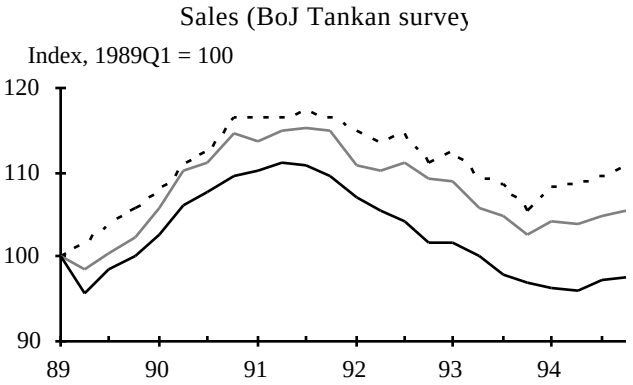


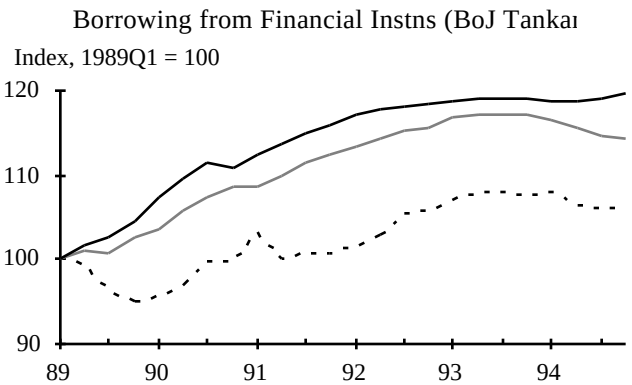






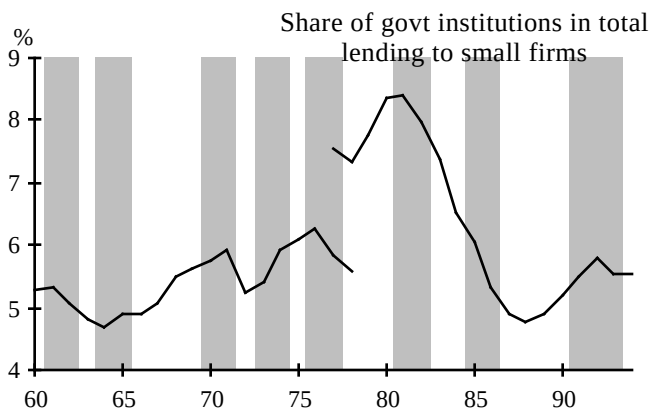


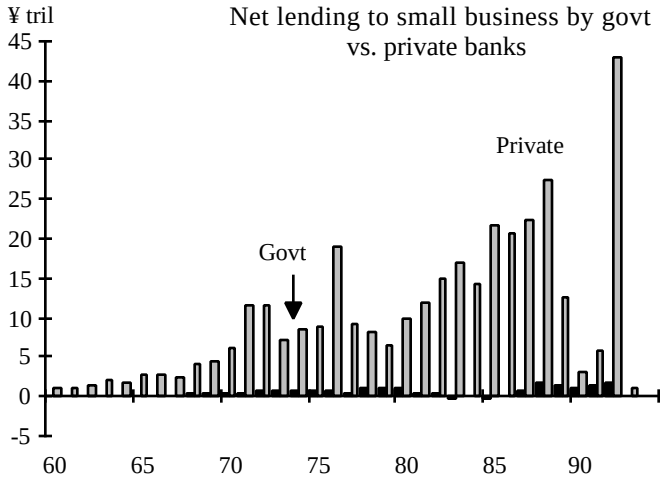


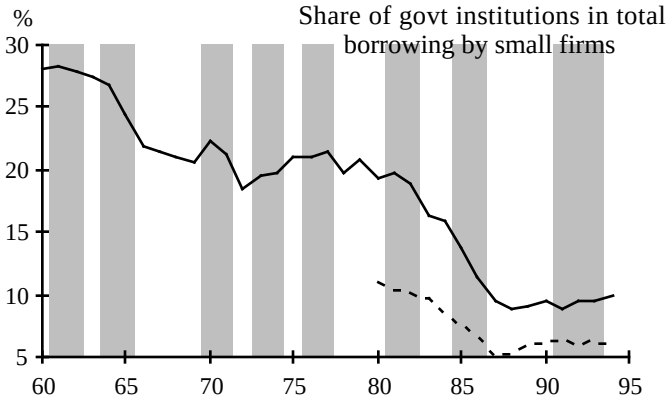


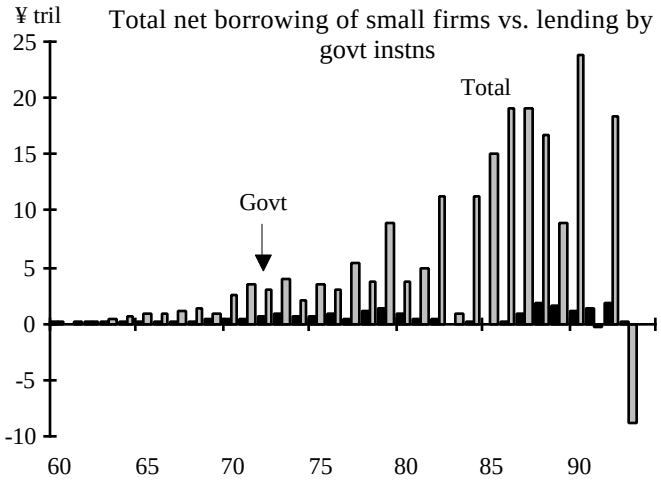
Notes to Charts 7 and 8:
Data definitions and sources, same as Charts 3 and 4.
Indexes based on the average for the quarter during which monetary tightening began.

Charts - 10 Lending by specialized government institutions for small business









Series break at 1977-78 in first chart reflects a change in the criteria used to define "small" business loans of private institutions.
Specialized government institutions for small business lending are: Chusho kigyo kinyu kok, kokumin kinyu koko, Kankyo kaisei kinyu koko.
"Share" in first chart = lending by specialized government institutions as % of total by all financial institutions, to small firms defined as: Capital below ¥10 mil before 1963; below ¥50 mil until 1972; below ¥100 mil 1973-76; below ¥100 mil and fewer than 300 employees from 1977.
"Share" in second chart = lending by specialized institutions, as shown by MITI, as % of total borrowing from financial institutions reproted in MoF Quarterly survey for firms below ¥100 mil. Note that this ratio is overstated for at least tow reasons, as noted in the text: The MoF quarterly data include only firms with ¥10 million capital or more, and do not include unincorporated enterprises.The dotted line in the second chart, based on the fuller annual MoF survey available from 1980 on, gives an indication of the size of the first problem, but does not correct for the second.
Shaded areas are years in which EPA-dated downturns occurred.
Net lending or borrowing = change in outstandings.

Sources: MITI White Paper on Small Enterprise, various years (original data from BoJ annuals and other sources); MoF Quarterly Survey of Corporations.

Appendix A: Firm characteristics by size and industry
Source: MoF quarterly survey of corporations

	Debt as % of fixed assets:				Land as % of fixed assets:				Borrowing from financial institutions as % of debt:			
end-year levels	1980	1985	1990	1995	1980	1985	1990	1995	1980	1985	1990	1995
All industries*	240	207	203	171	17	17	21	24	40	44	45	46
Large firms**	206	168	167	137	10	10	12	15	42	43	39	38
Small firms	283	258	246	206	25	27	32	33	38	45	50	51
Manufacturing	227	195	172	149	14	16	16	19	40	40	34	39
Large firms	212	180	153	127	11	11	12	13	41	38	26	29
Small firms	257	222	207	187	20	24	24	28	38	43	45	50
Food	203	183	160	137	18	20	19	22	40	41	39	47
Textiles	267	221	196	176	14	14	15	22	46	51	48	52
Clothing,textile pdts	341	332	224	214	26	26	35	27	38	37	47	51
Lumber,wood pdts	302	258	221	219	31	38	29	35	41	45	42	51
Paper pulp	194	181	148	139	13	15	13	16	46	49	46	48
Printing, publishing	185	163	156	157	18	26	23	24	35	34	38	42
Chemicals	206	180	156	135	13	14	14	16	41	40	31	36
Petroleum, coal pdts	370	303	233	149	15	20	25	25	60	56	52	49
Ceramic products	204	177	158	153	16	18	20	24	42	45	38	46
Steel	176	173	155	133	10	11	13	15	44	49	33	41
Nonferrous metals	248	223	177	139	11	12	15	15	49	53	37	51
Precious metals	243	218	189	176	20	24	23	25	37	46	41	48
General machinery	277	230	217	175	18	17	18	25	34	36	33	43
Electrical machinery	229	190	169	154	9	10	10	11	26	25	21	25
Transport machinery	158	131	132	103	13	12	13	14	25	28	25	30
Precision machinery	221	171	182	153	11	13	16	18	27	33	34	35
Shipbuilding	438	416	358	291	15	16	19	18	40	42	27	26
Other manufacturing	257	220	188	154	19	25	20	23	36	40	39	36
Non-manufacturing	248	213	218	180	19	18	23	26	40	46	49	48
Large firms	201	160	176	143	10	10	13	16	42	47	45	43
Small firms	294	273	259	211	27	28	34	35	38	46	51	51
Wholesale & retail trade	416	357	312	247	23	25	25	29	36	40	38	42
Wholesale	532	455	399	325	25	27	25	28	34	37	34	38
Retail	200	191	188	164	21	23	26	29	45	49	49	26
Real estate	213	203	226	173	32	33	41	44	52	64	71	65
Transport & commun.	143	110	105	103	15	12	15	22	53	44	43	41
Land transport	144	141	108	105	21	23	22	30	57	56	44	37
Marine transport	150	127	133	127	4	3	7	9	55	68	64	65
Other transport & comr	134	86	97	95	16	8	9	13	43	20	35	41
Electric utilities	95	91	88	89	3	3	4	4	46	53	49	43
Gas,water	102	90	82	85	8	9	11	12	53	57	40	37
Other services	152	171	194	153	20	18	20	19	46	61	64	60
Business services	187	222	238	181	4	4	12	8	59	73	78	71
Lodging	115	128	117	129	13	16	15	23	69	73	70	67
Personal services	177	139	158	162	21	30	18	31	17	19	44	42
Entertainment	130	125	142	128	38	34	33	27	31	36	48	44
Broadcasting	102	100	85	89	20	19	20	19	32	33	30	46
Other services	175	195	261	158	18	28	25	30	22	47	35	49
Construction	501	471	410	322	26	29	36	34	30	35	32	37

* Includes mining, agriculture, etc., which are not shown above and account for between 1% and 2% of firms, employees, sales, or debt.

** Firms with more than ¥1 billion capital

Source: Ministry of Finance, Quarterly Survey of Corporations

Appendix A: Table 2
Results of VAR estimations

F-test for joint contribution to explaining variance of inventories, borrowing or investment, based on comparison of VAR estimation with four lags of restricted form including sales only, and unrestricted form including sales and one of the five measures of monetary conditions:

Dependent variable	Monetary conditions measure	Sample period	F value	Degrees of freedom
Small firms'				
Inventories	Dummy (start of tightening)	1968.3 - 1995.2	1.62	4,95
	Call money rate	"	1.52	"
	Real call money rate	"	0.90	"
	Nominal monetary conditions index	1971.1-95.2	0.22	4,85
	Real monetary conditions index	"	1.03	
Investment	Dummy (start of tightening)	1971.3 - 1995.2	1.66	4,85
	Call money rate	"	0.45	"
	Real call money rate	"	0.46	"
	Nominal monetary conditions index	"	0.41	"
	Real monetary conditions index	"	0.38	"
Borrowing	Dummy (start of tightening)	1971.3 - 1995.2	0.21	4,85
	Call money rate	"	0.73	"
	Real call money rate	"	2.03*	"
	Nominal monetary conditions index	"	0.80	"
	Real monetary conditions index	"	3.62**	"
Large firms'				
Inventories	Dummy (start of tightening)	1968.3 - 1995.2	0.23	4,95
	Call money rate	"	1.61	"
	Real call money rate	"	0.64	"
	Nominal monetary conditions index	1971.1-95.2	2.16*	4,85
	Real monetary conditions index	"	0.995	
Investment	Dummy (start of tightening)	1971.3 - 1995.2	1.59	4,85
	Call money rate	"	0.16	"
	Real call money rate	"	0.45	"
	Nominal monetary conditions index	"	1.18	"
	Real monetary conditions index	"	0.53	"
Borrowing	Dummy (start of tightening)	1971.3 - 1995.2	0.74	4,85
	Call money rate	"	0.37	"
	Real call money rate	"	1.53	"
	Nominal monetary conditions index	"	1.82	"
	Real monetary conditions index	"	1.59	"

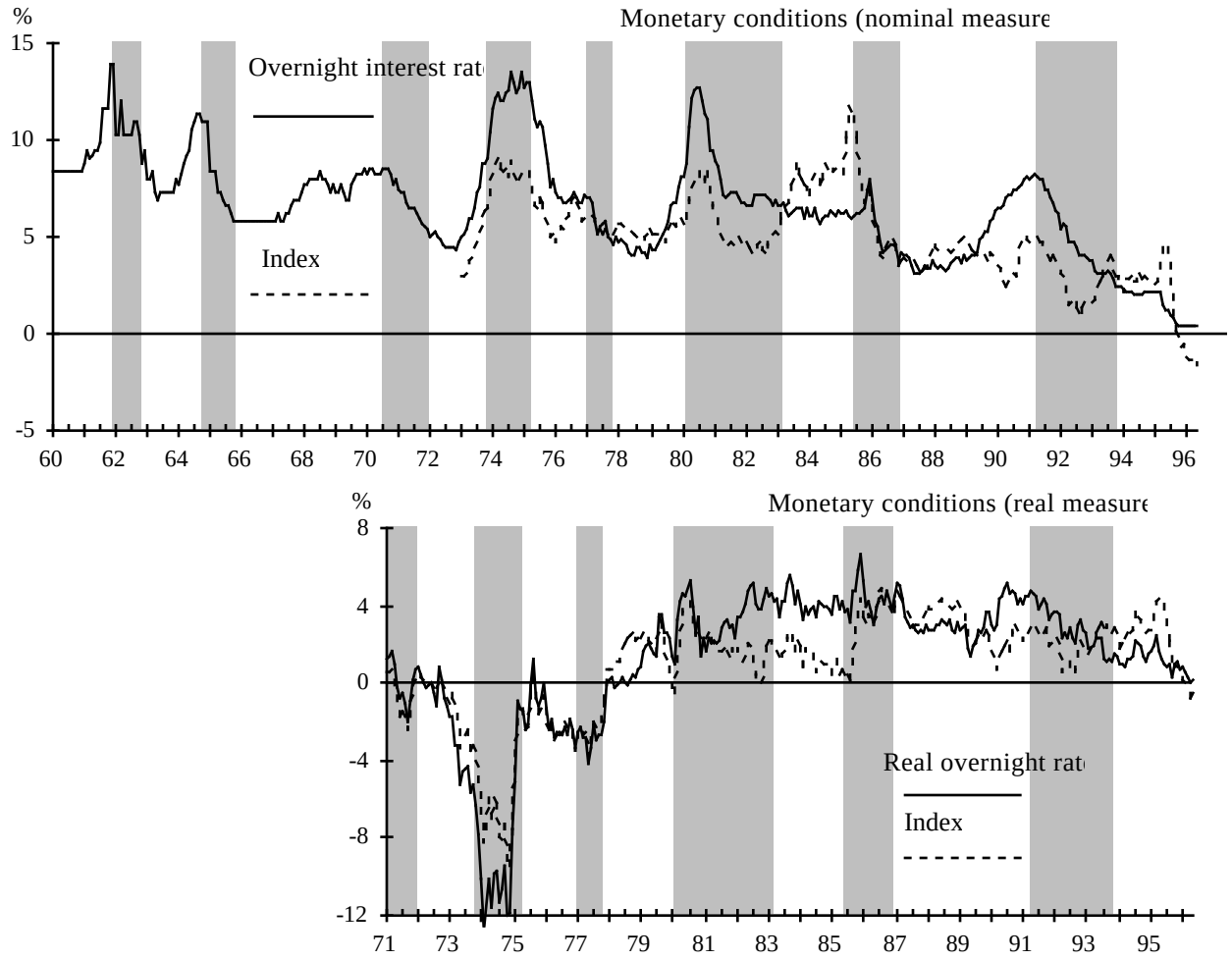
* Significant at 10% level
** Significant at 5% level

Appendix B: Measures of monetary conditions

The timing of periods of monetary tightening is basically similar, whether measured using the interest rate alone or by an index that reflects exchange rates. The extent of change in monetary conditions does change – most strikingly in the recent period of easing that began in 1995. In principle, the deflated measures should be more meaningful (and they probably are when used for more current analysis), but for a period this long, including the 1970s oil shocks, the meaning of real interest rates becomes harder to interpret.

In the descriptive analysis above, dating of periods of tightening was based on the nominal interest rate alone. VAR experiments were done using quarterly versions of all four measures.

Monthly averages:

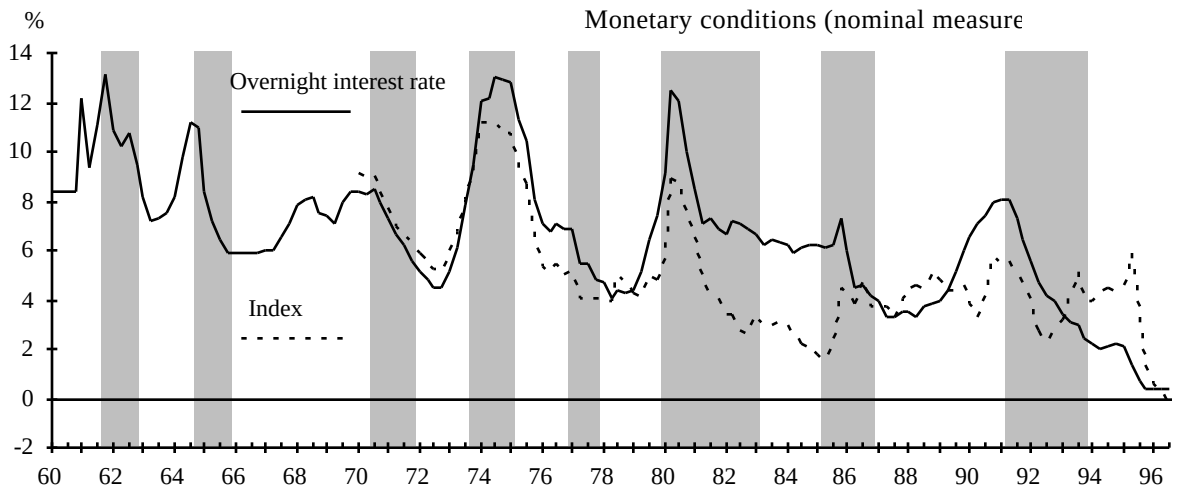


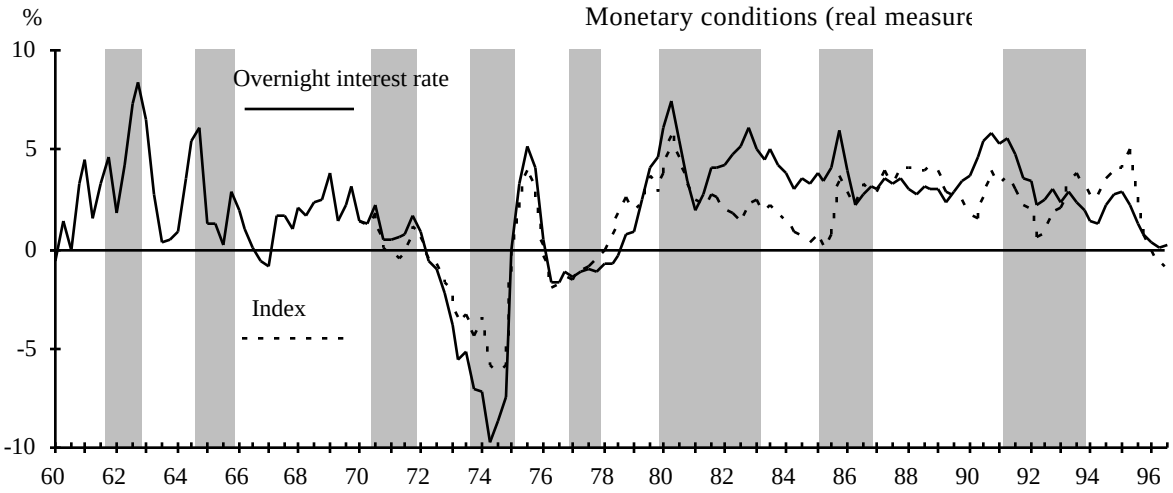
Note: Shading depicts official EPA recession periods, peak to trough
Overnight interest rate: Uncollateralized call money*
Inflation rate: Year-on-year % change in nationwide CPI for all items (Quarterly measure was deflated using the GDP deflator)
Index = weighted average of interest rate and effective exchange rate, the latter measured as a deviation from the 1970-1995 trend (1990=100). Weights based on exports/GNP ratio for each quarter.
Effective exchange rate: J.P. Morgan index against 15 industrial country currencies; real measure deflated by manufacturing prices in each country
Sources: Bank of Japan; J.P. Morgan

* An outlier observation (21%) for March 1961 was omitted from the charts. This period was not in any of the data comparisons anyway.

Appendix B - Continued

Quarterly averages:





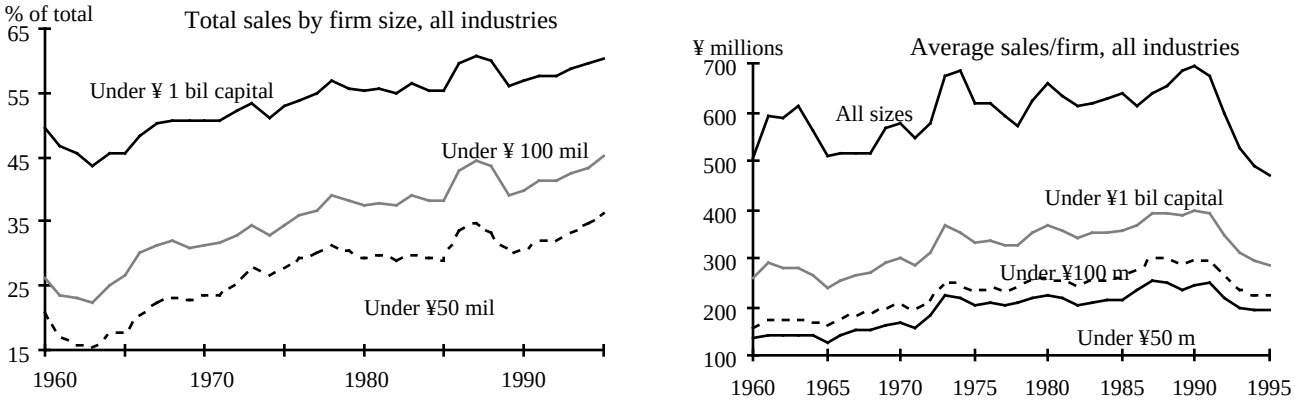
Note:
All definitions same as in monthly averages (see previous page), except the real interest rate is deflated using the GDP deflator.

Appendix C: Data issues

I. Over- or under-representation of smaller firms?

As noted in Section IV.A of the text, one of the first things that stands out in the Ministry of Finance quarterly data is that the share of smaller firms in estimated total corporate sales appears to *increase* over time, despite the fact that these size levels are set in unchanged nominal yen terms over 35 years. The chart below is illustrative, and basically similar pictures could be painted using other variables such as investment or inventory levels.

The estimates, as noted in Section IV.A, are made using an approach that may tend to exaggerate the importance of lower size groups. This is because they assume the sample average is representative of the entire population of corporations, but sampled firms are likely to be biased toward being larger than average. However, there is no obvious reason why this bias would have increased over time.



Source: All data in this appendix are from the MoF Survey of corporations, Fiscal year data, unless noted otherwise.

In principle, the bias could increase over time if there were a tendency for the samples to be broadened, bringing in a larger component of smaller firms as time went on. However this does not seem to be the case. As can be seen in the table below, the size of samples (except for the largest size class, which is actually a census, not a sample) has been kept broadly unchanged since 1980. As a result, the share of small or medium-sized firms actually included in the samples has gone down, not up. Note that there has been an accelerated trend toward a larger number of small firms in recent years, which can be attributed to the legal change raising the minimum capital required for incorporation to ¥10 million, a level that happens to be the same as the minimum size included in the MoF survey. As can be seen in the table, the number of firms in the smallest category shown (those between ¥10 million and ¥100 million capital) almost doubled between 1990, when the change was announced, and 1996 when it became effective. A 19% increase occurred just in the last year before the new minimum went into effect.

(Corporations with more than ¥10 million capital, all industries)

Oct-Dec 1980 survey

	¥10 mil to ¥100 mil	¥100 mil to ¥1 bil	Above ¥1 bil	
Population	236927	13071	2020	252018
Sample	13364	6487	2020	21871
Respondents	10826	5804	2019	18649
%:				
Response rate	81.0	89.5	100.0	85.3
Coverage of est. population	4.6	44.4	100.0	7.4

Oct-Dec 1985 survey

	¥10 mil to ¥100 mil	¥100 mil to ¥1 bil	Above ¥1 bil	
Population	316824	15089	2584	334497
Sample	7587	6436	2584	16607
Respondents	6039	5794	2584	14417
%:				
Response rate	79.6	90.0	100.0	86.8
Coverage of est. population	1.9	38.4	100.0	4.3

Oct-Dec 1990 survey

	¥10 mil to ¥100 mil	¥100 mil to ¥1 bil	Above ¥1 bil	
Population	406619	19995	3746	430360
Sample	9098	8292	3746	
Respondents	6906	7145	3746	17797
%:				
Response rate	75.9	86.2	100.0	84.2
Coverage of est. population	1.7	35.7	100.0	4.1

Oct-Dec 1995 survey

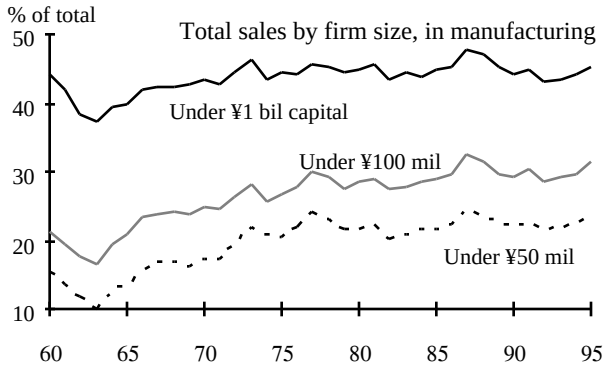
	¥10 mil to ¥100 mil	¥100 mil to ¥1 bil	Above ¥1 bil	
Population	681600	24065	4884	710549
Sample		10157	4884	24252
Respondents	6817	8647	4874	20338
%:				
Response rate	74.0	85.1	99.8	83.9
Coverage of est. population	1.0	35.9	99.8	2.9

April-June 1996 survey

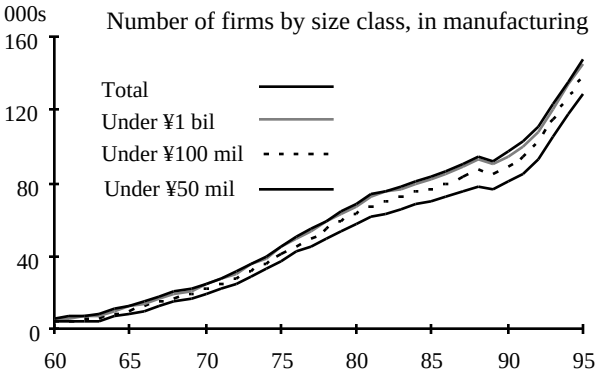
	¥10 mil to ¥100 mil	¥100 mil to ¥1 bil	Above ¥1 bil	
Population	809590	24644	5081	839315
Sample	9381	9126	5081	23588
Respondents		7570	5023	19304
%:				
Response rate	71.5	82.9	98.9	81.8
Coverage of est. population	0.8	30.7	98.9	2.3

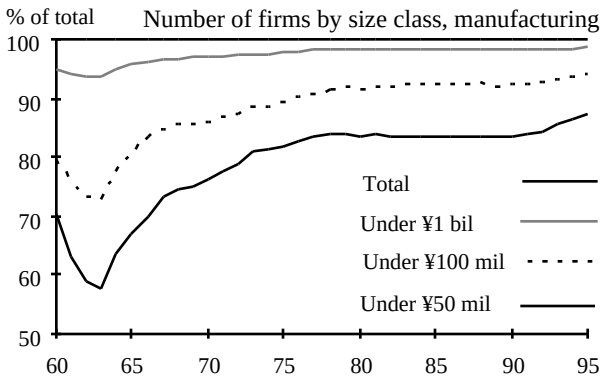
Source: MoF Quarterly Survey of Corporations, various issues

A similar tendency is seen within the manufacturing sector, although it is not quite as dramatic. The share of sales accounted for by large, as opposed to small, manufacturing firms has remained broadly unchanged since 1970s – and before that, the weight of small firms actually grew. Again, this seems counterintuitive with a size break set in nominal yen.

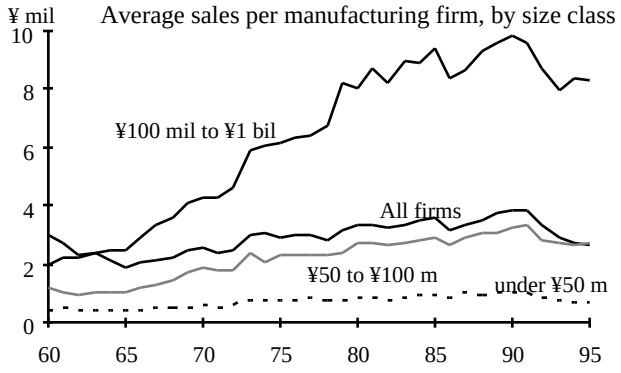


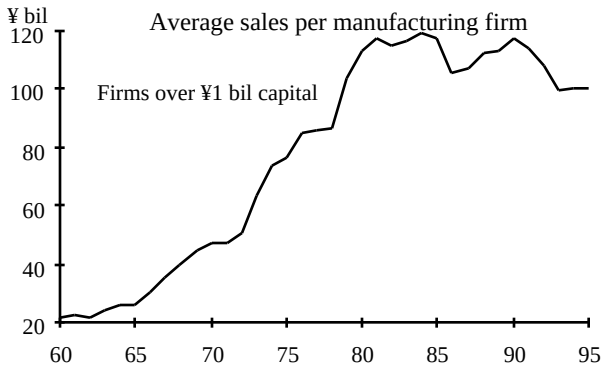
Breaking this observation into its two components – the number of firms and average sales per firm – shows that the phenomenon is due to disproportionate growth in the number of firms in the very smallest size category. In fact, firms with less than ¥50 million capital account for almost all of the increase and came up to 87% of all firms by 1995. As noted above for all firms, the growth in this category accelerated markedly after 1991, when small firms made efforts to meet the new capital requirement for incorporation.



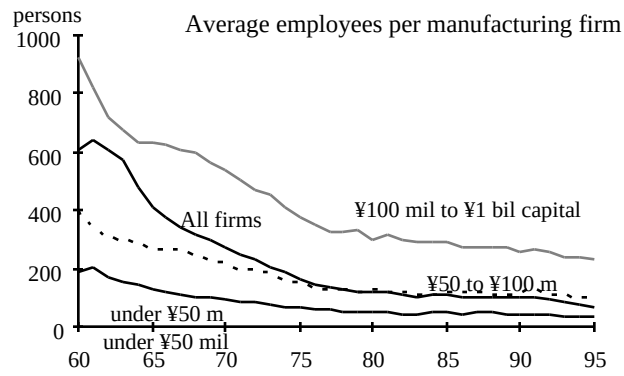


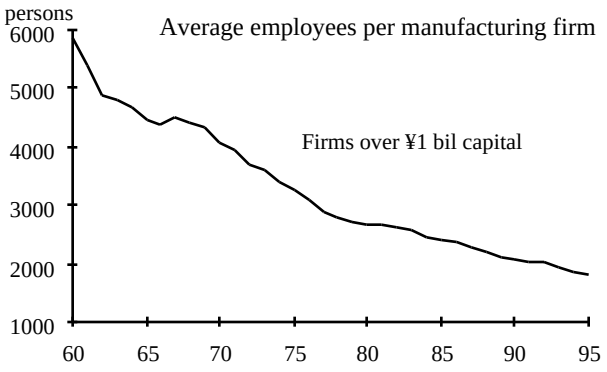
Average sales per firm within each size class has grown markedly over time (although not during the 1990s recession), as might be expected. The exception is the smallest category, of firms below ¥50 million, which have not increased very much in average size (Charts on next page). Similar observations can be made for capital, investment and inventories in manufacturing.





The MoF survey shows the average number of employees per firm declining steadily over time; the decline being especially sharp during the 1960s and early 1970s. The same pattern holds for manufacturing firms within the MoF survey (charts below).





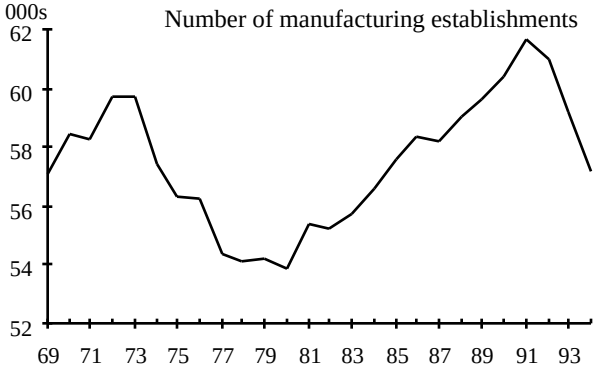
Some of these characteristics can be checked against the Ministry of International Trade and Industry's data on industrial firms. Generally, these comparisons support the idea that the MoF data are accurate in showing a decline of average firm size over time.

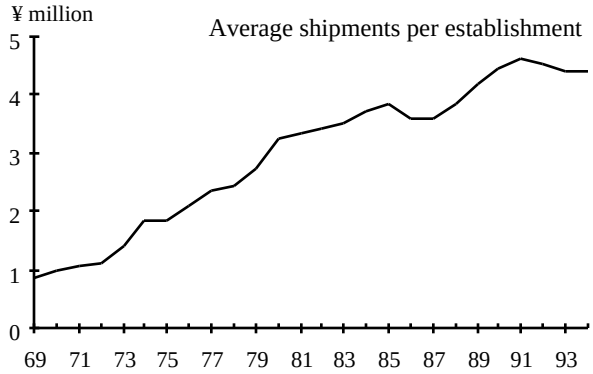
Employment: Data are not completely comparable, because the MITI survey covers establishments rather than firms, and the series used here are limited to establishments with 30 or more employees. The establishment data show more cyclical ups and downs, as might be expected, but they do show the same broad downward trend in average size, which was especially pronounced before 1975.

Source: MITI Industry Statistics

Total *number of firms*: Size trends for establishments differ from what the MoF survey shows for firms, which may not be unreasonable. MITI data show big declines during the "restructuring" periods of the 1970s and the 1990s. Note that the first "restructuring" period was accompanied by significant decline in firm size, measured by employees, while the second one seems to have seen a moderate increase. (Note that the MITI survey is a census, not a sample as the MoF survey is, but these data cover only establishments with 30 or more employees so that the number is much smaller than the estimated number of firms in MoF data.)

Sales per firm: Shipments data from the MITI survey show a similar pattern to sales in the MoF survey (second chart on next page). The exception is in the 1990s, when average sales per firm show a steep decline, while shipments per establishment do not. Part of the difference could be deflation in prices of manufactured goods, since the shipments data are in volume terms. Average levels of *investment* and *inventories* show similar patterns in both sets of data (not shown).

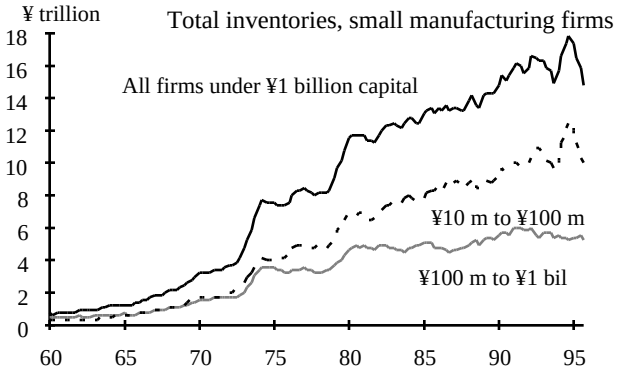


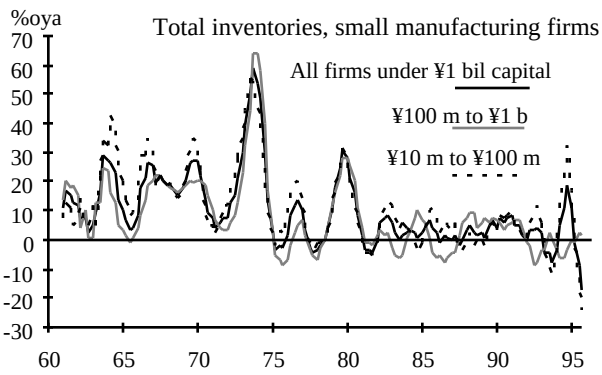


Source: MITI Industry Statistics

II. Volatility in the small-manufacturing sector

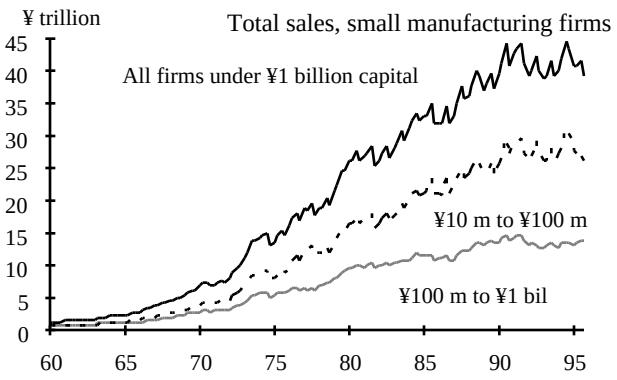
The behavior of small manufacturing firms looks considerably different, in the MoF survey data, depending on whether the smallest capital-size classes are included or not. Charts below illustrate this for two variables, sales and inventories, by splitting series for all firms below ¥1 billion into those for firms between ¥100 million and ¥1 billion only, and those for firms between ¥10 million and ¥100 million. The latter category, of very small firms (measured by capital), accounts for most of total activity, as already observed. But it accounts for an even larger share of short-term varia-

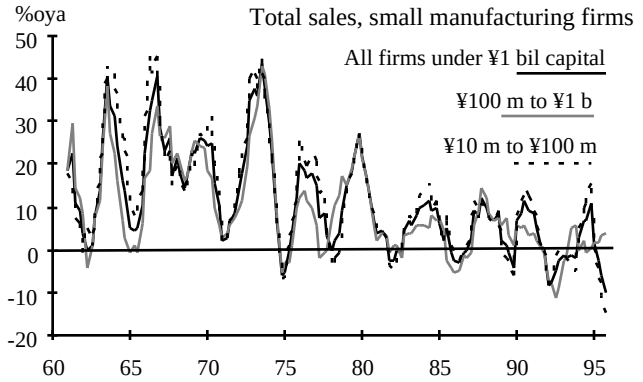




Source: All data in this section on small manufacturers are from the MoF quarterly survey of corporations, and are adjusted for sample change (see Appendix D), but not for seasonality.

tions. Viewed in year-on-year changes, it is particularly noticable in the past few years that fluctuations at the smallest firms have followed idiosynchratic patterns. Indeed, the sharp ups and downs in 1995 occurred only in the below-¥100 million class, disappearing altogether when series for ¥100 to ¥1 billion is used. (Similar discrepancies appear in the borrowing data, not shown here.)





This recent instability may be related to the rapid expansion of the smallest size class due to the legal change discussed above. If so, it could be a temporary problem that will disappear over time. For present purposes, it was deemed sufficient reason to limit the "small" size class used in comparisons to include only firms with over ¥100 million capital. However, it has to be admitted that this sacrifices a considerable amount of information, given the importance of these smallest firms.

III. Sample instability: Observations on the business services sector

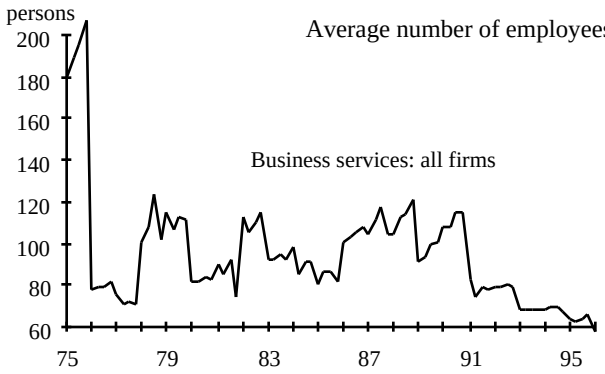
The business services sector (which means firms supplying services to businesses) was initially selected for study because it is reasonably large and showed some of the classic patterns of the bubble and post-bubble period.

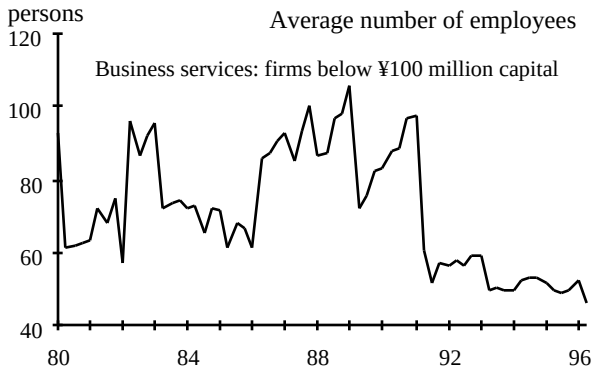
Business services firms made up about 7.5% of employment and 6% of total debt (as estimated in the MoF survey) in 1995. But they accounted for almost 12% of debt growth in the 1980s (whether measured for the whole decade or the second half only), and experienced a sharp debt contraction between 1990 and 1995 (enough to contribute a negative 4 percentage points to total corporate debt growth). Debt to fixed assets ratios and financial institution dependence both rose markedly to 1990 and shrank thereafter. And these patterns were reflected in interest burdens as well: Non-operating profits as a share of total sales grew from a negative 60% in 1985 to 120% in 1990, and then were pulled back sharply to 30% in 1995.

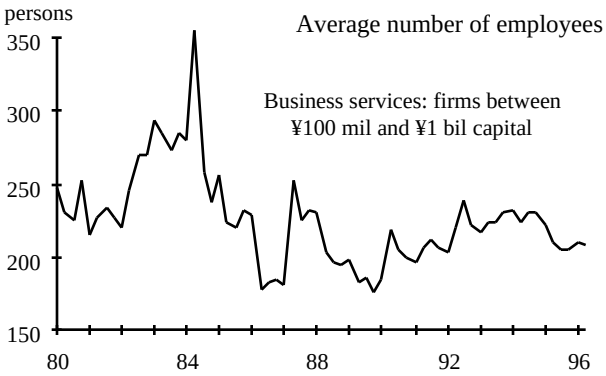
The data on business services firms turned out to be difficult to interpret. They show clear signs of sample instability, especially for the smallest firms. One clue to this, even in the summary data presented in Appendix A, is the change in importance of land holdings: Land as a percent of fixed assets was only 4% in the samples for 1980 and 1985, jumped to 12% in 1990 and fell back to 8% in 1995. A few other sectors showed similar jumps back and forth over time, but the overall pattern was usually for this ratio to be stable or show a consistent trend over time.

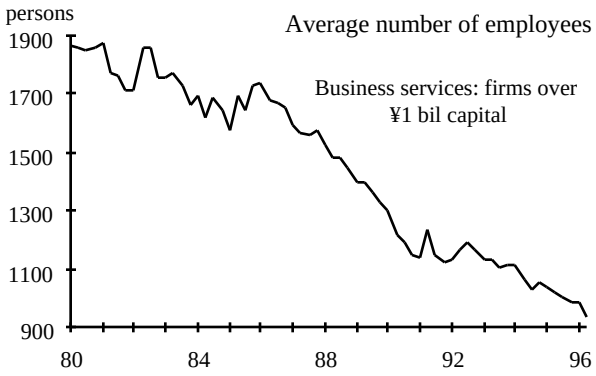
In the charts below, it is immediately apparent that data for firms below ¥100 million capital are subject to more-than-cyclical volatility, very likely reflecting changes in the composition of the sample. Even outside this class, there are some suspicious patterns: For instance, the average firm

size measured by employees, among firms between ¥100 million and ¥1 billion, gyrates senselessly in the 1980s. At least one of these swings (lasting from 1988 Apr-Jun through 1989 Jan-Mar) is almost surely due to the annual sample change, and most of the financial variables (borrowing, debt, interest coverage) reflect a sharp swing in that same period for that class of firms.



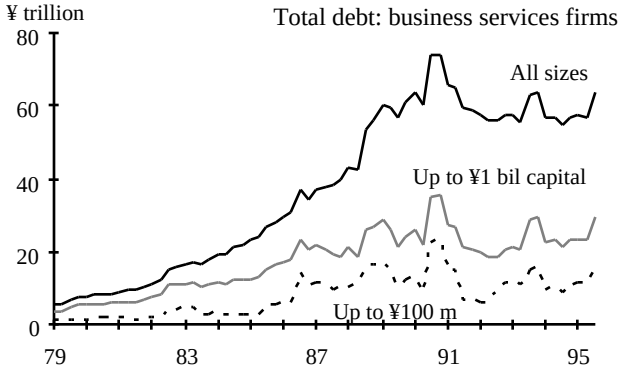


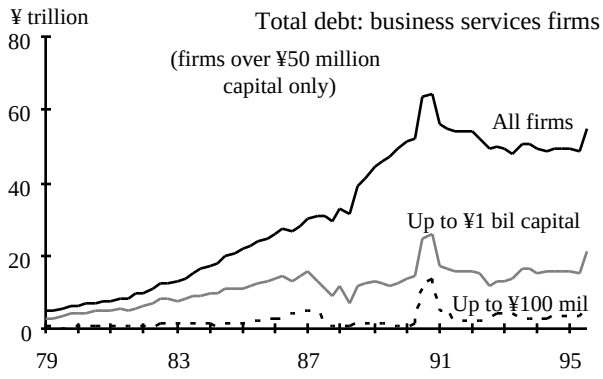




Source: All data in this section on business services firms are from the MoF quarterly survey of corporations; they are not adjusted for sample change or seasonality.

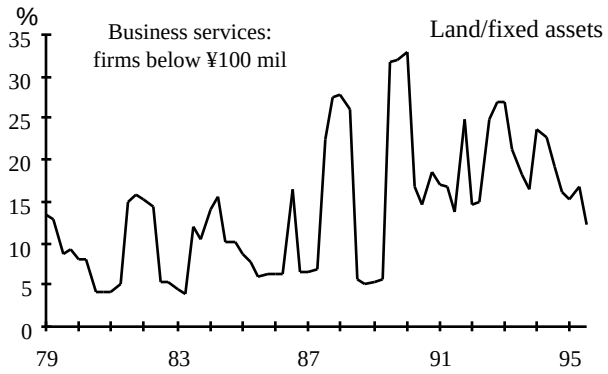
Changes in total liabilities, as one example, show a ragged pattern that is not very credible. Moreover, some of the changes are dominated by the smallest firms. In particular, the jump in debt levels reported in Apr-Jun 1991 does not look plausible. Interestingly, the anomalies do not disappear when the very smallest firms – those between ¥10 million and ¥50 million capital – are taken out of the reckoning (second chart below). It looks as if changes in membership within the ¥50 to ¥100 million class were sufficiently large to distort the entire industry sample during that year.

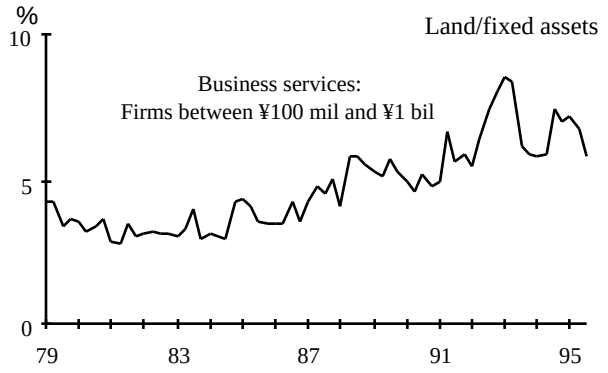


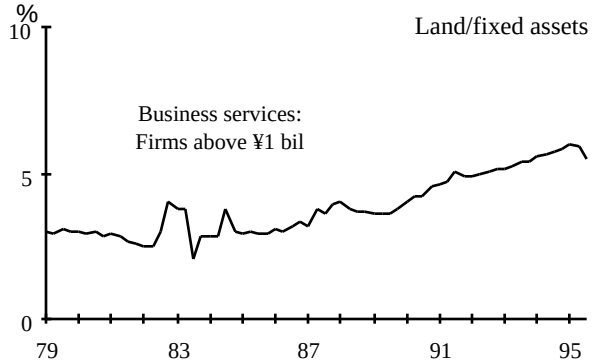


As another example, the proportion of assets represented by land shows suspicious changes, especially in the small size class. This item generally tends to be stable, since the measurements are at book value. The first chart below brings out the frequency with which swings happen in April data, often persisting for four quarters as would be expected if they are due to sample change. Data for middle-sized and (especially) large firms look more reasonable.

Since land holding is thought to have been an important influence on the financial situation of firms during the periods of asset-price change – a hypothesis that goes to the heart of the credit channels thesis, at least for Japan – these distortions in sampling could obscure the relationships that are sought in the data. These observations, of course, relate to a single sector, and the problem could conceivably be specific to, or especially important in, business services firms. Still, these observations suggest caution in interpeting detailed data in the MoF survey, especially for small firms.







Appendix D: Adjustment for sample discontinuities in the MoF survey data

The Ministry of Finance's Quarterly Survey of Corporations takes as its sample a set of firms that are selected each April from the Tax Bureau's data and other sources, and then used for a period of one year (four quarters). Ideally, if the sample selection method is appropriate, there should be no discontinuity in the time series resulting from these sample changes. However, examination of the data clearly reveals that there are discontinuities around these points of sample change. Consequently, we have attempted an adjustment for sample change. The adjustment is similar in intent to that of the Institute for Social Engineering (1976), but different in a number of details.

For stock items such as asset or liability levels, the survey contains figures for both the beginning and end of each period covered. This means that the end-March level of the old sample can be compared with the end-March (beginning-April) level of the new sample. For flow items like sales and current profits, however, there are no overlapping data from the new and old sample that can be directly compared. As a result, different adjustment methods are adopted for stock data as opposed to flow data, as described below.

I. Adjustment for discontinuity in stock data

Stock items are recorded with values as of the beginning and end of each quarter. As a result, looking at the January-March quarter, there is an overlap between the old sample's fourth quarter (fiscal year base – used throughout this Appendix – i.e., the January-March quarter) and the new sample's first quarter (i.e., April-June). The method used is to adjust the old sample's fourth quarter ending level to the new sample's first quarter starting level. In other words, taking the starting level of each sample year's first quarter as a fixed point, the ending values for each quarter are distributed between these first-quarter levels. Then, using the assumption that the rate of stock growth was the same at newly included firms as at previously included firms, the distribution was made so that the average per-firm increase in the stock (measured as the ratio to the fourth quarter level) was unchanged throughout the adjustment. More precisely, the method is as follows:

Define the end-quarter stock level and number of firms for quarter k of fiscal year t as $S_{t,k}$ and $N_{t,k}$ respectively, and the starting stock level for the first quarter of fiscal year t as S^*_t . If $r_{t,k}$ is defined as the growth rate of the average stock per firm, between quarter k of fiscal year t and the fourth quarter of the same year, then

$$r_{t,k} = (S_{t,4}/N_{t,4})/(S_{t,k}/N_{t,k})$$

Then, expressing the adjusted quarter-end value for the kth quarter of fiscal year t as $S^{\#}_{t,k}$

$$S^{\#}_{t,k} = (S^*_{t+1} - S_{t,4}) \bullet (k/4)/r_{t,k} + S_{t,k}$$

II. Adjustment for discontinuity in flow data

Since flow items, unlike the stock data, have no overlapping values between the old and new samples, the method described in section I cannot be applied directly. The adjustment is done based on an assumption that the ratio of each flow item to the total stock of capital is fixed, regardless of whether data are adjusted for discontinuity or not. This is based on the empirical observation that these ratios to total capital are relatively stable over time. Then, the adjusted flow items are obtained by applying the ratio of adjusted to unadjusted capital stock for each period, where the capital stock figures have been adjusted using the method of section I.