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Local Economic Effect of a Government - Owned Depository

Institution: Evidence from a Natural Experiment in Japan

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Local Economic Effects of a Government-Owned Depository Institution: Evidence from a Natural Experiment in Japan*

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Abstract

Beginning in 2000, Japan's postal saving system experienced a rapid outflow of funds as a large number of 10-Year Postal Saving Certificates were maturing. This paper exploits this episode as a natural experiment in order to investigate the effects of a government-owned depository institution on local economic performance. The results show that the prefectures in which local funds were more heavily invested in the postal saving system in the early 1990s tended to experience a larger shift of funds away from the postal saving system and that these prefectures performed better in terms of output and small business creation in the early 2000s.

JEL Classification Codes: G21, G28

Key Words: Government-owned banks, Postal saving system, Japan

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1. Introduction

Do government-owned banks serve under-banked (or un-banked) savers who do not have access to the private provision of depository services, thereby raising untapped saving that would not otherwise have financed viable investment projects? Alternatively, does the presence of government-owned banks retard economic growth as they divert funds away from private entrepreneurs with positive net present value projects? These questions are of interest to policy-makers, as a number of studies suggest that the development of financial markets is an important determinant of entrepreneurship and economic growth (e.g., King and Levine, 1993; Rajan and Zingales, 1998).

Nonetheless, because the amount of financial resources that flows into government-owned banks is endogenous to local financial and economic conditions, it is difficult to formulate an appropriate empirical strategy to investigate these questions in a systematic fashion. For instance, empiricists might observe negative statistical correlation between economic performance and the amount of financial capital deposited into government-owned banks. This correlation might occur, not necessarily because government-owned banks divert funds away from viable investment projects, but perhaps because finance might naturally flow into government-owned banks in an economically depressed place where private banks find few profitable business opportunities or where small savers do not have confidence in private banks. This paper explores whether or not a government-owned depository institution has negative effects on local economies by exploiting a unique event in Japan that resulted in a transparent instrumental variable which can be used to identify an exogenous shift in the allocation of local funds.

In 1990, interest rates peaked, causing many Japanese savers to purchase Postal Saving Certificates (PSCs) issued by the local post offices. PSCs resemble 10-year fixed-rate certificates of deposits (CDs) offered by private banks: PSCs offer virtually identical interest rates to CDs and are protected by government guarantee up to 10,000,000 yen (approximately 100,000 dollars).¹ The only difference is that the holders of PSCs do not have to pay a penalty for early liquidation. Such an implicit “put option” gives depositors a strong incentive to hold on to PSCs until maturity during periods of declining interest rates, while liquidating and re-investing them during periods of rising interest rates.

After 1990, Japanese savers faced steadily declining interest rates, which eventually fell to zero percent in 2000. Predictably, those who had bought PSCs in the early 1990s held onto them throughout the 1990s. These PSCs began to reach maturity in 2000, prompting those savers to invest their funds elsewhere as newly issued PSCs no longer offered attractive interest rates. Although some of these funds were re-deposited into the postal saving system, the system, which had initially held 260 trillion yen as of 1999, ended up losing about one-fifth of its funds (i.e., 60 trillion yen) by 2005. Given that Japan’s GDP is approximately 500 trillion yen, the size of the financial re-balancing that occurred after 2000 is significant. In sum, although this unique institutional feature of PSCs created serious distortion in the societal allocation of interest rate risk, it generated a useful natural experiment in which a large sum of local funds that was taken in by the postal saving system in the early 1990s was released to seek the highest return 10 years later for reasons unrelated to local demand conditions.

More specifically, we make use of variation in the share of postal saving deposits in total deposits (i.e., postal saving deposits plus deposits at private banks) across 47 prefectures during

¹ One could argue, however, that PSCs might be a little safer if depositors believe that (1) the postal saving system will never default, and (2) private banks fail with a positive probability and the actual payout of guaranteed deposits will cost them some time and resources (e.g., bureaucratic paperwork to verify which accounts belong to who).

the period of high interest rates in the early 1990s as an instrument to predict variation in differential shifts in the share 10 years later, in the early 2000s. The empirical results indeed show that the prefecture with a higher share of postal saving deposits in the early 1990s tended to experience a larger decline in the share after 2000. That is, the prefectures whose funds were more heavily invested in the postal saving system in the early 1990s tended to experience larger outflows of deposits from the postal saving system into private banks in the early 2000s as a result of the exogenous maturing of PSCs. Furthermore, the share of postal saving deposits, when appropriately instrumented, is negatively correlated with both prefecture income and the number of small firms, but not the number of large firms. Overall, the findings lend support to the view that Japan's postal saving system had a negative effect on local economies as it took away scarce funds from local banks and local businesses. In addition, the results suggest that such effects have distributional consequences, as they have the largest effects on small firms that rely on local banks that compete with the postal saving system for deposits.

This paper is closely related to a large literature that studies the adverse effects of government-ownership of banks on the efficiency of credit allocation and economic performance (e.g., La Porta, Lopez-de-Silanes, and Shleifer, 2002; Sapienza, 2004; Khwaja and Mian, 2005; Dinç, 2005; Cole, 2009, 2009b; Imai, 2009a; Illueca, Norden, and Udell, 2009). The empirical evidence in this literature suggests that the negative economic effects of government-owned banks stem from the fact that they are prone to make lending decisions based upon political considerations, not on the economic viability of investment opportunities. This paper complements these earlier studies by focusing on the funding side of a government-owned depository institution and estimating the opportunity costs that it imposes on local economies where funds are diverted away from private entrepreneurs.

The present paper also complements a growing literature on access to financial services around the world (e.g., World Bank, 2008; Schmukler, Gozzi, and de la Torre, 2007; Claessens, 2006; Beck, Demirguc-Kunt, and Martinez Peria, 2007). Strikingly, the existing cross-country studies in this literature show that government ownership of banks, most of which are supposed to provide universal financial services, is negatively correlated with various indices of access to finance (e.g., Beck, Demirguc-Kunt, and Martinez Peria, 2007). Although these results need to be interpreted with caution given the endogeneity of government owned banks, one interpretation that is consistent with both the results of cross-country studies and those of this paper is that large government-owned banks, like Japan's postal saving system, expend an enormous amount of resources in their efforts to draw deposits away from private banks instead of offering depository services to the un-banked (or under-banked). This interpretation is also consistent with the political motivation of governments to extract a large sum of economic rents from financial markets at the expense of public interests.

In addition, this paper's findings closely resemble those of an important paper by O'Hara and Easley (1979). Their findings show that the postal saving system in the United States diverted substantial sums from thrift institutions during the period of the Great Depression, which, in turn, caused a severe slump in local housing markets. A policy implication that naturally emerges from both this paper and O'Hara and Easley (1979) is that postal saving systems, or government-owned financial institutions in general, that aim to provide financial services to the un-banked or under-banked savers must be carefully designed so as not to adversely affect the flow of funds to local borrowers who typically borrow from local financial institutions that are in direct competition with postal saving systems for deposits.

It is important to point out an important caveat up front. First, although our empirical strategy provides estimates of differences across prefectures, the approach is unable to capture any aggregate nationwide effects of the postal saving system on the Japanese economy; i.e., the counterfactual of Japanese economic performance in the absence of the postal saving system cannot be observed. In particular, the funds collected by the postal saving system were channeled to a so called “second budget” (or “shadow budget”) of the central government, allowing the Ministry of Finance to finance the budget deficits of local and central governments and a variety of investment projects via government banks without formally issuing a large amount of debts. Hence, if the postal saving system served to relax the government’s financing constraints, allowing it to make investments in viable projects, then the aggregate (net) effects might have been positive even after taking into account the opportunity costs that it imposed on some prefectures.² Our within-country approach, however, has important merits. It allows us to make use of common data sources and, more importantly, common institutions so as to estimate local economic impacts of deposit outflow from government banks more precisely than would be possible in a cross-country analysis.

The rest of this paper is organized as follows. Section 2 describes the institutional background of Japan’s postal saving system (Postal Saving Certificates, in particular) during the period that the present paper investigates. Section 3 describes the empirical strategy and data.

² Of course, this counterfactual presumes that the investment decision of the government was driven entirely by economic factors. Three related papers, however, suggest that the funds collected via the postal saving system were inefficiently utilized for political reasons. Doi and Hoshi (2002) analyze the financial performance of these government banks and other public and semi-public corporations that relied on the funds collected via the postal saving system. Their analysis reveals an enormous number of nonperforming loans (75 percent of all loans). They also show that because of the insufficient capitalization and loan loss reserve, these bad loans are estimated to result in the financial loss of 75 trillion yen to taxpayers (15% of Japan’s GDP). Iwamoto (2002) estimates the welfare loss associated with National Motorway Program, which was financially supported by the postal savings. He shows that the estimated cost is staggering 14.5 trillion yen. Imai (2009a) finds that the allocation of government loans was driven in part by political factors such as the seniority and electoral vulnerability of politicians belonging to the ruling political party.

Section 4 presents the basic results. Section 5 shows the results for differential effects of finance on small firms versus large firms. Section 6 performs robustness checks. Section 7 discusses the results in relation to the literature on financial market friction. Section 8 makes concluding remarks.

2. Institutional Background³

Japan's postal saving system is large. There are over 24,000 post offices nationwide, more than the total number of bank branches (just over 22,000). As of 1999, when its deposits peaked, the amount of outstanding deposits was 260 trillion yen (approximately \$2.4 trillion), 37 percent of total household deposit holdings and more than a half of Japan's Gross Domestic Product). The funds collected at post offices were channeled to the Ministry of Finance through the Fiscal Investment and Loan Program (FILP), which generally used them to fund the budgetary shortfall of central and local governments, government-owned enterprises, and government-owned banks, some of which, in turn, offered funding for private sectors.⁴

Among the type of deposits offered at post offices, Postal Saving Certificates (PSCs) were the most popular, equaling as much as 90 percent of total deposits collected by the postal saving system. PSCs closely resembled 10-year fixed-rate certificates of deposit (CDs) issued by private banks: PSCs offered virtually identical interest rates as CDs, and, like CDs, were protected by government guarantee up to 10,000,000 yen (approximately \$100,000). The main attractions of PSCs were: (1) they offered a fixed-interest rate for up to 10 years maturity, so that savers did not bear any interest rate risk, and (2) early withdrawal could be made without penalty

³ The postal saving system went through extensive reform in 2007. This section focuses exclusively on the institutional background of postal saving system during 1985-2004.

⁴ See Iwamoto (2002), Cargill and Yoshino (2003), Doi and Hoshi (2003), Doi (2005), Doi and Ihori (2009), and Imai (2009a) for detailed discussions of the FILP.

after six months.⁵ Such an implicit “put option” naturally gave depositors strong incentives to hold onto PSCs during the period of declining interest rates until maturity while liquidating them during the period of rising interest rates and re-investing the proceeds into the newly issued PSCs, provided that PSCs continued to offer competitive rates. Because of this feature, if the interest rate on PSCs peaks and then never recovers to that level during the subsequent 10 years, then the postal saving system will be vulnerable to fund withdrawal exactly 10 years after the peak year, if the postal saving system is unable to offer a competitive interest rate.

Figure 1 shows the time series movements of interest rates on PSCs and 10-year Japanese Government Bonds (JGB). Three features of this figure are relevant to our identification strategy. First, even though there is a noticeable downward trend in interest rates in Japan from 1978 to 2004, there were two periods, specifically 1980 and 1990, when both interest rates went up sharply. Second, the interest rates continued to decline from 1990-2004 and never recovered to the peak level which was prevailing in 1990. Third, although these two rates moved closely together, the relative competitiveness of PSCs changed over time. In particular, the spread of the market rate over the PSCs rate increased dramatically from 50 basis points in 1990 to 150 basis points in 2000, thereby making the PSCs much less competitive throughout the 1990s and the early 2000s.

Figure 2 plots withdrawals and receipts of postal saving deposits during a given year as well as the stock of total postal saving deposits and that of PSCs prevailing at the end of the year; hence, the difference between receipts and withdrawals equals the change in stock of postal saving deposits. When interest rates were rising sharply (1978-1980, 1988-1990), we observe a rapid increase in both withdrawals from and receipts into the postal saving system, which is

⁵ Private banks in Japan were offering so-called Maturity Designated Time Deposits (MTDs), which gave the same type of implicit option; however, the maturity of MTDs was only three years.

consistent with the view that the Japanese savers must have exercised the put option by liquidating the old PSCs at face value and used the proceeds to purchase the new PSCs that offered higher interest rates. When interest rates were trending downward (1981-1987, 1991-1999), the level of withdrawals and receipts are low, relative to the total amount (or stock) of deposits. During these periods of declining interest rates, it did not make economic sense to exercise the put option; i.e., withdrawals and receipts were mostly due to transaction purposes. Finally, from 2000-2004, despite the continuing downward trend of interest rates, the maturing of the old PSCs which had been purchased in 1990 led to a rise in withdrawals, and since the difference between market rates and the rate on PSCs was widened (relative to that prevailing in 1990), some of these funds were not re-invested back into the postal saving system, as shown by the gap between withdrawals and deposits (and declining stock of postal saving deposits).

One notable feature of Figure 2 is that withdrawals and receipts moved closely together over time and that this co-movement is particularly pronounced in 1990 and 2000, when both series spiked up. There are two economic explanations for the observed co-movement. First, because some of the postal saving deposits are used for transaction purposes (like bank deposits), both withdrawal and receipts tend to go down together during economic downturns (e.g., the early 1990s in the aftermath of the tight monetary policy and the collapse of asset market bubble) and up together during upturns (e.g., the brief economic recovery in the mid 1990s). The second explanation is based upon the put option-like feature of PSCs. When the interest rate on PSCs rises, savers have strong incentives to liquidate the old PSCs (which offer lower interest rates) and re-invest the proceeds into new PSCs (which offer higher interest rates). This option-like feature also generates the observed simultaneous increase in withdrawals and receipts in 1999,

when the holders of maturing PSCs (which they bought in 1990) were investing some of the proceeds back into the postal saving system.

For the purpose of this paper, the most important aspect of this development in the early 2000s is that not all of the proceeds were re-deposited into the postal saving system because of the declining attractiveness of PSCs; i.e., if the Ministry of Post and Telecommunication had received enough political support to be able to raise the interest rate on PSCs in 2000 (and thereafter) to match the market rates, we would have seen the receipts going up as much as the withdrawals like we saw in 1990.⁶ Hence, even though most PSCs were rolled over, the postal saving system lost a large sum of funds – approximately 60 trillion yen, or 23 percent of its total funds – starting in 2000.

Because a part of the deposit withdrawals from the postal saving system in the early 2000s is caused by the maturing of the old PSCs purchased in the early 1990s, the amount of decline in postal saving deposits in the early 2000s in different prefectures should be closely related to the amount of newly purchased PSCs a decade earlier. Unfortunately, the data on the amount of new deposits in 1990 are not available at disaggregated prefecture level, but it should be strongly correlated with the stock of postal saving deposits in 1990 if a large number of savers were aware of the put option and replaced the old PSCs with the new ones in 1990. As we plot in Panel A of Figure 3, a change in the ratio of postal saving deposits to total deposits (postal saving deposits plus deposits in all private financial institutions) from 1999 to 2004 is strongly negatively related to the ratio of postal saving deposits to total deposits in 1990, confirming that a part of deposit outflow from the postal saving system from 1999-2004 is exogenously driven by the economic conditions prevailing in 1990. Moreover, the economies of those prefectures

⁶ This is because the privatization/shrinkage of the postal saving system and government-affiliated financial institutions were given serious political consideration in the Diet, starting in the late 1990s. See Imai (2009b) for the political background surrounding the postal saving privatization in Japan.

with a larger share of postal saving as of the 1990s tended to perform better from 1999-2004, as shown in Panel B of Figure 3.

3. Empirical Strategy and Data

The above discussion suggests that the allocation of local funds between the postal saving system and private banks in the early 2000s is, in part, driven by the inevitable maturing of PSCs that were purchased during the early 1990s. That is, the differential decline in the share of postal saving deposits in the early 2000s across 47 prefectures should be related to how heavily local funds were invested in the postal saving system as of the early 1990s. Hence, the basic specification for the first stage regression is:

$$Postal\ Saving_{it} = \beta_i + \beta_t + \beta_1(Dummy\ for\ 2000-04)_i * (Postal\ Saving)_{it-10} + v_{it} \quad (1)$$

where *Postal Saving* is the ratio of postal saving deposits to total deposits (postal saving deposits plus deposits at private banks), and *Dummy for 2000-04* is a dummy variable that equals 1 during 2000-04. The regression equation includes prefecture fixed effects and year fixed effects, β_i and β_t , which capture the unobservable time-invariant characteristics of each prefecture and economy-wide shocks that affect the allocation of local funds, respectively. A coefficient β_1 on $(Dummy\ for\ 2000-04)_i * (Postal\ Saving)_{it-10}$ captures differential shifts in the share of postal saving deposits that occurred starting in 2000. If β_1 is negative, then it means that those prefectures where local funds were more heavily invested in the postal saving system in the early 1990s (i.e., the prefectures with high $(Postal\ Saving)_{it-10}$) tended to experience a larger shift of funds away

from the postal saving system to private banks (i.e., a larger decline in *Postal Saving_{it}*) as a result of the maturing of these deposits, beginning in 2000.

The second stage regression equation is simply:

$$Income_{it} = \gamma_i + \gamma_t + \gamma_1 Postal Saving_{it} + \varepsilon_{it} \quad (2)$$

where *Income* is the log of Gross Prefecture Product per capita. As in the first stage regression, this equation includes prefecture fixed effects and year fixed effects, γ_i and γ_t , which capture the unobservable time-invariant characteristics of each prefecture and economic-wide shocks that affect local economic activities, respectively. A system of these two equations is estimated with Two Stage Least Squares (TSLS) using the data that cover 47 prefectures in Japan over a decade, from 1995 to 2004. Standard errors are adjusted for heteroskedasticity and serial correlation of error terms within each prefecture (Bertrand, Duflo, and Mullainathan, 2004). Data sources are described in Table A1. Table A2 provides summary statistics.

The presence of prefecture-fixed effects ensures that the results not be driven by an alternative (and simple) story that savers in poor and rural prefectures are under-banked and thus more likely to utilize post offices for depository services. Moreover, since the coefficient on *Postal Saving* is estimated, based only on within-prefecture shifts in postal saving deposits during 1995-2004 that are explainable by the initial level of postal saving deposits during 1990-1994, we can rule out the reverse causality story that local economic growth itself drives the shift of funds away from the postal saving system. Hence, the crucial identifying assumption in this framework is that the share of postal saving deposits in total deposits in each prefecture does not contain any information that predicts economic performance 10 years later.

4. Basic Results

Table 1 shows the basic results. Column 1 reports the results of simple ordinary least squares (OLS) regression for the purpose of comparison. The coefficient on *Postal Saving* is negative and significant, but there is no causal interpretation to this coefficient given the endogeneity of the allocation of deposits between private banks and the postal saving system.

Column 2 shows the results of the instrumental variable (IV) estimation in which $(\text{Dummy for } 2000-04) * (\text{Postal Saving}, t-10)$ is used as an instrument to extract the exogenous component of *Postal Saving*. The results of the first stage regressions are consistent with the prior expectation. The coefficient on $(\text{Dummy for } 2000-04) * (\text{Postal Saving}, t-10)$ is negative and statistically significant, suggesting that those prefectures with large amounts of postal saving deposits in the early 1990s experienced larger shifts of funds from the postal saving system to private banks in the early 2000s due to the maturing of PSCs.⁷ The first stage F-statistic is large, suggesting that the instrument is strong (Stock and Yogo, 2005). In the second stage regression, the coefficient on *Postal Saving* is negative and statistically significant.

Note that the estimated effect of the share of postal saving deposits in the IV estimation (column 2) is larger in absolute value than that in the OLS (column 1). One can think of two possible endogeneity stories that affect the OLS estimate. On the one hand, it could simply be the case that as economic conditions improve, funds are attracted into the private sector and away from the postal saving system to finance more economic activities. On the other hand, as

⁷ In the appendix, we report the results of the specifications in which log of postal saving deposits and log of private bank deposits are used as dependent variables (Table A3). The signs of the coefficients come out as expected (i.e., the coefficient on government deposit share is positive for log of government deposits, whereas that for private bank deposits is negative). Hence, both government deposits and private bank deposits are moving in the expected direction. They were, however, not statistically significant and estimated with a large confidence interval, which prevents us from talking precisely about how much each part of the fraction is moving.

economic conditions improve, borrowers' (and banks') internal cash holdings increase, which, in turn, reduces demand for external funds and thus stimulates the holding of PSCs by households. Depending on the relative size of the first and second effects, the OLS coefficients can have positive or negative bias, and our results suggest that the second effects might dominate in this particular case.

The results are economically important as well. Consider a typical prefecture whose share of postal saving deposits as of 1990 was 0.276 (the mean and median of postal saving deposit share turn out to be roughly the same). Based on the first stage results, this translates into a decline of the share of postal saving deposits by 0.03 (0.12×0.276), which, based on the second stage results, increases prefecture income by 3 percent.⁸ This is quite a large impact, given that the Japan's typical GDP growth is just over 0% during the sample period. However, since most of Japan's income is generated in large prefectures (e.g., Tokyo) where the share of postal saving deposits are small to begin with (e.g., 0.1 for Tokyo), the aggregate effects are likely to be quite modest, although the results do indicate that some local economies reaped large benefits from the shock.

One might wonder if the share of postal saving deposits contains some information about future economic conditions, thereby making these results spurious. That is, the instrumental variable may in fact be invalid. To address this concern, we perform simple falsification

⁸ Making a fair quantitative comparison of these results with those of other relevant papers is difficult, given non-trivial differences in methodologies and measurement. One of the two papers that are the closest is Guiso, Sapienza, and Zingales (2002), which shows that local financial condition contributes positively to entrepreneurship and local economic growth in Italy, where, presumably, there have been no regulatory barriers to intra-national flow of capital for more than a century. Based on these results, they maintain that "domestic financial institutions are likely to remain important in a financially integrated Europe and, more broadly, in a financially integrated world for some time to come." Becker (2007) also shows the importance of local supply of deposits for local income and entrepreneurship in the US. The results of the present paper are also consistent with such a view: just like in Italy and the U.S., local financial conditions have important real effects on local economies in Japan even in the absence of regulatory restriction on intra-national flow of capital and the presence of inter-bank loan markets.

exercises by directly including $(Postal\ Saving)_{t-10}$ into the right hand side of both the first and the second stage regression.

If the share of postal saving deposits always predicts economic conditions 10 years later (and our results are driven by this mechanism) for a reason unknown to us, then our main results should vanish after we control for the “usual” relationship between current PSC shares and (10-year) lagged PSC shares. The results show that the coefficients on the lagged postal saving share are insignificant in both the first and second stage regression equation, whereas our main results are robust to the inclusion of the lagged postal saving share (column 3). That is, the lagged share of postal saving deposits does not have any direct correlation with current economic performance once its economic impact through the current share of postal saving deposits is controlled for. In sum, these falsification exercises show that the share of postal saving deposits does not predict future economic performance; it has such predictive power only after a decade long decline in interest rates in the early 2000s.

Lastly, we report the results of a specification in which we replace $(Postal\ Saving, t-10)$ with $(Postal\ Saving, 1990)$. This specification forces us to utilize only the cross-sectional variation that was prevailing in 1990 when the interest rate peaked. The results are qualitatively similar, if not stronger, suggesting that year-to-year (possibly endogenous) fluctuations in the share of the postal saving system in the early 1990s are not driving our main results.

5. Distributional Effects

A large theoretical literature in banking suggests that banks (partially) solve asymmetric information problems in credit markets by investing in the acquisition of borrower-specific information and/or closely monitoring borrowers (e.g., Sharpe, 1990; Rajan, 1992; Diamond,

1984, 1991). One of the empirical implications of this theory is that banks are particularly important for those borrowers that face severe information problems (e.g., Hadlock and James, 2002; Ashcraft, 2005; Khwaja and Mian, 2008).⁹ Therefore, if the observed statistical relationship between income and the (instrumented) flow of deposits from the postal saving system to private banks is indeed non-mechanic, then the effects of postal saving deposits should have distributional consequences; i.e., an increase in the share of postal saving deposits hurts small firms more than large firms because small firms tend to have limited access to stock and bond markets, and thus are more likely to rely on local banks for external funds.

To check if this is the case, we use the log of the number of firms per capita, the log of the number of small firms (fewer than 30 employees) per capita, and the log of the number of large firms (300 employees or more) per capita as the dependent variables in the second stage regression, instead of the log of prefecture income per capita.¹⁰ It must be noted that although the data on prefecture income are available annually, the data on the number of firms are from *Jigyousho Kigyoushou Toukei Chousa Houkoku (Enterprise Statistical Survey)* which was performed only in 1996, 1999, 2001, and 2004, and thus the sample size declines dramatically from 470 to 188.

Additionally, we examine the differential response of loans (per capita) originated from two types of banks: city banks and local banks (regional banks, credit cooperatives, and credit unions).¹¹ This is a useful empirical exercise for two reasons. First, although the banking deregulation reduced the difference in loan portfolios between city banks and regional banks in

⁹ In a related literature, it has been shown that competition in the banking sector has positive effects on the real economy and, in particular, fosters the entry and growth of small firms which depend on bank loans for external finance (e.g., Black and Strahan, 2002; Beck, Demirguc-Kunt, and Maksimovic, 2004; Cetorelli and Strahan, 2006; Kerr and Nanda, 2009).

¹⁰ We follow the previous studies (Beck, Demirguc-Kunt, and Maksimovic, 2004; Cetorelli and Strahan, 2006; Kerr and Nanda, 2009), which use a cut-off size for small firms ranging from 5 to 100 employees in classifying small firms and large firms.

¹¹ The data are from Nikkin Shiryo Nenkan (see Table A1).

Japan (Hoshi and Kashyap, 2001), it is still the case that small firms are more likely to rely on small banks as their main banks,¹² and thus loans from small local banks are likely to serve as a good proxy for the usage of bank credit by small firms. Second, city banks operate nationwide and thus are better able to move funds across prefectural borders via internal capital markets, whereas regional banks operate more locally.¹³ Hence, our story would be less credible if most of our results are driven by city banks which serve relatively larger firms and are also able to shield themselves from local funding shocks more effectively.

The results are reported in Table 2. The results concerning the number of firms show that the shift of funds from private banks to the postal saving system has negative effects on small firms (column 2), but not on large firms (column 3). Similarly, loans from local banks seem to have increased in response to the outflow of funds from local post offices (column 5), whereas loans from nation-wide city banks are left unaffected (column 6). In sum, the results are consistent with the theory that the presence of a government-owned depository institution hurts local small businesses as it takes away deposits from local private banks, which small businesses rely on for external finance. Moreover, the observed negative correlation between local income and the share of postal saving deposits (Table 1) is unlikely to be spurious, given the differential effects on small versus large borrowers.

6. Robustness Checks

6.1 Instrument Validity

¹² See Berger et al. (2005) for an empirical documentation of this pattern in the US. For Japan, the *Basic Survey of Small and Medium Enterprises* (2010), published by Small and Medium Enterprise Agency, reports that less than 20% of small enterprises use city banks as their main banks and also that the tendency to rely on local banks is inversely related to the size of small firms

¹³ There is a large literature on the functioning of internal capital markets within large bank holding companies in this US (e.g., Houston, James, and Marcus, 1997, Jayaratne and Morgan 2000, Campello, 2002). Although these results have yet to be replicated with the Japanese data, it is plausible to assume that local funding shocks are less relevant to the loan supply of city banks with nation-wide branch network, compared to that of local banks.

Instrumental variable methods generate inconsistent estimates if instruments are weakly correlated with a bad regressor in the first stage regression or correlated with error terms in the second stage regression. The first stage F-statistics seem to suggest that our instruments are reasonably strong (Stock and Yogo, 2005). However, the validity of the instrument cannot be tested formally. We run two robustness checks to rule out some alternative stories that could potentially explain the negative correlation between real variables and the instrumented share of postal saving deposits.

The simplest possible alternative explanation as to why the share of postal saving deposits has predictive power for its future value and income a decade later is the presence of prefecture specific trends that might have existed even before the treatment. Such trends might in turn depend on the initial conditions that are spuriously captured by our instrument. For instance, postal saving deposits are more popular in rural, sparsely populated areas relative to cities,¹⁴ and it might be the case that rural economies grew faster during the sample period.¹⁵

To address this concern, we allow rural prefectures to have a different economic growth rate by including the interaction of a trend variable with the initial population density (as of 1990). Furthermore, we include “prefecture specific trend” (i.e., a separate linear trend for each prefecture), which accounts for a variation in the growth rate of income per capita that arises from any unobserved initial economic conditions that might be correlated with our instrument. If the pre-existing trend is driving the observed correlations between the share of postal saving deposits and its future shift a decade later, and between the (instrumented) share of postal saving

¹⁴ Population density is the most important predictor for postal saving deposit share across prefectures.

¹⁵ One might conjecture that those prefectures with a large amount of postal saving deposits in the early 1990s might have lacked viable private investment opportunity to begin with, which, in turn, should manifest itself in the form of sluggish economic performance a decade later. Note, however, that this particular mechanism would bias *against* finding positive correlation between the initial postal saving share and subsequent economic performance, which we observe in the data.

deposits and local income, then the coefficient on *Postal Saving* in the second stage regression will decline toward zero and lose statistical significance once these differential growth patterns are controlled for.

Another, and perhaps more serious, concern is that a factor that selected some prefectures into having a higher initial share during the high interest period could be the same factor that helped these prefectures recover faster during the low interest rate period. In other words, our results could be driven in part by differential sensitivity of local economies to interest rate shocks. To address this concern, we allow the response of each prefecture to fluctuations in interest rate (on 10-year Japanese government bonds) to depend on the initial population density, a major determinant of the postal saving share. Additionally, since the selection might be based on unobservable factors, we also allow each prefecture to respond flexibly to interest rate shocks by incorporating a “prefecture specific coefficient” on interest rates. Again, if the share of postal saving deposits in the early 1990s, its shift in the early 2000, and local income are spuriously correlated via differential responses of each prefecture to interest rate shocks, the effects of the share of postal saving deposits should vanish once these differential impacts are taken into account.¹⁶

The results of these robustness checks are reported in Table 3. The coefficients on the instrumental variable in the first stage remain statistically significant and qualitatively similar to the ones in the baseline specifications (Table 1). The first stage F-statistics, however, go down below 10 when both prefecture-specific trend and prefecture-specific sensitivity to interest rates

¹⁶ We also investigate the role of broader Japanese regions by allowing each of the 8 official Japanese regions (Hokkaido, Tohoku, Kanto, Chubu, Kinki, Chugoku, Shikoku, and Kyushu) to have different year-specific effects. This specification adds 80 dummy variables (8 regions x 10 years) and ends up removing much variation from the data (e.g., instruments become weak, and the significance of our key results declines).

are controlled for, (columns 6) as these additional control variables remove much of the variation from the data.

Although the coefficients on the share of postal saving deposits in the second stage regression do indeed change from one specification to another, they remain statistically robust and quantitatively important. According to the most conservative estimate (column 1, Table 3), a 3 percentage point increase in loans-to-total deposits ratio, a typical change within prefectures, leads to a 1.8 percent increase in local income. In sum, the results are robust to alternative specifications, and they are not driven by pre-existing trends or differential sensitivities of local economies to common macroeconomic shocks.

We also perform the same robustness checks on the regression equations for the number of firms of various sizes (Table 4). In these robustness checks, one result turns out to be somewhat fragile. When we include the prefecture specific time trends, the F-statistic of the instrument declines dramatically and it dips below 10, which means that the instrument in this specification is weak, and the results of the second stage regression might be seriously biased (columns 4, 6, 10, and 12). Otherwise, the results on the log of number of small firms are robust (columns 1, 2, 3, and 5), and the non-results on the log of number of large firms are again robust (columns 7-12). In sum, these results suggest that the instrument is likely to be valid (although it might be weak in a few specifications), and that the postal saving system seems to adversely affect small firms, as it takes away deposits from local banks that these firms depend on for external finance.

6.2. Alternative Definitions of Small and Large Firms

The definitions of small and large firms are somewhat arbitrary. In the main specification, we classify firms with fewer than 30 employees as small, and those with 300 employees or more as large, classifications which can certainly be disputed. In fact, according to the Small and Medium Enterprise (SME) Basic Law in Japan, SMEs are defined as enterprises with 300 or fewer regular employees or with a capital stock of 300 million yen or less, which is much higher than our “cut-off” size for the definition of small firms. Hence, we experiment with alternative classification schemes for small and large firms and see how the results change. As shown in Table 5, the results are robust even when we classify firms with 1-4 employees, 1-9 employees, or 1-49 employees as small (columns 1-3). The (non-)results are robust to alternative criterion for large firms (column 4, Table 5).

One notable result is that the coefficient on postal saving deposits is larger for small businesses with 1-9 employees (column 2) than for small businesses with 1-4 employees (column 1), which suggests that the response was stronger for firms with more than six employees than those with less than five. This result turns out to be roughly consistent with the US experience, in which the liberalization of interstate branching had the largest effects on the number of firms of this intermediate size (Cetorelli and Strahan, 2006; Kerr and Nanda, 2009).¹⁷

6.3. Zombie Lending

Thus far, our empirical results suggest that the funds released from the postal saving system had positive effects on local economic performance. Nonetheless, it has been documented in the literature that the Japanese banks – in particular, those with a large amount of non-

¹⁷ We make this comparison subject to an important caveat. Kerr and Nanda (2009) utilize the data on the number of new entrants of a given size, whereas we only have an aggregate data set on the number of new plus existing firms of a given size, thereby making it difficult to evaluate whether it is the growth of the existing small businesses or an increase in the average size of new entrants that is driving our results.

performing loans – had perverse incentives to continue to provide loans to poorly performing firms in this period (e.g., Peek and Rosengren, 2005, Caballero, Hoshi, and Kashyap, 2008). The strong real effects of financial shocks that we find might thus be quite puzzling in light of the documented prevalence of this so-called zombie lending. To address this potential criticism, we construct two prefecture-level proxies for the prevalence of zombie firms and test for the economic importance of nonlinearity. Since it is documented that zombie firms take away financial resources from healthy firms (Peek and Rosengren, 2005), exogenous increase in the availability of finance should have little or no real economic impacts in the prefectures with a large presence of zombies, whereas the prefectures with a relatively smaller presence of zombies should benefit from additional financial resources.

The prior literature identifies two important profiles of zombie firms, which provides us with some guidance to find reasonable proxies for zombie prevalence at the prefecture level. First, zombie firms were highly indebted (if not insolvent) and could not have operated without the financial assistance of banks (e.g., Sekine, Kobayashi, and Saita, 2003; Peek and Rosengren, 2005; Caballero, Hoshi, and Kashyap, 2008). Although we cannot directly observe the indebtedness of firms in each prefecture, it is likely that the financial health of typical borrowers during this particular period is strongly correlated with the severity of the asset price bubble in the prefecture where they operated. Thus, our first proxy for the prevalence of zombie firms is the percentage change in commercial land price index from 1980 to 1990¹⁸; i.e., the faster the commercial land price grew during the run-up (1980-1990), the more financial difficulty the

¹⁸ In the regression estimation, we re-scale this variable by dividing it by 100 so that the decimal points for the estimated coefficients are manageable in the table.

local businesses must have had repaying loans, and the more likely it is that they turned into zombie firms over time during the turndown.¹⁹

The second important characteristic of zombie firms is that they tend to be concentrated in the real estate and construction sectors (e.g., Sekine, Kobayashi, and Saita, 2003; Caballero, Hoshi, and Kashyap, 2008), as these are the sectors that became bloated during the period of real estate bubble in the 1980s. Thus, our second proxy is the ratio of the share of employment in real estate and construction sectors in 1990 to that in 1980; i.e., the prefecture which experienced faster growth in real estate and construction sectors in the 1980s is more likely to suffer from the prevalence of zombie firms.²⁰ In the econometric specifications, we interact our proxies for zombie prevalence with the share of postal saving deposits. We expect the coefficient on the interaction term to be positive (i.e., the opposite of the coefficient on the share of postal saving deposits), since zombie prevalence should reduce the benefit of deposit outflow from the postal saving system.

Table 6 shows the results of the specifications in which the share of postal saving deposits is interacted with the percentage change in commercial land price from 1980-1990. Consistent with the prior expectation, the coefficient on the interaction term is positive and statistically significant for the equation for log output (columns 1-4). The estimated non-linearity is economically important. Based on the coefficient estimates in column 1, the economic impact of a change in the share of postal saving deposits is basically zero for the prefectures that experienced the severest asset price bubble (e.g., Tokyo, Osaka, and Aichi, whose commercial

¹⁹ We also use the size of the decline in land price index from 1991-2003 as an alternative measure of zombie prevalence since it is the decline in the price of assets that create zombies. Although being strongly correlated with the increase in land price from 1980-1990, the shortcoming of this measure is that a part of it is likely to be endogenously affected by local economic conditions during the period under investigation. The results turn out to be qualitatively similar and are thus not reported to conserve space (but are available from the authors upon request)..

²⁰ Not surprisingly, these two proxies for zombie prevalence are strongly positively correlated, as shown in Figure A1. The data on land prices and employment in real estate and construction sectors are from Japan Statistical Yearbook and Enterprise Statistical Surveys (see Table A1 for description and Table A2 for summary statistics)

land price increased by 1000% from 1980-1990) . In contrast, in prefectures where the asset price bubble was moderate (e.g., Yamagata, Kochi, Miyazaki, and Kagoshima, whose commercial land price index increased only by 100% from 1980-1990), the effect of a change in the share of postal saving deposits is negative and highly significant; to be more specific, for this group of prefectures, when the share of postal saving deposits declines by 0.03, it leads to a 2.4% increase in prefecture income. These results suggest that additional finance did not contribute to local economic growth for prefectures with a large presence of zombies, whereas it boosted local economic activities where zombie firms were not as prevalent.

Columns 5-8 show the results for the numbers of small firms. These results show that financial shocks seem to affect the number of small businesses only in the prefectures where the run-up of asset market bubble was moderate. Columns 9-12 show the results for the number of large firms as a falsification test. The results are all insignificant, suggesting that local financial shocks are irrelevant for large firms, as expected.

Table 7 shows the results of the specification in which we use the ratio of the share of employment in real estate and construction sectors in 1991 to that in 1981 as an alternative proxy for zombie prevalence. The results are qualitatively similar to those in Table 6; financial shocks matter where zombies are less likely to dominate local economies. In sum, although we cannot rule out the possibility that some banks channeled newly acquired funds into zombie borrowers, the results based on prefecture-level data suggest that moving funds away from the hands of the government to the private banks was, on average, likely to generate economic benefit. More importantly, the economic benefits are likely to be larger in local economies where zombie firms are not the main user of financial resources.

7. Discussion

This paper's results might call into question how well (or poorly) financial markets are geographically integrated in Japan. If financial markets are completely integrated and perfectly competitive, then every local borrower faces a perfectly elastic supply of funds at a risk-adjusted rate, and thus, outflow of local funds from local postal saving accounts should not have any real effects on local economic performance. That is, this paper's results are possible only with some degree of geographical segmentation of financial markets in Japan.

In theory, the answer to this question is critically dependent upon the regulatory environment that constrains how financial market participants interact with one another. If, for example, a financial market is geographically segmented because of regulatory barriers, some entrepreneurs might not be able to finance profitable investment projects because of the limited availability of local credit.²¹ In Japan, however, such restrictions do not exist.

Nonetheless, even when there is no regulatory barrier inhibiting regional capital flows, asymmetric information problems could force entrepreneurs to be highly dependent upon closely related and well-informed local banks. Supporting this view, recent empirical papers document the importance of distance constraints that limit the ability of banks to extend informationally intensive credit to some distant borrowers in Japan (Uchida, Udell, and Watanabe, 2008; Uchida and Ogura, 2008) and elsewhere (Degryse and Ongena, 2005; Brevoort and Hannan, 2006; Mian, 2006; DeYoung, Glennon, and Nigro, 2008; Alessandrini, Presbitero, and Zazzaro, 2009). Thus,

²¹ Consistent with this view, local economic performance was closely tied to local credit conditions in the highly fragmented US banking system that operated before the deregulation of intrastate and interstate branching (e.g., Calomiris, Hubbard, and Stock, 1986).

our results might stem from the information-based segmentation of banking markets that have been well-documented in the literature.²²

Another concern might be that even if some banks are informationally constrained to provide loans to distant borrowers, they could, in theory, provide excess funds via inter-bank loan markets to other banks that possess locally specific information. In Japan, there is an unregulated, large, and active inter-bank loan market in which banks purchase and sell a large sum of funds (Suzuki, 1987). Thus, there seems to be an appropriate institutional foundation that integrates financial markets across prefectures. Nonetheless, even if markets exist, those markets do not necessarily lack friction. Even though there is no systematic study that directly examines the presence of such friction in the inter-bank loan markets in Japan, recent microeconomic studies of inter-bank loan markets in the US suggest that frictions stemming from imperfect information, although not serious enough to completely shut down the markets, are important enough that some banks are rationed out of the markets (Ashcraft and Bleakley, 2006; King, 2008; Cocco, Gomes, and Martins, 2008). These studies lead me to suspect that Japan's inter-bank loan markets operate with similar friction.

Furthermore, the literature on the so-called bank lending channel demonstrates that liquidity (or the lack thereof) in bank balance sheets plays an important role in monetary transmission mechanisms in the US (e.g., Kashyap and Stein, 2000), Europe (e.g., Ehrmann, Gambacorta, and Martinez-Pages, 2001), and Japan (e.g., Ogawa and Kitasaka, 2000; Imai and Takarabe, forthcoming). These results provide indirect evidence that inter-bank loan markets do not function perfectly for some banks, given that frictionless, inter-bank loan markets would

²² To verify this conjecture, one would need to utilize a more disaggregated data set on individual bank loans that record the location of banks and firms. We find that such a data set was compiled by the Japanese government (and used by Uchida, Udell, and Watanabe (2008)). However, the data starts only after 2002, making it unsuitable for the present paper, which examines the effects of deposit flow that started in 2000.

allow illiquid banks to finance all profitable lending opportunities, even in the face of monetary tightening (Freixas and Jorge, 2008).

In addition, there are several studies which perform careful examinations of whether financial markets are segmented in a geographical dimension in Japan. Iwamoto and van Wincoop (2000) show that saving-investment correlation is positive in cross-sectional data of Japan's prefectures (although such intra-national correlation within Japan is weaker than the international correlation in cross-country data that is first documented by Fieldstein and Horioka, 1980). Uchida and Tsutsui (2005) show that although city banks face competitive markets, regional banks which absorb local deposits and serve local small borrowers possess some market power in Japan. These studies show that although there is no regulation of intra-national capital flow, financial markets seem not to be perfectly integrated in Japan.

Finally, Guiso, Sapienza, and Zingales (2002) show that local financial development contributes positively to entrepreneurship and local economic growth in Italy where, presumably, there have been no regulatory barriers to the intra-national flow of capital for more than a century. Based on these results, they maintain that "domestic financial institutions are likely to remain important in a financially integrated Europe and, more broadly, in a financially integrated world for some time to come." Similarly, Becker (2007) also shows the importance of a local supply of deposits for local income and entrepreneurship in the US. The results of the present paper are also consistent with such views: just like in Italy and the U.S., local financial conditions have important real effects on local economies in Japan even in the absence of regulatory restriction on the intra-national flow of capital and the presence of inter-bank loan markets.

8. Concluding Remarks

As a large number of 10-year fixed-rate Postal Saving Certificates (PSCs) that had been purchased during the period of high interest rates in the early 1990s began to mature in the early 2000s, the Japanese economy experienced a rapid outflow of funds from the government-administered postal saving system. By exploiting this plausibly exogenous financial shock as a natural experiment, this paper investigates the local economic effects of a large government-owned depository institution. Two notable results emerge. First, the share of local funds that had been deposited into the postal saving system in the early 1990s is a likely explanation for the differential change in the share of postal saving deposits a decade later in the early 2000s. Second, when appropriately instrumented, an increase in the share of postal saving deposits has economically important negative effects on the local income and the number of small firms, but not on the number of large firms. These results support the hypothesis that the presence of large government-owned depository institutions has negative effects on local economies, particularly on small local firms which rely on local banks that compete with government-owned depository institutions for local deposits.

One important shortcoming of this paper, however, is that it does not firmly establish the mechanism by which the outflow of funds from the postal saving system generated growth in real economies. Clearly, more work is needed to open up the black box. In particular, future research on this topic should utilize disaggregated microeconomic data that trace the flow of funds into small firms from banks and examine whether additional funds indeed relieved the financing constraints of banks and small firms and ended up being invested in positive net present value projects. Not only would such a study add to the understanding of the impact of the

postal saving system in Japan, but it would also enhance our understanding of the role of financial intermediaries in the financing of small businesses in general.

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Table 1: Postal Saving Deposits and Prefecture Income

The dependent variables are postal saving deposits-to-total deposits ratio in the first stage, and log of prefecture income per capita in the second stage. The data cover Japan's 47 prefectures from 1995 to 2004. The regression equations include fixed prefecture effects and fixed year effects, and are estimated with Two Stage Least Squares (TSLS). Standard errors are in parentheses and robust to heteroskedasticity and serial correlation within each prefecture.

	(1)	(2)	(3)	(4)
Variables	OLS	IV	IV	IV
		1 st Stage	1 st Stage	1 st Stage
(Dummy for 2000-04)*(Share of Postal Saving Deposits, t-10)		-0.125*** (0.0260)	-0.122*** (0.0248)	
Share of Postal Saving Deposits, t-10			-0.145 (0.0945)	
(Dummy for 2000-04)*(Share of Postal Saving Deposits, 1990)				-0.110*** (0.0259)
R-squared		0.864	0.866	0.860
First Stage F Statistic		23.25	24.36	18.07
		2nd Stage	2nd Stage	2nd Stage
Share of Postal Saving Deposits	-0.306** (0.130)	-1.007** (0.442)	-0.991** (0.455)	-1.368** (0.612)
Share of Postal Saving Deposits, t-10			0.0978 (0.234)	
Observations	470	470	470	470
Number of Prefectures	47	47	47	47
R-squared	0.415			

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2: Postal Saving Deposits and Firm Creation

The dependent variables are postal saving deposits-to-total deposits ratio in the first stage and log of the number of firms per capita (columns 1-3) and log of bank loans per capita (column 4-6) in the second stage. Small firms (column 2) are defined as those with fewer than 30 employees. Large firms (column 3) are those with 300 employees or more. Local bank loans (column 5) are loans originating from regional banks, credit cooperatives, and credit unions. City bank loans (column 6) are loans originated from city banks. The regression equations include fixed prefecture effects and fixed year effects, and are estimated with Two Stage Least Squares (TSLS). Standard errors are in parentheses and robust to heteroskedasticity and serial correlation within each prefecture.

	(1)	(2)	(3)	(4)	(5)	(6)
	ln(Firms)	ln(Small Firms)	ln(Large Firms)	ln(Total Loans)	ln(Local Bank Loans)	ln(City Bank Loans)
Share of Postal Saving Deposits	-1.174*** (0.403)	-1.234*** (0.420)	-0.0319 (1.535)	-2.705* (1.609)	-6.648* (3.846)	1.885 (3.113)
First Stage F Statistic	26.35	26.35	26.35	23.25	23.25	23.25
Observations	188	188	188	470	470	470
Number of Prefectures	47	47	47	47	47	47

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3: Robustness Checks (Prefecture-Specific Time Trend and Differential Effects of Common Interest Rate Shocks)

The dependent variables are postal saving deposits-to-total deposits ratio in the first stage and log of prefecture income per capita in the second stage. Prefecture specific time trend (columns 4 and 6) is a separate linear trend for each prefecture. Differential effect of interest rate (columns 5 and 6) is a separate coefficient on the interest rate on 10-year government bonds for each prefecture. The data cover Japan's 47 prefectures from 1995 to 2004. The regression equations include fixed prefecture effects and fixed year effects, and are estimated with Two Stage Least Squares (TSLS). Standard errors are in parentheses and robust to heteroskedasticity and serial correlation within each prefecture.

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	1 st stage	1 st stage	1 st stage	1 st stage	1 st stage	1 st stage
(Dummy for 2000-04)*(Share of Postal Saving Deposits, t-10)	-0.153*** (0.0288)	-0.138*** (0.0264)	-0.153*** (0.0290)	-0.0852*** (0.0274)	-0.0852*** (0.0274)	-0.0596** (0.0275)
(Pop. Density as of 1990)*(Trend)	-0.0560** (0.0231)		-0.0534* (0.0304)			
(Pop. Density as of 1990)*(Interest Rates)		0.175** (0.0717)	0.0151 (0.0810)			
First Stage F Statistic	28.28	27.41	27.85	9.682	28.91	4.708
R-squared	0.867	0.866	0.867	0.931	0.931	0.948
	2nd stage	2nd stage	2nd stage	2nd stage	2nd stage	2nd stage
Share of Postal Saving Deposits	-0.612* (0.369)	-0.796** (0.378)	-0.616* (0.370)	-1.515** (0.661)	-0.860*** (0.320)	-2.183* (1.208)
(Pop. Density as of 1990)*(Trend)	-0.0995 (0.0896)		-0.0890 (0.0926)			
(Pop. Density as of 1990)*(Interest Rates)		0.362 (0.305)	0.0646 (0.0756)			
Prefecture Specific Time Trend	No	No	No	Yes	No	Yes
Differential Effects of Interest Rate	No	No	No	No	Yes	Yes
Observations	470	470	470	470	470	470
Number of Prefectures	47	47	47	47	47	47

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Robustness Checks on Firm Results

The dependent variables are postal saving deposits-to-total deposits ratio in the first stage as well as log of the number of small firms per capita (columns 1-6) and log of the number of large firms per capita (column 7-12) in the second stage. Small firms are defined as those with fewer than 30 employees. Large firms are those with 300 employees or more. Prefecture specific time trend (columns 4, 6, 10, and 12) is a separate linear trend for each prefecture. Differential effect of interest rate (columns 5, 6, 11, and 12) is a separate coefficient on the interest rate on 10-year government bonds for each prefecture. The regression equations include fixed prefecture effects and fixed year effects, and are estimated with Two Stage Least Squares (TSLS). Standard errors are in parentheses and robust to heteroskedasticity and serial correlation within each prefecture.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Variables	1 st stage											
(Dummy for 2000-04)	-0.189***	-0.190***	-0.192***	-0.107**	-0.107**	-0.0891	-0.189***	-0.190***	-0.192***	-0.107**	-0.107**	-0.0891
*(Share of Postal Saving Deposits, t-10)	(0.0332)	(0.0320)	(0.0330)	(0.0460)	(0.0460)	(0.0589)	(0.0332)	(0.0320)	(0.0330)	(0.0460)	(0.0460)	(0.0589)
(Pop. Density as of 1990)*(Trend)	-0.0623**		-0.0183				-0.0623**		-0.0183			
	(0.0248)		(0.0415)				(0.0248)		(0.0415)			
(Pop. Density as of 1990)*(Interest Rates)		0.349***	0.269					0.349***	0.269			
		(0.109)	(0.176)					(0.109)	(0.176)			
R-squared	0.895	0.895	0.895	0.952	0.952	0.984	0.895	0.895	0.895	0.952	0.952	0.984
First Stage F Statistic	32.25	35.34	33.69	5.393	16.22	2.291	32.25	35.34	33.69	5.393	16.22	2.291
	2 nd stage											
	ln(Small Firms)						ln(Large Firms)					
Share of Postal Saving Deposits	-0.520**	-0.656***	-0.532**	-0.394	-0.629***	-0.590	0.282	0.253	0.290	-0.560	-0.655	-1.004
	(0.245)	(0.249)	(0.245)	(0.377)	(0.231)	(0.556)	(1.597)	(1.565)	(1.589)	(3.075)	(1.219)	(4.040)
(Pop. Density as of 1990)*(Trend)	-0.230***		-0.261***				-0.101		-0.0786			
	(0.0485)		(0.0782)				(0.122)		(0.203)			
(Pop. Density as of 1990)*(Interest Rates)		0.995***	-0.181					0.489	0.134			
		(0.202)	(0.208)					(0.469)	(0.598)			
Prefecture Specific Time Trend	No	No	No	Yes	No	Yes	No	No	No	Yes	No	Yes
Differential Effect of Interest Rates	No	No	No	No	Yes	Yes	No	No	No	No	Yes	Yes
Observations	188	188	188	188	188	188	188	188	188	188	188	188
Number of Prefectures	47	47	47	47	47	47	47	47	47	47	47	47

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Results Based on Alternative Definitions of Small Firms and Large Firms

The dependent variables are postal saving deposits-to-total deposits ratio in the first stage and log of the number of firms per capita in the second stage. The regression equations include fixed prefecture effects and fixed year effects, and are estimated with Two Stage Least Squares (TSLS). The results of the first stage regression are identical to those reported in Table 2, and thus not reported to conserve space. Standard errors are in parentheses and robust to heteroskedasticity and serial correlation within each prefecture.

	(1)	(2)	(3)	(4)
Variable	ln(Small Firms) (1-4 employees)	ln(Small Firms) (1-9 employees)	ln(Small Firms) (1-49 employees)	ln(Large Firms) (100 employees or more)
Share of Postal Saving Deposits	-1.051*** (0.404)	-1.252*** (0.441)	-1.215*** (0.413)	0.662 (0.749)
First Stage F Statistic	26.35	26.35	26.35	26.35
Observations	188	188	188	188
Number of Prefectures	47	47	47	47

*** p<0.01, ** p<0.05, * p<0.1

Table 6: % Change in Commercial Land Price Index from 1980-1990 as Proxy for Zombie Firms' Prevalence

The dependent variables are log of prefecture income per capita (columns 1-4), log of number of small firms (fewer than 30 employees) per capita (columns 5-8), and log of number of large firms (100 employees or more) per capita (columns 9-12). *% Change in Commercial Land Price Index*, a proxy for zombie prevalence, refers to the percentage change in commercial land price index from 1980-1990. *Share of Postal Saving Deposits* and $(\% \text{ Change in Commercial Land Price Index}) * (\text{Share of Postal Saving Deposits})$ are instrumented with $(\text{Dummy for 2000-04}) * (\text{Share of Postal Saving Deposits}, t-10)$ and $(\% \text{ Change in Commercial Land Price Index}) * (\text{Dummy for 2000-04}) * (\text{Share of Postal Saving Deposits}, t-10)$. The first stage results are not reported to conserve space with the exception of the first stage F-statistics, which show the relevance of instruments. The regression equations include fixed prefecture effects and fixed year effects, and are estimated with Two Stage Least Squares (TSLS). Standard errors are in parentheses and robust to heteroskedasticity and serial correlation within each prefecture.

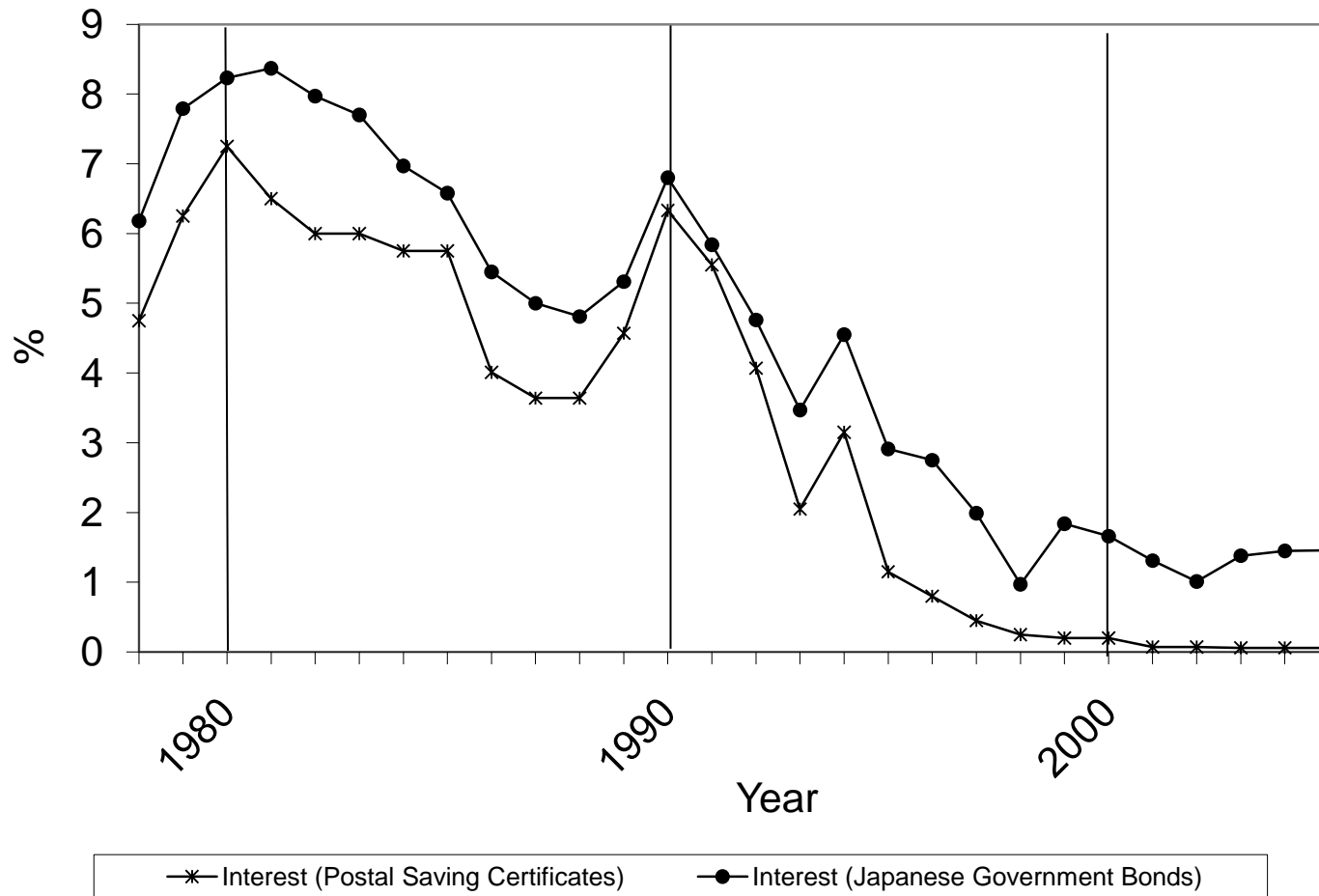
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	ln(prefecture income)				ln(small firms)				ln(large firms)			
Share of Postal Saving Deposits	-0.872**	-0.756**	-0.704*	-0.795**	-0.980***	-0.589***	-0.604***	-0.565**	-0.217	0.417	0.177	0.356
	(0.390)	(0.375)	(0.361)	(0.384)	(0.269)	(0.227)	(0.213)	(0.222)	(1.495)	(1.635)	(1.548)	(1.609)
(% Change in Commercial Land Price Index)	0.0805***	0.0715**	0.0682***	0.0757**	0.0920***	0.0598***	0.0651***	0.0599***	-0.0669	-0.119	-0.0949	-0.119
x(Share of Postal Saving Deposits)	(0.0272)	(0.0327)	(0.0238)	(0.0344)	(0.0229)	(0.0231)	(0.0198)	(0.0229)	(0.0847)	(0.0983)	(0.0846)	(0.0990)
(Pop. Density as of 1990)*(Trend)		-0.0333		0.0505		-0.155***		-0.0906		-0.251		-0.416
		(0.0869)		(0.101)		(0.0385)		(0.0689)		(0.193)		(0.405)
(Pop. Density as of 1990)*(Interest Rates)			0.325	0.489***			0.775***	0.383*			0.811	-0.988
			(0.270)	(0.187)			(0.131)	(0.223)			(0.546)	(1.334)
Observations	470	470	470	470	188	188	188	188	188	188	188	188
Number of Prefectures	47	47	47	47	47	47	47	47	47	47	47	47
First Stage F Statistic	10.09	13.27	10.79	13.30	12.33	14.94	14.82	15.02	12.33	14.94	14.82	15.02

Table 7: Ratio of Employment Share in Real Estate/Construction in 1991 to that in 1981 as Proxy for Zombie Firms' Prevalence

The dependent variables are log of prefecture income per capita (columns 1-4), log of number of small firms (fewer than 30 employees) per capita (columns 5-8), and log of number of large firms (100 employees or more) per capita (columns 9-12). *Growth in Employment Share in Real Estate/Construction*, a proxy for zombie prevalence, refers to the ratio of employment share in real estate and construction in 1991 to that in 1981. *Share of Postal Saving Deposits* and $(\text{Growth in Employment Share in Real Estate/Construction}) \times (\text{Share of Postal Saving Deposits})$ are instrumented with $(\text{Dummy for 2000-04}) \times (\text{Share of Postal Saving Deposits, } t-10)$ and $(\text{Growth in Employment Share in Real Estate/Construction}) \times (\text{Dummy for 2000-04}) \times (\text{Share of Postal Saving Deposits, } t-10)$. The first stage results are not reported to conserve space with the exception of the first stage F-statistics which show the relevance of instruments. The data cover Japan's 47 prefectures from 1995 to 2004. The regression equations include fixed prefecture effects and fixed year effects, and are estimated with Two Stage Least Squares (TSLS). Standard errors are in parentheses and robust to heteroskedasticity and serial correlation within each prefecture.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	ln(prefecture income)				ln(small firms)				ln(large firms)			
Share of Postal Saving Deposits	-3.961**	-3.171	-3.302**	-3.276	-5.256***	-3.618***	-3.800***	-3.574***	1.885	3.671	3.088	3.614
	(1.726)	(1.997)	(1.582)	(2.070)	(0.966)	(0.810)	(0.720)	(0.788)	(4.218)	(4.899)	(4.397)	(4.806)
(Growth in Employment Share in Real Estate/Construction) x(Share of Postal Saving Deposits)	3.521*	2.856	2.972*	2.949	4.869***	3.493***	3.671***	3.467***	-2.321	-3.822	-3.311	-3.788
	(1.835)	(2.072)	(1.719)	(2.137)	(1.032)	(0.882)	(0.815)	(0.866)	(3.750)	(4.224)	(3.820)	(4.170)
(Pop. Density as of 1990)*(Trend)		-0.0584		-0.00372		-0.162***		-0.106**		-0.176		-0.247
		(0.0863)		(0.102)		(0.0282)		(0.0465)		(0.167)		(0.321)
(Pop. Density as of 1990)*(Interest Rates)			0.339	0.327			0.803***	0.335*			0.663	-0.429
			(0.279)	(0.220)			(0.118)	(0.173)			(0.535)	(1.010)
Observations	470	470	470	470	188	188	188	188	188	188	188	188
Number of Prefectures	47	47	47	47	47	47	47	47	47	47	47	47
First Stage F Statistic	9.847	12.01	11.05	11.80	13.95	15.50	17.41	16.31	13.95	15.50	17.41	16.31

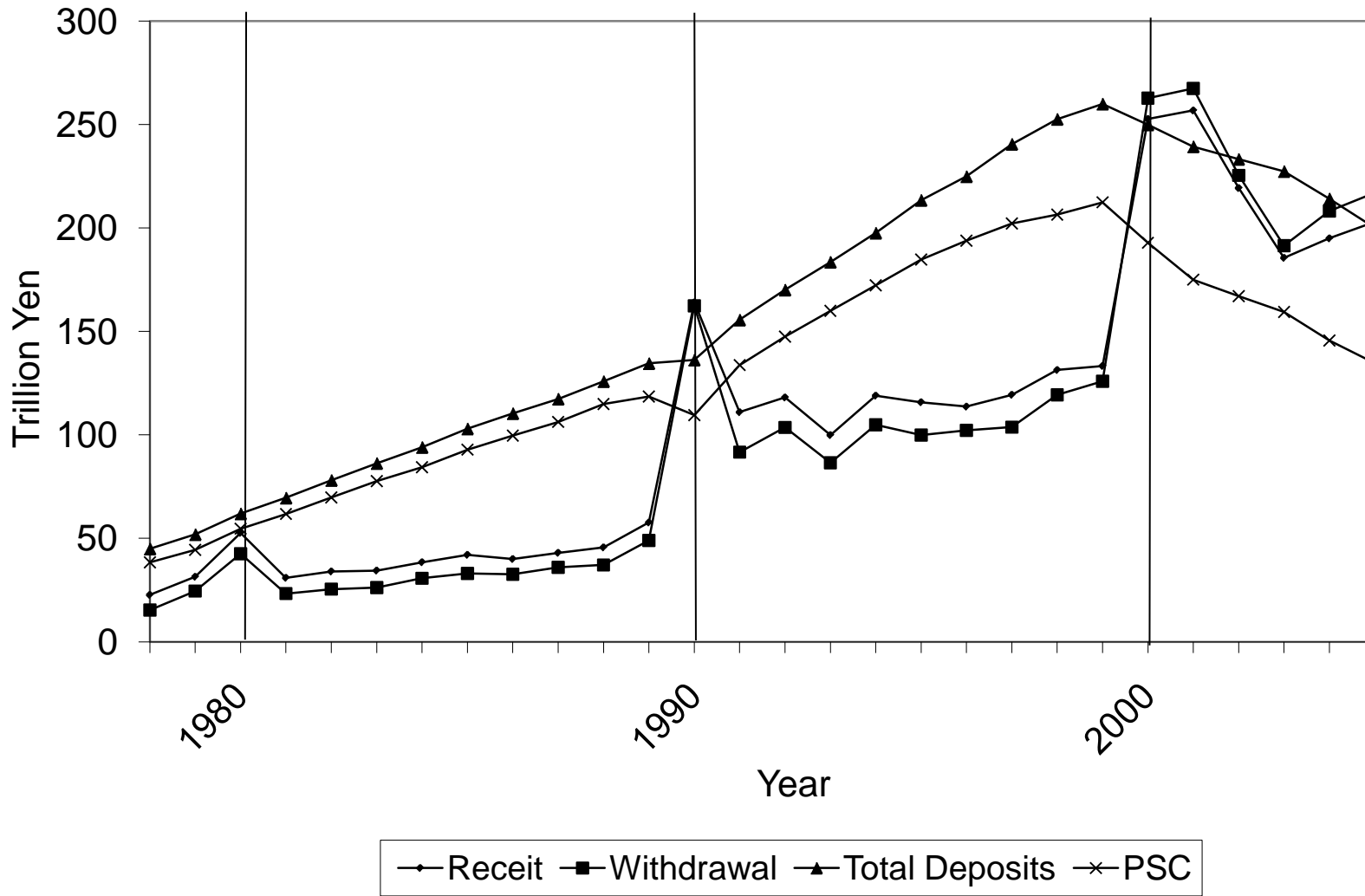
Figure 1: Interest Rates



This figure shows the time series movements of interest rates on Postal Saving Certificates (PSCs) and 10-year Japanese Government Bonds (JGB).

Data Source: Bank of Japan

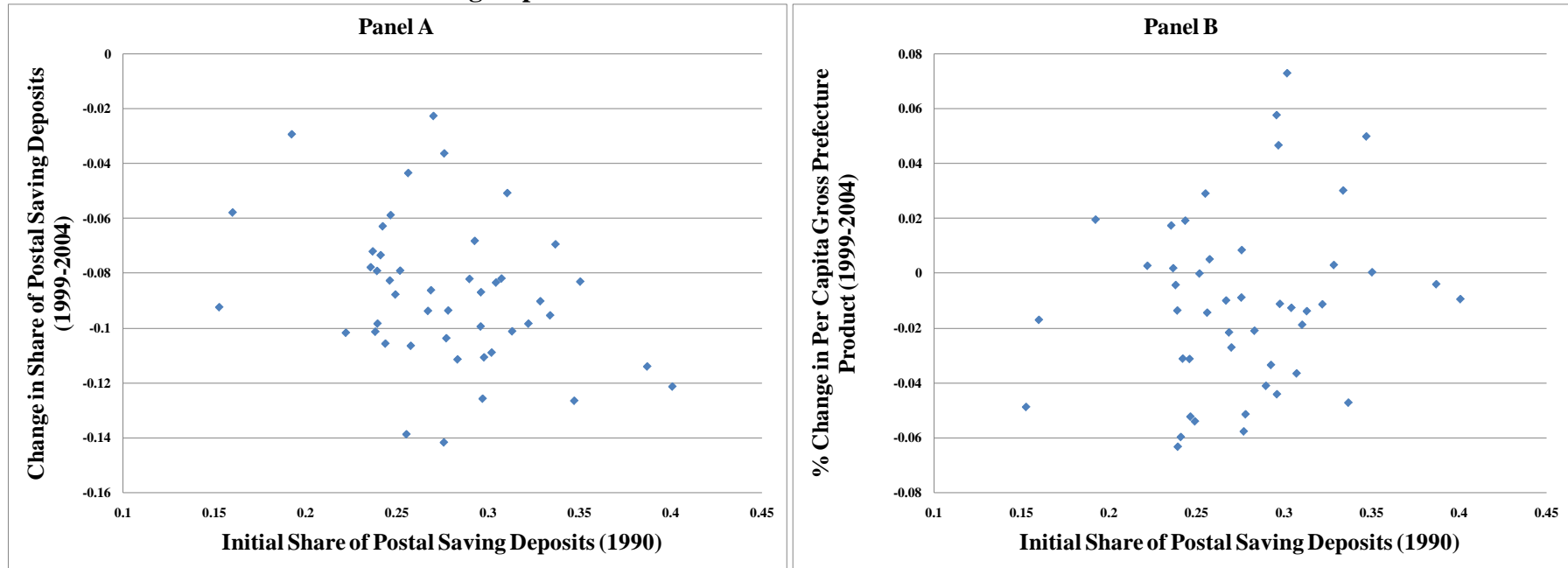
Figure 2: Receipts and Withdrawals of Postal Saving Deposits, and Postal Saving Deposits Outstanding



This figure plots withdrawals and receipts of postal saving deposits during a given year as well as the stock of total postal saving deposits and that of Postal Saving Certificates (PSCs) prevailing at the end of the year; i.e., the difference between receipts and withdrawals equals the change in stock of postal saving deposits.

Data Source: Japan Post

Figure 3: Change in Share of Postal Saving Deposits and % Change in Per Capita Gross Prefecture Product during 1999-2004 in relation to Initial Share of Postal Saving Deposits in 1990



Data Source: Kenmin Keizai Keisan Nenpo (Annual Report on Economics Statistics in Prefecture), Kinyu Keizai Tokei Geppou (Reports on Finance and Economy)

Appendix

Table A1: Data Source and Description

<i>Variable</i>	<i>Definition</i>	<i>Data Source</i>
ln(Prefecture Income)	Log of gross prefecture income per capita	Kenmin Keizai Keisan Nenpo (Annual Report on Economics Statistics in Prefecture)
Share of Postal Saving Deposits	Ratio of postal saving deposits to total deposits	Kinyu Keizai Tokei Geppou (Reports on Finance and Economy)
Dummy for 2000-04	Dummy variable (= 1 if year = 2000-2004)	Author's calculation
Share of Postal Saving Deposits, t-10	Ratio of postal saving deposits to total deposits (lagged 10 years)	Kinyu Keizai Tokei Geppou (Reports on Finance and Economy)
% Change in Commercial Land Price Index	Proportional change in commercial land price index from 1980 to 1990	Japan Statistical Yearbook
Growth in Employment Share in Real Estate/Construction	Ratio of share of employment in real estate and construction sectors in 1990 to that in 1980	Jigyousho Kigyō Toukei Chōsa Houkoku (Enterprise Statistical Survey)
Pop. Density in 1990	Population Density in 1990	Kokusei Chōsa (National Census),
ln(Firms)	Log of number of firms per capita	Jigyousho Kigyō Toukei Chōsa Houkoku (Enterprise Statistical Survey)
ln(Small Firms)	Log of number of small firms per capita (fewer than 30 employees)	Jigyousho Kigyō Toukei Chōsa Houkoku (Enterprise Statistical Survey)
ln(Large Firms)	Log of number of large firms per capita (300 employees or more)	Jigyousho Kigyō Toukei Chōsa Houkoku (Enterprise Statistical Survey)
ln(Total Bank Loans)	Log of total loans per capita	Nikkin Shiryo Nenkan
ln(Local Bank Loans)	Log of loans from local banks (regional banks, credit cooperatives, and credit unions) per capita	Nikkin Shiryo Nenkan
ln(City Bank Loans)	Log of loans from city banks per capita	Nikkin Shiryo Nenkan

Table A2: Summary Statistics

<i>Variable</i>		<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>	<i>Observations</i>
ln(Prefecture Income)	overall	1.270	0.164	0.943	1.984	N = 470
	between		0.164	0.970	1.946	n = 47
	within		0.023	1.184	1.371	T = 10
Share of Postal Saving Deposits	overall	0.371	0.067	0.133	0.548	N = 470
	between		0.061	0.162	0.498	n = 47
	within		0.029	0.288	0.450	T = 10
Dummy for 2000-04	overall	0.500	0.501	0.000	1.000	N = 470
	between		0.000	0.500	0.500	n = 47
	within		0.501	0.000	1.000	T = 10
Share of Postal Saving Deposits, t-10	overall	0.303	0.061	0.080	0.477	N = 470
	between		0.058	0.103	0.427	n = 47
	within		0.020	0.251	0.359	T = 10
% Change in Commercial Land Price Index	overall	3.466	2.781	0.596	12.435	N = 470
	between		2.808	0.596	12.435	n = 47
	within		0.000	3.466	3.466	T = 10
Growth in Employment Share in Real Estate/Construction	overall	0.933	0.068	0.792	1.088	N = 470
	between		0.069	0.792	1.088	n = 47
	within		0.000	0.933	0.933	T = 10
Pop. Density in 1990	overall	0.006	0.011	0.001	0.054	N = 470
	between		0.011	0.001	0.054	n = 47
	within		0.000	0.006	0.006	T = 10
ln(Firms)	overall	-3.008	0.140	-3.476	-2.733	N = 188
	between		0.133	-3.398	-2.795	n = 47
	within		0.046	-3.119	-2.912	T = 4
ln(Small Firms)	overall	-3.053	0.143	-3.533	-2.772	N = 188
	between		0.136	-3.452	-2.835	n = 47
	within		0.047	-3.168	-2.957	T = 4
ln(Large Firms)	overall	-9.785	0.363	-10.629	-8.573	N = 188
	between		0.361	-10.476	-8.618	n = 47
	within		0.063	-10.006	-9.601	T = 4
ln(Total Bank Loans)	overall	3.384	0.344	2.920	5.253	N = 470
	between		0.343	2.951	5.109	n = 47
	within		0.055	3.155	3.542	T = 10

ln(Local Bank Loans)	overall	3.239	0.254	2.358	4.451	N = 470
	between		0.246	2.529	4.161	n = 47
	within		0.073	2.743	3.529	T = 10
ln(City Bank Loans)	overall	0.620	1.293	-1.684	4.657	N = 470
	between		1.295	-1.298	4.606	n = 47
	within		0.161	-0.122	1.611	T = 10

Table A3: Postal Saving Deposits and Private Bank Deposits as Dependent Variables

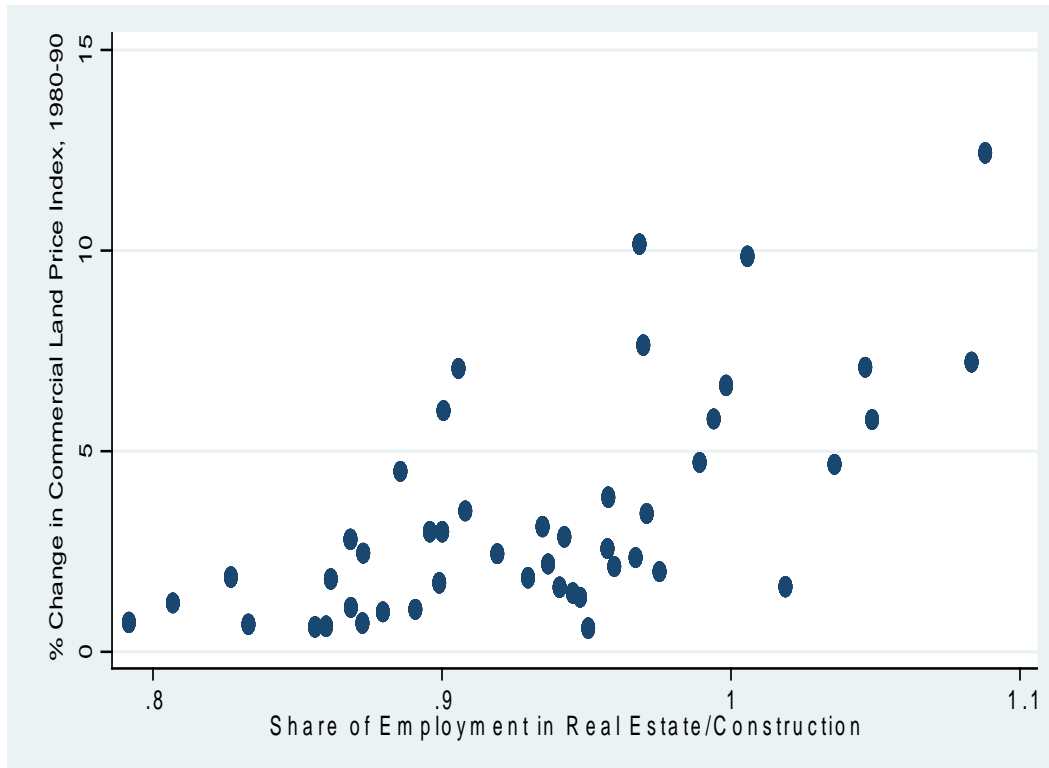
The dependent variables are postal saving deposits-to-total deposits ratio in the first stage and log of private bank deposits (column 1) and log of postal saving deposits (column 2) in the second stage. The data cover Japan's 47 prefectures from 1995 to 2004. The regression equations include fixed prefecture effects and fixed year effects, and are estimated with Two Stage Least Squares (TSLS). Standard errors are in parentheses and robust to heteroskedasticity and serial correlation within each prefecture.

	(1)	(2)
Variables		
(Dummy for 2000-04)*(Share of Postal Saving Deposits, t-10)	-0.125*** (0.0260)	-0.125*** (0.0260)
R-squared	0.864	0.864
First Stage F Statistic	23.25	23.25
	ln(Private Bank Deposits)	ln(Postal Saving Deposits)
Share of Postal Saving Deposits	0.437 (0.379)	-0.157 (0.406)
Observations	470	470

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Figure A1: % Change in Commercial Land Price Index and Growth in Employment Share in Real Estate/Construction



This figure plots proportional change in commercial land price index from 1980 to 1990 (vertical axis) against the ratio of share of employment in real estate and construction sectors in 1990 to that in 1980 (horizontal axis)