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Abstract

This paper uses the industry-level panel data from 1975-2005 and estimates Wurgler's η, the elasticity of industry investment to value-added, for each of Japan's 47 prefectures. We find that Wurgler's η varies considerably across prefectures even though there is no regulatory restriction on inter-regional flow of financial capital. Moreover, exploiting cross-prefecture variation in Wurgler's η, we show that the share of government loans is strongly and negatively correlated with the quality of capital allocation. We also find that this negative correlation is robust to controlling for local economic and financial development, and more pronounced in declining industries than growing industries. Moreover, the share of government loans is positively correlated with investment-to-output ratio but negatively correlated with total factor productivity growth. Taken as a whole, the results are broadly consistent with the view that Japan's government financial institutions stimulate investment in declining industries while distorting capital allocation and reducing overall productivity growth.

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Financial Market essentially involve the allocation of resources. They can be thought of the "brain" of the entire economic system, the central locus of decision-making: if they fail, not only will the sector's profit be lower than they otherwise have been, but the performance of the entire economic system may be impaired. Stiglitz (1993)

1. Introduction

The prevalence of government-owned banks and the pervasiveness of government's direct control over capital allocation are well-documented in many countries. In spite of privatization wave in the last two decades, the average share of total assets in state owned banks still stood at 15 percent in 2011 according to Barth, Caprio, and Levine (2013). In many countries, government ownership remains the overriding feature of their banking systems. Does the government ownership of financial institutions have positive or negative effects on real economic performance? This question has sparked the interest of economists and policy-makers alike since Gerschenkron (1962).

On the one hand, agency problems in financial markets might make government ownership of banks useful; i.e., government-own banks might be able to identify growing industries that are starving for external finance and make loans available to them. In this case, government loans should have positive impact on capital allocation efficiency and enhance economic growth. On the other hand, government banks might base their lending decisions, in part, on political cost-benefit calculations. If borrowers in declining industries are politically powerful and well-connected, they will be able to gain preferential access to capital from government financial institutions, which allow them to keep investing in negative net present

value projects. In this case, government owned banks distort capital allocation and impede economic growth. Recent papers on political economy of government control use detailed microeconomic data on the lending pattern of government banks to uncover political motivations in a variety of countries (Sapienza, 2004, Dinç 2005, Khwaja and Mian, 2005, Cole 2007, Carvalho, 2014, Micco, Panizza, and Yanez, M., 2007, Morck, Yavuz, and Yeung, 2011).

Empirically, the performance of government owned banks is rather mixed. Earlier cross-country studies show that the pervasiveness of government-owned banks is negatively correlated with financial and economic development (e.g., La Porta, Lopez-de-Silanes, and Shleifer, 2002, Barth, Caprio, and Levine, 2001, 2004). Recently, however, Andrianova, Demetriades, and Shortland (2012) challenged the results of La Porta, Lopez-de-Silanes, and Shleifer (2002). They show that (1) the central results in La Porta, Lopez-de-Silanes, and Shleifer (2002) are not robust to the inclusion of institutional factors (e.g., property right protection and bureaucratic quality) and (2) the correlation between the prevalence of government ownership and economic growth turns out to be positive during more recent period. These papers underscore the limitation of cross-country studies in separating the economic impacts of government ownership of banks from other confounding institutional factors. The economic effects of government ownership of banks might be highly nonlinear as well.

This paper investigates the link between the quality of capital allocation and the extent to which local economies use government loans in Japan using prefecture-level data on industry investment and value-added from 1975-2005. Our data offer two advantages and complement the aforementioned cross-country studies. First, the data offer common and high-quality data on capital allocation across industries and the extent to which government banks

direct credit in local economies at prefecture-level. Second, and perhaps more importantly, our within-country approach allows us to keep constant difficult-to-measure factors (e.g., institutional quality and macroeconomic policies) that might have affected cross-country analyses. These settings allow us to examine more precisely the effects of government loans on the efficiency of capital allocation across industries and on overall productivity gains within local economies.

To be more specific, we first follow Wurgler (2000) to measure the extent to which capital is allocated to growing industries away from declining industries. That is, we use industry-level panel data from 1975-2005 for each prefecture to estimate the elasticity of industry investment to value-added, so called Wurgler's η. We find that while Wurgler's *η's* are all positive and statistically significant in every prefecture in Japan (with the exception of the island of Okinawa), they do vary considerably across prefectures. For example, the elasticity of industry investment to value-added is several times as high in Hyogo, Kanagawa, and Hiroshima as in Yamaguchi, Nagasaki, and Hokkaido. These results are analogous to those found in Wurgler (2000), who uncover important heterogeneity in the elasticity of industry investment to value-added vary across countries. Our results, however, might be somewhat more surprising because there is no regulatory restriction on inter-regional flow of financial capital. A growing industry in, say, Yamaguchi, Nagasaki, and Hokkaido, should be able to finance its investment projects by borrowing from national financial market even if local credit supply is scarce.

Second, we link the quality of capital allocation to the scope of government financial institutions' involvement in credit allocation. The results show that local economies which rely

heavily on government loans tend to exhibit lower value of Wurgler's η. Moreover, this negative correlation between government loans and capital allocation efficiency turns out to be stronger in declining industries. Our results are robust to a variety of relevant controls. As in Wurgler (2000), we include the initial level of economic development (the log of output per capita) as well as different measures of financial development (the number of private bank branches per capita, the ratio of private loans to deposits, and the ratio of private loans to output). We find that the ratio of government loans to total loans is the only factor that is robustly correlated with Wurgler's η. Hence, the negative correlation of government loans and Wurgler's η does not seem to be driven by heterogeneity in the level of economic and financial development across prefectures. Taken as a whole, these results are consistent with the view that government financial institutions distort capital allocation and, in particular, lead to overinvestment in declining industries in Japan.

We also address the possibility that government loans might have been targeting those industries that generate positive externalities.[1] If government loans are deployed to correct market failure, then the extent to which government financial institutions control capital allocation should be positively correlated with overall efficiency gain. Nonetheless, we find the exactly opposite pattern of correlation: those local economies that rely on government loans more heavily tend to experience slower Total Factor Productivity (TFP) growth, even though their investment-to-output ratio tend to be higher. It is difficult to conclude from these results that government loans addressed financial market failures, successfully. Rather, the results

[1] Indeed, there is a large body of empirical research suggesting that investment generates positive externalities and that social return on investment is significantly higher than private return (e.g., De Long and Summers, 1991).

suggest that government financial institutions base their lending decision on non-economic factors, which, in turn, lead to efficiency losses from overinvestment in declining industries.

This paper is also related to two strands of literature. First, a large body of literature, dating back to Bagehot (1873), Schumpeter (1912), Gurley and Shaw (1955), and Goldsmith (1969), explores the role of financial development in economic growth. Although financial development seems to have causal impacts on economic growth (Levine, 2006), there remain some questions as to whether the economic benefit of financial development is highly heterogeneous; in addition, we also know less about whether financial development facilitates investment boom or efficiency gain, or both (Demetriades and Hussein, 1996, Rioja and Valev, 2004a, 2004b, Jayaratne and Strahan, 1996, Beck, Levine, and Loayza, 2000, Wurgler, 2000, Rousseau and Wachtel, 2011, Abiad, Oomes, and Ueda, 2008). Our results corroborate the findings of those papers which show that financial reform can promote economic growth primarily via its impact on the quality of capital allocation and TFP growth, rather than the quantity of financial capital and capital deepening.

Second, the Japanese government's extensive involvement in credit allocation (and politics behind it) has been well-documented (Patterson 1994; Cargill and Yoshino 2003; Amyx, Takenaka, and Toyoda 2005; Beason and Patterson 2004; Imai 2009; Beason and Weinstein 1996). Beason and Weinstein (1996) is directly relevant to this paper. Using the time-series, aggregate data on investment and productivity in various sectors in manufacturing industry from 1955-1990, they examine the economic impacts of industrial policy measures. Industrial policy tools that they examine are: tariff protection, tax relief, subsidy, and loans from the Japan Development Bank (JDB). With respect to loans from the JDB, Beason and Weinstein

(1996) show that the JDB favored declining sectors, although the JDB's proclivity to support declining sectors appears much less prominent during 1975-1990, relative to the earlier period (1955-1974). In addition, they find that, while the JDB's loans simulated investment, they failed to boost productivity growth in targeted sectors. Our paper is complementary to Beason and Weinstein (1996) in that it illuminates heterogeneity in capital allocation efficiency across prefectures and links it to the extent to which local economies rely on government loans. The implication of our central results still mirrors that of Beason and Weinstein (1996): government loans worsen the quality of capital allocation and reduce productivity growth in Japan.

The rest of the paper is structured as follows. In Section 2, we briefly review the relevant literature on the performance of government financial institutions in Japan. Sections 3 introduce our data and explore the correlation of government loans to capital allocation efficiency and local economic outcomes. Section 4 concludes.

2. Background on Government Financial Institutions in Japan

During the period we examine in this paper (1975-2005), there were 10 different government financial institutions which directed loans to a variety of borrowers: Government Housing Loan Corporation (Est. 1950), People's Finance Corporation (Est. 1949), Environmental Sanitation Business Finance Corporation (Est. 1967), Japan Finance Corporation for Small Business (Est. 1953), Agriculture, Forestry, and Fishery Finance Corporation (Est. 1953), Japan Finance Corporation for Municipal Enterprises (Est. 1957), Hokkaido-Tohoku Development Finance Public Corporation (Est. 1956), Japan Development Bank (Est. 1951), Okinawa Development Finance Corporation (Est. 1972), and Export-Import Bank (Est. 1950). These

government financial institutions obtained funds from the Fiscal Investment and Loan Program (FILP) which was well-funded by the postal saving and insurance system. The postal saving system was the world's largest financial institution; e.g., in 1999, with over 24,000 post offices nationwide, the postal saving system drew 260 trillion yen. Doi (2005) shows that loans from government financial institutions reached nearly 160 trillion yen (20% of total loans) and that government provided them with the annual subsidy of 800 billion yen in 1999. Naturally, Doi (2005) raises a concern that the government's willingness to subsidize these financial institutions can create soft-budget constraints and lead to inefficient capital allocations.

A few relevant papers examine the performance of government financial institutions in Japan. Seko (1993) notes that government housing loans, which treat the financing of small and new houses preferentially, distort housing consumption decisions over floor space and quality and depress the market for used houses.[2] Horiuchi and Sui (1993) examines whether industrial development loans promoted investment by easing liquidity constraints for firms that faced severe agency problems, which they find to be the case. Beason and Weinstein (1996), however, find that industrial development loans, along with preferential trade barriers and subsidies, did not have any effects on output and technical growth.

More recently, several studies examine the performance of government financial institutions that target small and medium sized enterprises (SMEs). The results are rather mixed. Ogura (2018) shows that Japan Finance Corporation for Small Business increased loans to SMEs that have weak relationship with their main bank during the financial crisis of 2008.

[2] Seko (1993) also emphasize that government housing loans also affect income distribution as the loan policy favors those households with already own land.

Ogura's results suggest that Japan Finance Corporation for Small Business specifically targeted SMEs which lacked access to relationship lending and thus faced severe agency problem.

Similarly, Sekino and Watanabe (2018) show that Japan Finance Corporation for Small Business increased loans to SMEs whose main banks cut back on lending due to binding capital requirements. Like Ogura (2018), their results indicate that government loans were made to address market failures. However, Sekino and Watanabe (2018) show that government loans were correlated, negatively, with firm performance (measured by profitability and investment rate). Hence, while government loans are likely to have mitigated credit crunch for SMEs, these same loans might have also softened budget constraints for the borrowing firms with negative impacts on efficiency. Lastly, Doi and Hoshi (2002) carry out a close examination of the quality of FILP loans and estimate the amount of subsidy to government financial institutions. If government loans are used to fund viable investment projects, then one would expect to see adequate return on these loans. Doi and Hoshi (2002), however, show that 75 percent of all FILP loans are non-performing.

3. Data and Econometric Analyses

3.1. Measuring Capital Allocation Efficiency with Wurgler's η

In order to measure the efficiency of capital allocation, we follow the methodological approach of Wurgler (2000) who uses the annual industry-level data from 1963-1995 for each of the 65 countries to estimate the elasticity of industry investment to value-added, η. Wurgler's η, thus, captures the extent to which capital is allocated to growing industries away from declining

industries.[3] Likewise, we estimate the elasticity of industry investment to value-added for each prefecture using the annual industry-level data from 1975-2005; i.e., prefecture *p*'s Wurgler's elasticity is the coefficient η_p in the following regression equation:

$$\ln\left(\frac{Inv_{ipt}}{Inv_{ipt-1}}\right) = \beta_p + \eta_p \ln\left(\frac{VA_{ipt}}{VA_{ipt-1}}\right) + \varepsilon_{pit} \qquad (1)$$

where *i* represent industry, *t* year, *p* prefecture, *Inv* industry investment, and *VA* industry value-added. Investment data and value-added data are available from 1975-2005 at industry-level for 47 prefectures taken from the Cabinet Office and the Regional-Level Japan Industrial Productivity Database, respectively. The data set covers 10 industries: 1. Agriculture, fishery, and forestry, 2. Mining, 3. Manufacturing, 4. Construction, 5. Utility, 6. Sales, 7. Finance, 8. Real estates, 9. Transportation and communication, and 10. Service.

The estimated elasticity of industry investment to value-added for each prefecture is reported in Table 1 and Figure 1. There are three notable results. First of all, Table 1 shows that they are all positive and statistically significant with the exception of Okinawa where the ratio of the elasticity estimate to standard error is only 1.5. That is, the results indicate overall tendency for industry investment to rise (fall) when industry value-added increases (falls) in

[3] Wurgler (2000) links the elasticity of industry investment to value added to various proxies of financial development in a series of cross-country regressions. He finds that financially developed countries tend to increase investment more in their growing industries and decrease investment more in their declining industries, compared to financially under-developed countries. His results suggest that, in a country without well-functioning financial system, a growing industry faces financing constraints and is unable to fully exploit its large investment opportunity, whereas a declining industry might be well-connected and enjoys preferential access to capital.

each of Japan's prefectures. Nonetheless, as shown in both Table 1 and Figure 1, the estimates vary noticeably across prefectures as it ranges from .227 (Okinawa) to 1.035 (Hyogo), suggesting that the degree to which more capital is allocated into growing industries away from declining industries is highly heterogeneous within Japan. These results might be surprising for two reasons. First, Wurgler's η might vary across countries if value-added growth is measured with significant error in some countries, thereby producing attenuation bias in econometric estimations of η. Our prefecture-level data come from the common source that follow the same accounting convention. There might be some measurement error and attenuation bias in the estimate of η, but one will be hard-pressed to argue that the size of attenuation bias varies significantly across prefecture.

Second, there is no regulatory or legal barrier to inter-prefectural flow of financial capital within Japan and that all 47 prefectures share the same legal (and similar cultural) institutions that could affect the performance of local capital markets. The exception might be the island of Okinawa is approximately 1000 kilometers away from the mainland Japan, roughly the same distance to Seoul from Tokyo (or to Shanghai from Tokyo). Hence, Okinawa is indeed geographically isolated and might not be as integrated as the rest of Japan, financially, which might explain its low η. Nonetheless, heterogeneity in elasticity estimates is evident even if we disregard Okinawa; Wurgler's η is several times as high in Hyogo, Kanagawa, and Hiroshima as in Yamaguchi, Nagasaki, and Hokkaido.

3.2. Government Loans and Wurgler's η

The central question of this paper is whether Wurgler's η, a proxy for efficiency of capital allocation, is associated with the extent to which government financial institutions direct loans to the preferred borrowers or industries. On the one hand, if government loans are directed to growing industries that are starving for external finance, then government loans should have positive correlation with Wurgler's η. On the other hand, if government loans are directed to borrowers who do not have viable investment projects and yet are politically influential and well-connected, then we expect government loans to be negatively associated with Wurgler's η.

We put together the data on the share of government loans in total loans (private loans plus government loans) in each prefecture from 1975-2005 from the Bank of Japan. We calculate the average value for each prefecture during this time period ($\overline{GL_p}$).[4] Figure 2 shows the geographical distribution of the share of government loans. We drop Okinawa for our econometric analyses, given that Okinawa is unique in two dimensions. As described earlier, Okinawa might be financially isolated due to its geographical distance from the mainland. Moreover, Okinawa's economy relies heavily on a government financial institution, called Okinawa Development Finance Corporation, which does not operate in any other prefectures. Hence, we suspect a priori that even though Okinawa's η is low and its reliance on government

[4] Even when we remove government housing loans from government loans and re-estimate all regressions, the results are qualitatively similar as the share of government loans without housing and that with housing is tightly correlated (the correlation coefficient is .91). We keep government housing loans in all regressions because there are not any comparable prefecture-level data on private housing loans, which should be subtracted from total loans when calculating the share of government loans if we are to remove government housing loans.

loans is high, these two phenomena might not be causally related.[5] The scatter plot of the share of government loans ($\overline{GL_p}$) against our estimate of Wurgler's η is displayed in Figure 3. There are some outliers (e.g., Hyogo and Yamaguchi), but it shows a strong negative relationship.[6]

In order to test econometrically whether Wurgler's η is associated with government loans, we formulate the following random coefficient model.

$$\ln\left(\frac{Inv_{ipt}}{Inv_{ipt-1}}\right) = \beta_p + (\alpha_0 + \alpha_1\overline{GL_p} + u_p)\ln\left(\frac{VA_{ipt}}{VA_{ipt-1}}\right) + \varepsilon_{pit} \qquad (2)$$

where Wurgler's η for prefecture p is allowed to vary deterministically with the average share of government loans, $\overline{GL_p}$, and randomly with u_p. α_1 is the key parameter, capturing the relationship between government loans and the quality of capital allocation. If the quality of capital allocation is lower in prefectures with more government loans, then α_1 is negative. One can estimate equation (2) with the Maximum Likelihood Methods (MLE), assuming that u_p and ε_{pit} are jointly normally distributed, or more simply with the Ordinary Least Squares (OLS) without normality assumption. We confirm that the MLE and the OLS yield nearly identical results and only report the OLS results to conserve space.[7] Standard errors are clustered by prefecture.[8]

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[5] The results with Okinawa are stronger in general but not reported to conserve space. The results are available upon request.

[6] The bivariate regression of our estimate of Wurgler's η on the share of government loans yields the slope coefficient of -1.3 with the robust standard error of .36.

[7] The MLE results are available upon request.

[8] We also cluster standard errors by year as well as by prefecture to account for contemporaneous correlation within each year across prefectures. This two-way clustering yields similar results, and thus they are not reported to conserve space. The results are

Table 2 reports the regression results. Column 1 show the results only with prefecture fixed effects. The coefficient on the interaction of the share of government loans to value-added growth is negative and statistically significant. The point estimate, -1.4, is also quantitatively important. The share of government loans ranges from .1 (e.g., Tokyo and Kyoto) to .3 (e.g., Miyazaki and Shimane), approximately. So, the results indicate that if the share of government loans is to increase in Tokyo and Kyoto from .1 to .3, then the elasticity of investment to value-added will fall by almost 30 percentage point. Column 2 adds year fixed effects to control for aggregate shocks common to all prefectures. The results are broadly similar. Columns 3 also control for industry-year interaction effects to probe whether the results are driven by cross-prefecture heterogeneity in industry composition and unmeasured industry shocks. The coefficient on the interaction of the share of government loans to value-added growth remains statistically significant. The specification with industry-year interaction effects, however, yields a quantitatively smaller coefficient estimate. To be prudent, we include industry-year interaction effects in our preferred speficifications.

We also consider other possible correlates of the elasticity of industry investment to value added. In particular, Wurgler (2000) finds that the initial level of output per capita and various measures of financial development are positively correlated with the elasticity estimate. Hence, the low elasticity of industry investment to value-added might be a prominent feature of economically backward prefectures, which, in turn, might have motivated the government to direct more loans to these prefectures to facilitate economic development. To

available upon request. See Bertrand et al. (2004), and Cameron and Miller (2015) for extensive discussion of multi-way clustering.

explore this possibility, we include the interaction of log of initial output per capita in 1975 to value-added growth as well as the interaction of three different measures of financial development (the number of banks per capita, the ratio of private loans to output, and the ratio of private loans to private deposits) with value-added growth.[9] The results are displayed in Columns 4-10 of Table 2. The coefficient on the interaction of the share of government loans with value-added growth remains quantitatively unchanged and statistically robust, whereas none of these additional control variables is statistically significant. Hence, the negative correlation between government loans and the elasticity of investment to value-added does not seem to be driven by heterogeneity in the level of economic and financial development across prefectures.[10]

3.3. Overinvestment vs. Underinvestment

[9] We calculate the within-prefecture average of these proxies for financial development.

[10] Additionally, instead of using the average share of government loans for each prefecture ($\overline{GL_p}$), we use the share of government loans (GL_{pt}), which varies over time within each prefecture, and treating u_p as a set of prefecture specific slope parameters. However, in this specification, estimates of α_1 turned out to be small in magnitude and statistically insignificant. Our main concern in this specification is that a large part of year-by-year fluctuation represents noise and might not adequately capture economically meaningful change in the extent of government intervention in capital allocation process. In order to improve the signal-to-noise ratio, we also use the averaged data over 5-year interval (1975-1980, 1981-1985, 1986-1990, 1991-1995, 1996-2000, 2001-2005), 10-year interval (1975-1985, 1986-1995, 1996-2005), and also 15-year intervals (1975-1990, 1991-2005). Nonetheless, the results turn out to be similarly insignificant. The problem is that within-prefecture variation in GL_{pt} is quite limited in the averaged data as well; e.g., there was no dramatic change in the geographical allocation of government loans in the 1990s, relative to the earlier period. Insufficient within-prefecture variation is likely to yield unreliable estimates of α_1. The results of these specifications with prefecture-specific slope parameters are not reported to conserve space but available upon request.

The above results suggest that local economies whose credit demand is largely satisfied by government financial institutions is characterized by underinvestment in growing industries or overinvestment in declining industries or both, but it is not clear which one. We explore this question next. As done in Wurgler (2000), we first re-estimate the elasticity of industry investment to value-added for each prefecture, using just the observations in which industry value added was growing. We also re-estimate the elasticity of industry investment to value added for each prefecture, using just the observations in which industry value added was declining. In Figure 4, we plot these two elasticities against each other. Two patterns are notable. First, while η's that are estimated using just growing industries ($dV > 0$) are mostly positive (except for Yamaguchi), there are 7 prefectures whose η's are negative for declining industries ($dV < 0$). The elasticity of industry investment to value-added for declining industries is much more heterogeneous across prefectures than for growing industries. Second, these two estimates of Wurgler's η are not strongly correlated.[11] In sum, capital allocation amongst growing industries might be reasonably efficient in many prefectures, while at the same time these same prefectures might still see increase investment in some of their declining industries.

These phenomena might be surprising from the perspective of value-maximizing creditors who should have strong incentives to fund positive net present value projects and not fund negative net present value projects. However, it might be the case that private loans fund growing sectors based mostly on economic considerations, while government loans might continue to fund some declining sectors based on non-economic considerations. If that is the case, the negative effects of government loans on Wurgler's η should be larger among declining

[11] The correlation coefficient between them is .15 and not significant.

industries than growing industries. We test this hypothesis by allowing investment growth and Wurgler's η to differ in declining industries as follows:

$$\ln\left(\frac{Inv_{ipt}}{Inv_{ipt-1}}\right) = \beta_p + \beta_1 Decline_{ipt} + (\alpha_0 + \alpha_1\overline{GL_p} + \alpha_2 Decline_{ipt} + \alpha_3(Decline_{ipt})(\overline{GL_p}) + u_p)\ln\left(\frac{VA_{ipt}}{VA_{ipt-1}}\right) + \varepsilon_{pit}$$

where $Decline_{ipt}$ is a dummy variable for declining industries (i.e., dVA < 0).

Table 3 reports the results. Column 1 reproduces the benchmark results from Column 3 of Table 2. Column 2 adds a dummy variable for declining industries. It reports a positive coefficient, which suggests that, on average, declining industries tend to invest more than predicted on the basis of value-added growth. Column 3 adds the interaction of this dummy variable with value-added growth and shows a negative coefficient on this interaction term. The results suggest that, on average, the elasticity of investment to value-added is somewhat smaller in declining industries. Column 4 adds the triple interaction term, the interaction of this dummy variable, the share of government loans, and value-added growth. The coefficient on this interaction term is negative and quantitatively large, suggesting that low elasticity of investment to value-added in declining industries is much more evident in prefectures with greater share of government loans. Moreover, when this triple interaction term is included, the coefficient on the interaction of the share of government loans to value-added growth is much smaller and statistically insignificant. In sum, local economies' reliance on government financial institutions does not seem to reduce their proclivity to increase investment in growing

industries. Rather, government financial institutions seem to reduce the extent to which declining industries refrain from investment.

3.4. Political Rent-Seeking Mechanism

The above results are consistent with the hypothesis that government financial institutions distort capital allocation in Japan. The results are robust even when we control for proxies of local economic and financial development. Hence, the negative correlation between government loans and Wurgler's η does not appear to be driven by heterogeneity in the level of economic and financial development across prefectures. A concern about endogeneity problem still remains, however. Are government financial institutions more active in prefectures where local financial system is functioning poorly to begin with? If so, the observed negative correlation between Wurgler's η and the share of government loans is simply capturing the government's objective to address financial market failure. Alternatively, is the provision of government loans motivated, in part, by politics? If so, the results might be capturing a glimpse of causal relation, suggesting that government loans end up financing investment projects that are politically appealing but economically unviable, thereby lowering the overall quality of capital allocation. In this subsection, we attempt to deal with this endogeneity problem while shedding some light on possible political rent-seeking mechanism in the provision of government loans.

The literature on targeted political favors emphasizes two mechanisms: patronage, which rewards core supporters, and strategic redistribution, which is used to win swing voters (e.g., Cox and McCubbins 1986, Dixit and Londregan 1995, 1996). In Japan, the Liberal

Democratic Party (LDP) is the dominant political party which consistently held majority in the Diet during this time period.[12] Anecdotally, the LDP is widely known to have used its position to implement policies favorable to their core supporters such as trade barriers to protect agricultural sectors and distortionary tax systems that strongly favor small businesses.[13] Some econometric evidence also shows that the LDP strategically direct subsidies to swing voters as well. For example, Hirano (2011) finds that central government transfers are larger in the municipalities where incumbent LDP politicians were elected by smaller margin. Similarly, Imai (2009) finds that prefectures that are populated by electorally vulnerable LDP politicians tend to receive more government loans. We first explore to what extent the geographical allocation of government loans during 1975-2005 is related to patronage and strategic redistribution in Japan. We then examine whether Wurgler's η is correlated with the degree to which the share of government loans is attributable to political factors via instrumental variable methods.

We capture patronage and strategic redistribution by calculating the average vote share of the LDP and the average margin of electoral victory for the LDP incumbents, respectively, in the Lower House elections from 1975-2005 for each prefecture. [14] We then regress the average

[12] The only exception is 1993 when some of the party leaders departed the LDP, and a coalition of smaller parties seized the majority. This coalition government consisted of eight parties that excluded the LDP and the Japan Communist Party (JDP); as a result, it had frequent internal conflicts. The coalition government lasted only for 11 months as the LDP regained the control of the government by forming a coalition government with the Japan Socialist Party and the New Party Sakigake in 1994.

[13] See Ramseyer and Rosenbluth (1993) and Lincoln (2001).

[14] Japan's parliament consists of the lower House of Representatives and the upper House of Councillors. The House of Representatives is much more influential than the House of Councillors. The former can override vetoes on the latter's bills with a two-thirds majority. The House of Representatives also elects the prime minister, passes the budget, and ratifies international treaties.

share of government loans on these two political variables. The results show that the share of government loans is positively correlated with the vote share of the LDP but negatively correlated the margin of victory (Table 4, Columns 1 and 2). Thus, political incentives to favor core supporters and swing voters seem at play in the geographical allocation of government loans.

Nonetheless, the exact causal direction here is unclear since economic conditions, election results, and rent-seeking activities might be closely intertwined with one another. For example, the LDP might opportunistically direct more government loans to prefectures that have economic difficulties in order to win more political support. The LDP incumbents might perform poorly in elections when local economies are troubled as well. To address this issue, we also collect the data on the 33rd Lower House election, which was held on December 10th, 1972, three years before the beginning of the sample period. We calculate the LDP's vote share in this election and use it as our instrumental variable. Since electoral support for the LDP in 1972 would not be driven by future economic problems, this measure is arguably a better instrument. The regression of the share of government loans during 1975-2005 on the LDP vote share in the 1972 election yields a positive and statistically significant coefficient, although it is smaller in magnitude (Column 3, Table 4).

Using the interaction of the LDP vote share in the 1975 election with value-added growth as an instrumental variable for the interaction between the share of government loans and value-added growth, we reproduce the results of Table 2 in Table 5. Column 1 controls only for prefecture fixed effects and industry-year interaction effects just like column 3 of Table 2. The coefficient on the key interaction term remains negative and statistically significant,

although its standard error is substantially larger, compared to that reported in column 3 of Table 2. Columns 2-5 add the same set of control variables that are included in columns 4-10 of Table 2. The results are largely robust to these control variables. We also calculate the average share of government expenditure in total output, interact it with value-added growth, and use it as an additional control variable. Our concern here is that the political support for the LDP might be related to the inefficiency of capital allocation via politicized fiscal spending. The results show that the interaction of the share of government loans with value-added growth still has a negative coefficient (Columns 6-9).

Taken as a whole, these results are largely consistent with the view that patronage might be lurking behind the provision of government loans in Japan and that the negative association between government loans and capital allocation efficiency might be causal. Yet, these instrumental variable results must be interpreted with cautiousness. The level of statistical significance declines substantially in columns 8 and 9. These two specifications also show low first stage F-statistics, which makes it difficult to quantitatively evaluate the effects of government loans on capital allocation efficiency (Andrews, Stock, Sun, 2018). Moreover, government loans and fiscal spending are not the only policy instrument that the LDP uses to reward its supporters. Even though we control for fiscal spending, which the LDP could use to reward its core supporter, our instrument might still contain relevant information about other distortive policies that affect capital allocation and yet are difficult to measure.

3.5. Structural Break

The Japanese economy stagnated persistently in the 1990s, which is commonly known as the "Lost Decade". The rate of per-capita GDP growth was merely 0.5% during this period. Weak aggregate demand and banking problems are considered as a contributing factor (e.g., Bernanke, 2000, Kuttner and Posen, 2001), but the slowing of Japan's economic growth is also attributed to sluggish technological progress (e.g., Hayashi and Prescott 2002). Some papers find that productivity slowdown in the 1990s was caused in part by misallocation due to large, persistent presence of inefficient, "zombie" firms (e.g., Caballero, Hoshi, and Kashyap 2008).

We assess whether there was any structural break by splitting the sample period in 1990. Recent papers also show that government banks might play a positive role during economic downturns by smoothing credit cycle with the provision of additional loans (e.g., Bertay, Demirgüç-Kunt, and Huizinga, 2015; Brei and Schclarek, 2013; Cull and Martinez Peria, 2013; Micco and Panizza, 2006; Ogura, 2018; Sekino and Watanabe, 2018). If government loans were directed to viable industries that were starving for external finance during the Lost Decade, then capital allocation efficiency might be positively associated with government loans after 1990. Our split sample results are displayed in Table 6. The coefficient on the interaction of the share of government loans to value-added growth it is largely insignificant, perhaps because sample size declines in half in these split sample specifications. However, the point estimates from both sample periods do not differ substantially from those reported in Table 2; thus, there appear to be little evidence of structural break in terms of statistical association between Wurgler's η and the share of government loans in 1990.

3.6. Total Factor Productivity Growth and Investment-Output Ratio

Thus far, the results show that local economies in which government financial institutions play a larger role in directing loans to favored borrowers tend to have lower Wurgler's η. A natural interpretation is that government loans favor declining industries, which, in turn, continue investing in negative net present value projects (i.e., type of projects that private lenders would not be willing to finance). In this case, we should observe that those local economies with a larger presence of government financial institutions is characterized by more investment but less efficiency gain. That is, while the share of government loans should be positively correlated with investment-to-output ratio, it should be negatively correlated with overall efficiency gain.

Alternatively, government loans might have been targeting those industries whose investment generate positive externalities. If government financial institutions successfully use their credit policies to correct financial market failure and externalities are locally confined to some extent, then those prefectures that rely heavily on government loans should exhibit more efficiency gains as well as more investment in the long run. In order to assess these two competing interpretations, we examine a possible statistical linkages between the average share of government loans and Total Factor Productivity (TFP) growth and also investment-to-output ratio during 1975-2005.[15] The data on TFP growth are obtained from the Regional-Level Japan Industrial Productivity Database.

[15] This econometric exercise is also useful in assessing the severity of possible endogeneity problem. If government financial institutions set up more loans in more economically troubled prefectures, then one would expect the share of government loans to be negatively associated with both investment-to-output ratio and TFP growth.

The results are displayed in Tables 7. Here, we find that the coefficient on the share of government loans is positive for investment-to-output ratio, while it is negative for TFP growth. The results are robust when we control for proxies for economic and financial development. Hence, local economies that rely on government loans more heavily tend to experience slower Total Factor Productivity (TFP) growth, even though their investment-to-output ratio tend to be higher. While one might conjecture that government financial institutions corrected some market failures, it is difficult to conclude from these results that they were able to generate efficiency gains in aggregate. On the contrary, taken as a whole, the results are consistent with the view that political considerations guided Japan's government financial institutions' lending decisions, which, in turn, led to aggregate efficiency losses from overinvestment in declining industries.

4. Conclusions

We find that local economies that are given preferential access to government loans tend to exhibit low elasticity of industry investment to value-added; that is, these local economies tend to invest less in growing industries and more in declining industries, compared to other similar local economies that do not receive as many government loans. Moreover, this negative correlation between government loans and elasticity of industry investment to value added is driven largely by declining industries. We find that those local economies with a large presence of government financial institutions also show low total factor productivity growth but high investment-to-output ratio. On aggregate, these results indicate that Japan's government financial institutions base their lending policies on non-economic factors and that

they have helped declining industries at the expense of capital allocation efficiency and technical progress. The results also have an important policy implication: Japan might be able to attain higher productivity if government financial institutions scale down its control over credit allocation.

There are two natural extensions of this article. First, the results found in this paper are largely correlational, even though, when taken as a whole, they are generally consistent with the view that government financial institutions base their lending decisions, in part, on politics, thereby distorting the allocation of capital in Japan. Future works that establish causality more firmly would greatly add to this literature. Second, to measure the quality of capital allocation in each prefecture, we use the panel data on investment and value-added in 10 broadly defined industries. The advantage of this data set is that every firm is included in the data, an important feature since government financial institutions in Japan give loans rather broadly to a diverse set of firms. Yet, we are not able to discern whether government financial institutions allocate capital efficiently across firms within each industry. Clearly, opening up this black box with disaggregated, firm-level data is of interest. In particular, future, complementary works should attempt to quantify the degree to which government loans are used to finance viable investment projects using firm-level data.

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Figure 1: Geographical Distribution of Elasticity of Industry Investment to Value Added (Wurgler's η)

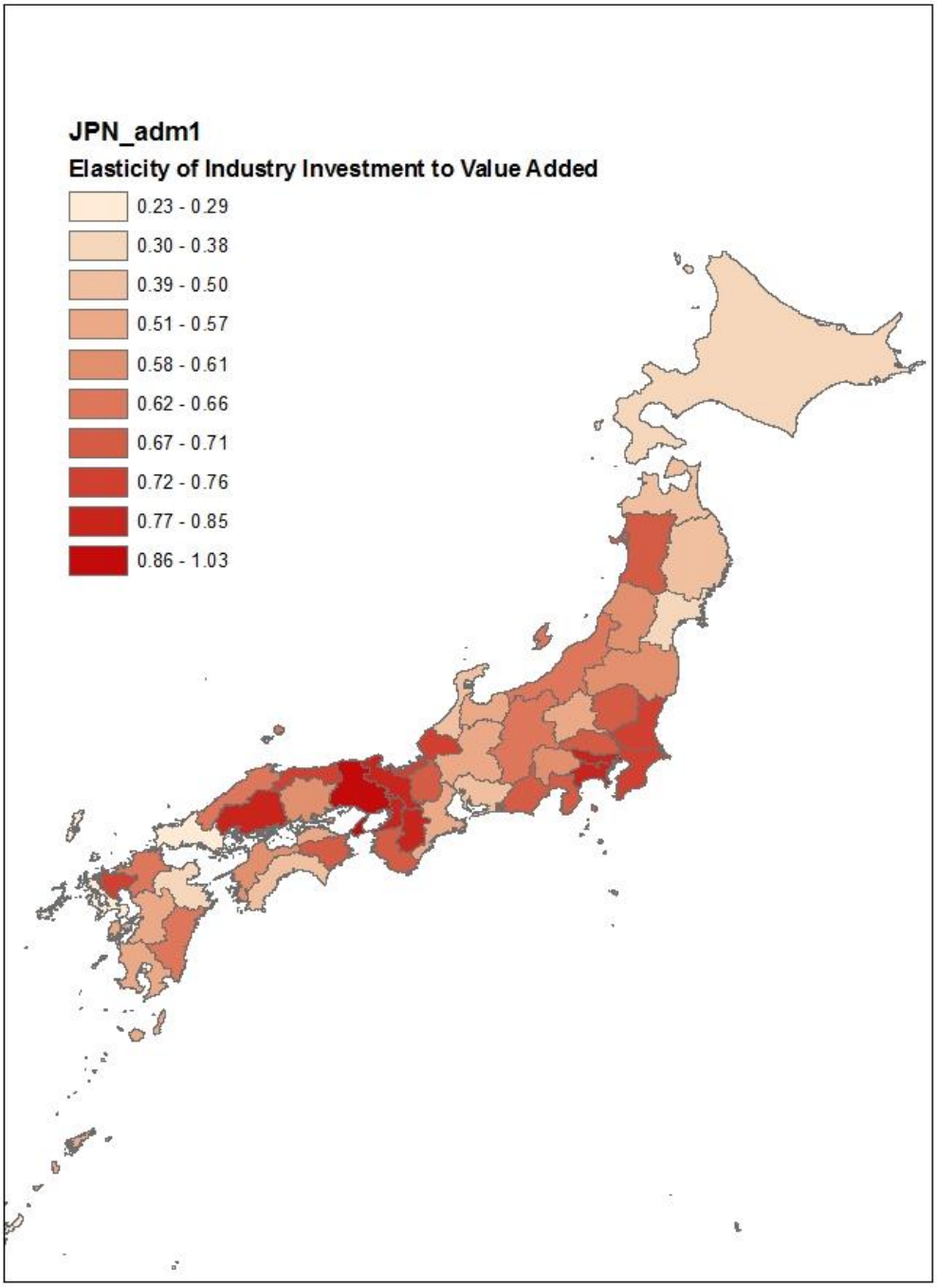

Figure 2: Geographical Distribution of Share of Government Loans ($\overline{GL_p}$)

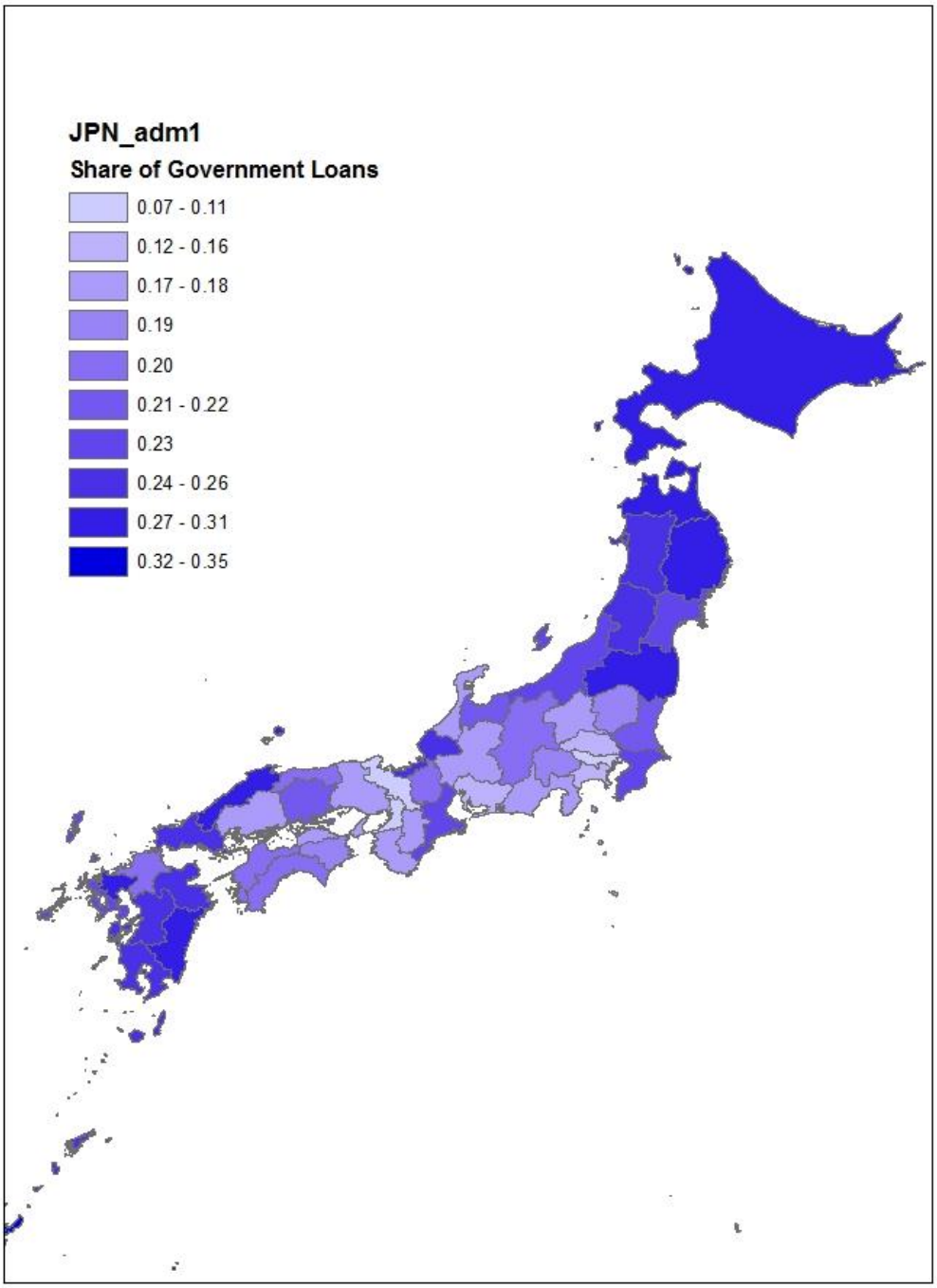

Figure 3: Elasticity of Industry Investment to Value Added (Wurgler's η) and Share of Government Loans ($\overline{GL_p}$)

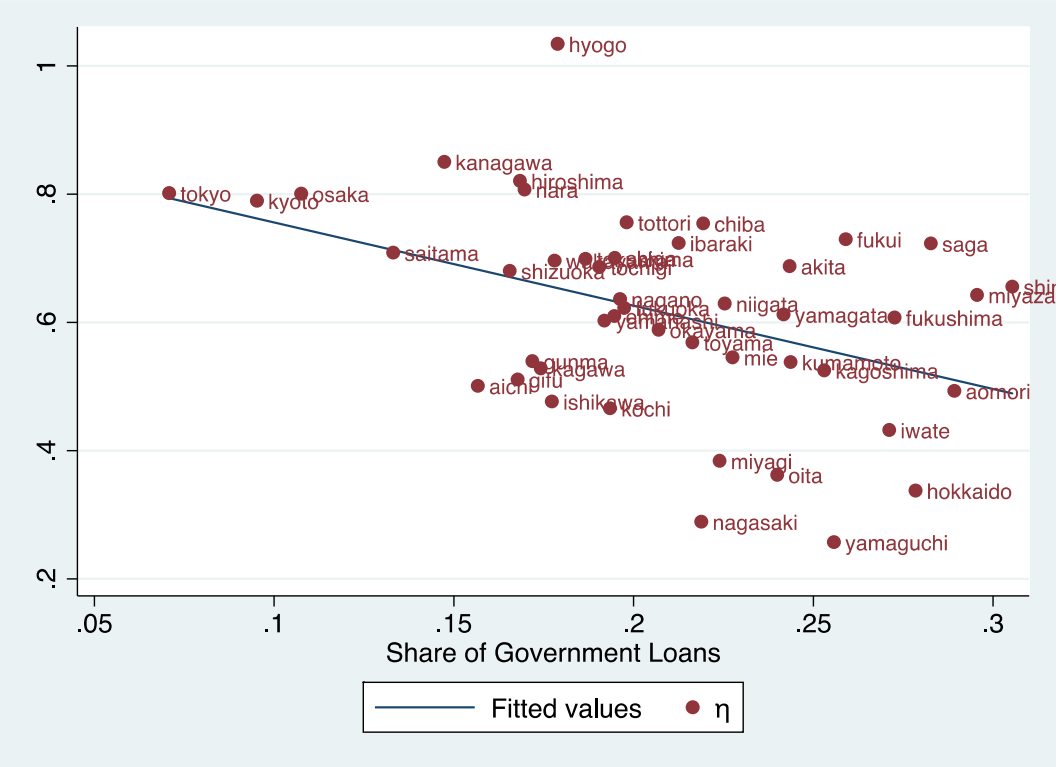

Figure 4: Elasticity of Industry Investment to Value Added (Wurgler's *η*) for Growing Industries (dV > 0) and Declining Industries (dV < 0)

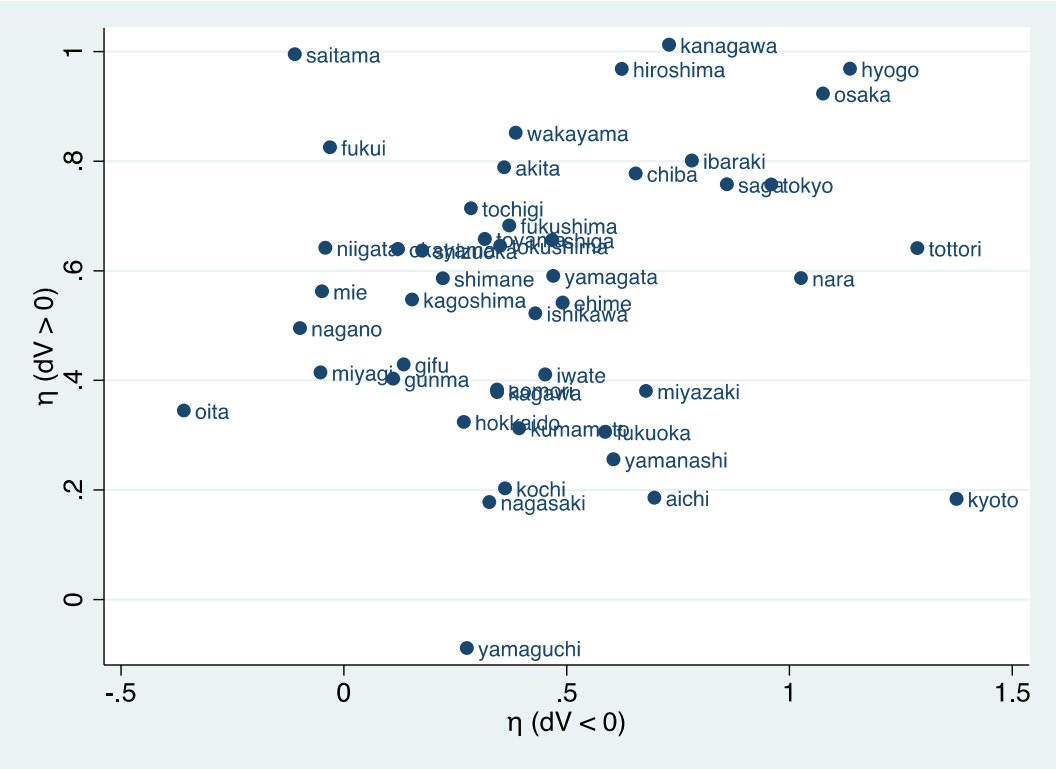

Table 1: Wurgler's η for Prefectures in Japan

Wurgler's η, the elasticity of industry investment to value added, is estimated based on the following regression

$$\ln\left(\frac{I_{ipt}}{I_{ipt-1}}\right) = \alpha_p + \eta_p \ln\left(\frac{V_{ipt}}{V_{ipt-1}}\right) + \varepsilon_{pit}$$

where i represent industry, t year, p prefecture, I industry investment, and V industry value-added.

Investment and value-added data are from 1975-2005 at industry-level for 47 prefectures (Cabinet Office of Japan).

The data set covers 10 industries: 1. Agriculture, fishery, and forestry, 2. Mining, 3. Manufacturing, 4. Construction, 5. Utility 6. Sales, 7. Finance, 8. Real estates, 9. Transportation and communication, and 10. Service.

prefecture	η	se	R-sq	rank of η
hokkaido	0.338	0.144	0.018	44
aomori	0.493	0.182	0.023	38
iwate	0.432	0.136	0.032	41
miyagi	0.384	0.140	0.024	42
akita	0.688	0.148	0.065	17
yamagata	0.613	0.160	0.046	25
fukushima	0.608	0.140	0.058	27
ibaraki	0.724	0.126	0.096	11
tochigi	0.687	0.175	0.048	18
gunma	0.540	0.143	0.044	32
saitama	0.709	0.155	0.063	13
chiba	0.754	0.113	0.126	9
tokyo	0.802	0.174	0.065	5
kanagawa	0.851	0.194	0.059	2
niigata	0.630	0.137	0.064	23
toyama	0.569	0.161	0.039	30
ishikawa	0.477	0.155	0.030	39
fukui	0.730	0.147	0.074	10
yamanashi	0.603	0.194	0.030	28
nagano	0.637	0.152	0.054	22
gifu	0.511	0.188	0.023	36
shizuoka	0.681	0.163	0.054	19

aichi	0.501	0.184	0.023	37
mie	0.546	0.135	0.051	31
shiga	0.701	0.192	0.042	14
kyoto	0.790	0.198	0.049	7
osaka	0.801	0.255	0.031	6
hyogo	1.035	0.119	0.198	1
nara	0.807	0.191	0.055	4
wakayama	0.697	0.096	0.146	16
tottori	0.756	0.159	0.069	8
shimane	0.656	0.144	0.063	20
okayama	0.589	0.143	0.052	29
hiroshima	0.821	0.154	0.084	3
yamaguchi	0.258	0.126	0.013	46
tokushima	0.699	0.139	0.075	15
kagawa	0.529	0.152	0.038	34
ehime	0.610	0.142	0.056	26
kochi	0.466	0.180	0.021	40
fukuoka	0.623	0.163	0.045	24
saga	0.723	0.150	0.071	12
nagasaki	0.289	0.133	0.015	45
kumamoto	0.538	0.130	0.052	33
oita	0.362	0.185	0.012	43
miyazaki	0.643	0.146	0.059	21
kagoshima	0.525	0.142	0.042	35
okinawa	0.227	0.153	0.007	47

Table 2: Impact of Government Loans on Capital Allocation Efficiency, Wurgler's η

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Value-Added Growth	0.922***	0.746***	0.983***	1.079***	0.976***	0.973***	0.994***	1.070***	1.053***	1.074***
	(0.0726)	(0.0814)	(0.0728)	(0.159)	(0.103)	(0.146)	(0.127)	(0.168)	(0.180)	(0.166)
(Share of Government Loans)*(Value-Added Growth)	-1.426***	-1.212***	-0.789*	-0.984*	-0.798*	-0.764	-0.805*	-1.004*	-0.916	-0.977*
	(0.358)	(0.389)	(0.398)	(0.541)	(0.396)	(0.536)	(0.441)	(0.544)	(0.602)	(0.546)
ln(Output per capita)*(Value-Added Growth)				-0.107				-0.109	-0.112	-0.108
				(0.137)				(0.138)	(0.142)	(0.143)
(# of Bank Branches per-capita)*(Value-Added Growth)					68.07			116.1		
					(534.4)			(546.3)		
(Loan-to-Output Ratio)*(Value-Added Growth)						0.00545			0.0163	
						(0.0491)			(0.0522)	
(Loan-to-Deposit Ratio)*(Value-Added Growth)							-0.0130			0.00732
							(0.0964)			(0.106)
Observations	14,260	14,260	14,260	14,260	14,260	14,260	14,260	14,260	14,260	14,260
R-squared	0.052	0.134	0.482	0.482	0.482	0.482	0.482	0.482	0.482	0.482
Number of prefectures	46	46	46	46	46	46	46	46	46	46
Prefecture Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effects	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry-Year Fixed Effects	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES

Standard errors in parentheses are clustered by prefecture

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

Table 3: Growing Industries vs. Declining Industries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Value-Added Growth	0.983***	1.015***	1.063***	0.919***	1.014***	0.992***	1.002***
	(0.0728)	(0.0751)	(0.0725)	(0.0811)	(0.165)	(0.171)	(0.159)
(Share of Government Loans)*(Value-Added Growth)	-0.789*	-0.763*	-0.733*	-0.00355	-0.251	-0.136	-0.191
	(0.398)	(0.404)	(0.404)	(0.494)	(0.619)	(0.623)	(0.605)
Declining Industry		1.125*	0.972	0.986	1.017*	1.019*	1.022*
		(0.587)	(0.589)	(0.593)	(0.582)	(0.581)	(0.579)
(Declining Industry)*(Value-Added Growth)			-0.151**	0.238	0.233	0.237	0.235
			(0.0715)	(0.203)	(0.203)	(0.201)	(0.203)
(Declining Industry)*(Share of Government Loans)*(Value-Added Growth)				-1.928**	-1.903*	-1.919**	-1.909**
				(0.949)	(0.947)	(0.936)	(0.944)
ln(Output per capita)*(Value-Added Growth)					-0.120	-0.122	-0.121
					(0.134)	(0.138)	(0.138)
(# of Bank Branches per-capita)*(Value-Added Growth)					147.3		
					(536.0)		
(Loan-to-Output Ratio)*(Value-Added Growth)						0.0198	
						(0.0495)	
(Loan-to-Deposit Ratio)*(Value-Added Growth)							0.0321
							(0.104)
Observations	14,260	14,260	14,260	14,260	14,260	14,260	14,260
R-squared	0.482	0.482	0.482	0.482	0.483	0.483	0.483
Number of prefectures	46	46	46	46	46	46	46
Prefecture Fixed Effects	YES	YES	YES	YES	YES	YES	YES
Industry-Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES

Standard errors in parentheses are clustered by prefecture

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

Table 4: Government Loans, Vote Share for the Liberal Democratic Party (LDP), and Margin of Electoral Vistory for LDP Incumbents

	(1)	(2)	(3)
Vote Share for LDP	0.286***	0.484***	
	(0.0766)	(0.0942)	
Margin of Victory		-0.00761***	
		(0.00274)	
Vote Share for LDP in 1972			0.236***
			(0.0691)
Observations	46	46	46
R-squared	0.274	0.376	0.258

Robust standard errors in parentheses

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

Table 5: Impact of Government Loans on Capital Allocation Efficiency (Instrumental Variable)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(Share of Government Loans)*(Value-Added Growth)	-1.511**	-2.220**	-2.537**	-3.549	-2.888*	-1.973**	-2.344**	-4.606	-3.524
	(0.715)	(1.000)	(1.137)	(2.429)	(1.608)	(0.966)	(0.981)	(3.492)	(2.152)
Value-Added Growth	1.128***	1.428***	1.447***	1.889**	1.705***	1.028***	1.238***	1.550***	1.488***
	(0.152)	(0.292)	(0.310)	(0.765)	(0.542)	(0.139)	(0.266)	(0.574)	(0.487)
ln(Output per capita)*(Value-Added Growth)		-0.292	-0.338*	-0.320	-0.341		-0.184	0.0647	-0.110
		(0.187)	(0.203)	(0.230)	(0.233)		(0.185)	(0.271)	(0.208)
(# of Bank Branches per-capita)*(Value-Added Growth)			522.3				136.3		
			(640.4)				(620.1)		
(Loan-to-Output Ratio)*(Value-Added Growth)				-0.185				-0.314	
				(0.194)				(0.312)	
(Loan-to-Deposit Ratio)*(Value-Added Growth)					-0.179				-0.325
					(0.200)				(0.312)
(Gov't Spending-to-Output Ratio)*(Value-Added Growth)						1.679	1.204	4.064	2.730
						(1.130)	(1.308)	(3.709)	(2.249)
Observations	14,260	14,260	14,260	14,260	14,260	14,260	14,260	14,260	14,260
R-squared	0.482	0.482	0.481	0.481	0.481	0.482	0.482	0.481	0.481
Number of prefectures	46	46	46	46	46	46	46	46	46
Prefecture Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry-Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
First Stage F Statistic	13.74	10.69	8.787	3.288	6.134	9.528	12.63	2.659	4.122

Standard errors in parentheses are clustered by prefecture

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

Table 6: Split-Sample Analysis (1975-1990, 1990-2005)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1975-1990				1991-2005			
Value-Added Growth	1.194***	1.161***	1.042***	1.048***	0.892**	0.890**	0.868**	0.934**
	(0.187)	(0.170)	(0.162)	(0.147)	(0.361)	(0.408)	(0.390)	(0.349)
(Share of Government Loans)*(Value-Added Growth)	-1.155	-1.229	-0.685	-0.965	-0.953	-0.955	-0.906	-0.978
	(0.732)	(0.780)	(0.643)	(0.652)	(0.763)	(0.753)	(0.830)	(0.759)
ln(Output per capita)*(Value-Added Growth)	-0.429**	-0.443**	-0.466**	-0.452**	0.275	0.276	0.269	0.315
	(0.181)	(0.189)	(0.187)	(0.189)	(0.207)	(0.211)	(0.217)	(0.231)
(# of Bank Branches per-capita)*(Value-Added Growth)		424.4				13.47		
		(599.4)				(995.7)		
(Loan-to-Output Ratio)*(Value-Added Growth)			0.110**				0.0181	
			(0.0445)				(0.114)	
(Loan-to-Deposit Ratio)*(Value-Added Growth)				0.189				-0.123
				(0.135)				(0.237)
Observations	7,360	7,360	7,360	7,360	6,900	6,900	6,900	6,900
R-squared	0.510	0.510	0.510	0.510	0.436	0.436	0.436	0.436
Number of prefecture	46	46	46	46	46	46	46	46
Prefecture Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry-Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES

Standard errors in parentheses are clustered by prefecture

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

Table 7: Impacts on Investment-Output Ratio and TFP Growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Investment-to-Output Ratio	Investment-to-Output Ratio	Investment-to-Output Ratio	Investment-to-Output Ratio	Investment-to-Output Ratio	TFP Growth	TFP Growth	TFP Growth	TFP Growth	TFP Growth
Share of Government Loans	0.168***	0.200***	0.201***	0.101*	0.157***	-4.786***	-4.513***	-3.989***	-3.920***	-4.163***
	(0.0449)	(0.0540)	(0.0601)	(0.0557)	(0.0434)	(1.274)	(1.151)	(1.288)	(1.370)	(1.093)
ln(Ouput per-capita)		0.0204	0.0206	0.0316**	0.0377**		0.173	0.253	0.106	0.0322
		(0.0141)	(0.0146)	(0.0121)	(0.0145)		(0.410)	(0.413)	(0.398)	(0.389)
# of Bank Branches per-capita			-5.073					-2,619		
			(74.94)					(1,599)		
Loan-to-Output Ratio				-0.0295***					0.176	
				(0.00859)					(0.324)	
Loan-to-Deposit Ratio					-0.0712***					0.579
					(0.0161)					(0.582)
Observations	46	46	46	46	46	46	46	46	46	46
R-squared	0.246	0.275	0.275	0.439	0.508	0.320	0.323	0.367	0.333	0.348

Robust standard errors in parentheses

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