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Firm Specificity, Cash Flow, Investment and Employment among Japanese Firms: Evidence from the Lost Decades*

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After the collapse of Japanese asset markets at the end of 1989 many observers expected dramatic transformation of the Japanese labor market, especially in terms of the system of permanent employment. During the 'lost decade' of the 1990's, however, there was a growing consensus that Japanese firms were unwilling to restructure. From the end of the 1990's to the present, however, Japanese firms have undertaken changes in order to adapt, among these has been a steady increase in the utilization of temporary employees. Despite this trend, we find that permanent employment continues to be important for research intensive firms.

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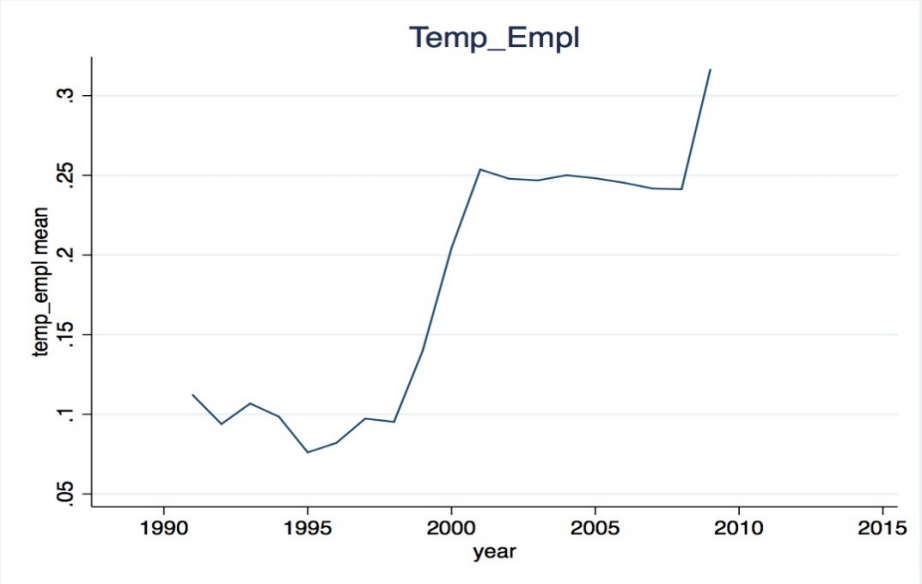
1. INTRODUCTION

The so-called system of lifetime employment was once considered one of the ‘three pillars’ of the Japanese labor market (together with seniority compensation and enterprise unionism). It was generally considered that this would erode significantly after the post-Plaza Accord appreciation of the Yen, and the later collapse of the bubble economy in late 1989. Ultimately, however, the business press and many analysts came to the opposite conclusion: viz. that Japanese firms were very slow to restructure during the 1990’s and that adjustment in the labor market was not evident. Indeed, in its 2001 downgrade of Japan, S&P cited slow restructuring in the corporate sector as the source of Japan’s economic woes (Williams, Dvorak, and Zukerman, 2001; Kambayashi, 2015). In hindsight it should not be surprising that restructuring of the labor market was slow during the 1990’s. After all, if indeed ‘permanent employment’ was considered one of the ‘three pillars’ of the Japanese labor market in the post-war period (Koike, 1984; Freeman and Weitzman, 1987; Ito, 1991; Hashimoto, 1982), then it might be expected to change slowly.

In reality, the Japanese labor market has been changing, most notably in terms of the dramatic increase in the utilization of temporary employees. Using data from 3145 registered Japanese firms over the period 1990 to 2010 we find that the ratio of temporary to total employment has risen from roughly 10% in 1990 to over 30% in 2010 (see figure 1).

In terms of utilization of temporary employees, those who were skeptical about Japanese restructuring during the ‘lost decade’ were correct. That is, there was no discernible increase in the use of temporary employees during the period 1990 to 1999 and the ‘lifetime employment’ system seemed intact. There were a number of reasons for increased utilization of temporary employees after 2000. Revisions to the *Worker Dispatch Act* in 1999 and 2004 essentially removed existing restrictions on the use of temporary employees, especially among manufacturing firms. Furthermore, there were a number of accounting and tax related reforms that made it easier for firms

Figure 1 Ratio of Temporary to Total Employment in Japan



Note: The ratio is calculated as temporary labor to total employees at each firm for both listed and unlisted registered firms in Japan between 1991 and 2009.

to restructure. Also, as the decade of the 1990's progressed many firms were able to shed 'permanent employees' through attrition, allowing them to increasingly make up the difference with temporary employees. Finally, Japanese manufacturing firms increasingly began to relocate production facilities abroad, including Asian countries such as Vietnam, potentially allowing such firms to decrease reliance on 'permanent employees' in Japan.

A natural observation regarding the trend toward greater use of temporary employees in Japan would be that the phenomenon is the result of a cash flow and investment sensitivity as in Fazzari, Hubbard, and Petersen (1988). That is, due to informational asymmetries, firms might face financing difficulties and therefore must rely more heavily on internal cash in order to undertake investment activities (Meyers and Majluf, 1984; Fazzari *et al*., 1988; Almeida and Campello, 2007). Generally, however, observers have argued that cash flow-investment sensitivity (to the extent it was ever

binding) has either disappeared or become less important among developed countries as a result of better information.

The issue of investment-cash flow constraints has been studied at least since the paper by Fazzari, Hubbard, and Petersen (1988). The argument is that financially constrained firms (defined variously) must rely more heavily on cash in order to undertake investment. This is an information asymmetry argument, as in Myers and Majluf (1984), whereby 'constrained firms' may be forced to finance investment from cash flow or cash stock. However, it is increasingly argued that cash flow-investment sensitivity has declined over time as information asymmetry has declined (Chen and Chen, 2012). Others argue that cash flow-investment sensitivity may still be prevalent but difficult to measure as intangible investment has grown relative to more traditional capital expenditure (Almeida and Campello, 2007). Finally, testing for cash flow-investment sensitivity may give results that are essentially just a statistical artifact of the data, or reflect the fact that the cash flow-investment sensitivity hypothesis is only meant to apply to 'financially constrained' firms.

While the focus of this paper is specifically on the relationship between 'tangible' and 'intangible' investment and utilization of temporary employment, a possible underlying force driving our observations might be the investment-cash flow sensitivity hypothesis described above. That is, if investment of either type is positively influenced by cash measures, then we might naturally expect that potentially cash enhancing measures, such as greater utilization of temporary employees, might be positively related to investment by firms. As a first step in our analysis we therefore consider a simple regression of the two types of investment as a function of various cash measures, firm quality, leverage, industry dummy variables, time fixed effects and general macroeconomic conditions as measured by GDP growth. The dependent variables used to describe 'tangible' and 'intangible' investment are Capex/Sales and R&D/Sales. Firm quality is measured by alternative specifications of *Q* (essentially different Market/Book measures). Alternative cash measures are used (such as scaled and unscaled sales, scaled

Table 1 Capex/Sales and R&D/Sales as a Function of Cash Measures and Controls

Dependent Variable Capex/Sales	Estimated Coefficient	*t*-stat	*p*-value
Q-proxy	0.0032	4.66	0.0001
Cash Measure	0.00000011	5.25	0.0001
Leverage	0.095	18.52	0.0001
GDP Growth	–0.094	–.63	0.529
Intercept	0.116	28.05	0.0001
Industry Fixed Effects	Yes		
Year Fixed Effects	Yes		
Regression *F*	97.8		
Adj. *R*-Square	0.232		
N Obs.	9,953		
Dependent Variable R&D/Sales	Estimated Coefficient	*t*-stat	*p*-value
Q-proxy	0.007	9.06	0.0001
Cash Measure	0.000000046	3.54	0.0004
Leverage	–0.012	–3.32	0.0009
GDP Growth	–0.15	–1.68	0.0932
Intercept	0.034	9.74	0.0001
Industry Fixed Effects	Yes		
Year Fixed Effects	Yes		
Regression *F*	51.5		
Adj. *R*-Square	0.215		
N Obs.	5,711		

and unscaled EBIT, etc.), and leverage is measured as the sum of short and long term firm borrowing. The dependent and independent variables are described in more detail in the 'Data and empirical model' section below.

The preliminary results in table 1 suggest that there is a positive, statistically significant but quantitatively small relationship between both types of investment for Japanese firms and cash measures. This result is interesting in itself given that the literature cited above generally has found that this relationship has weakened in most developed economies. However, the results are consistent with the idea that managers in Japan may be prone to over-invest when cash flows are good. We use these results as motivation for the primary focus of the paper: the relationship between utilization of temporary employees and investment. More specifically, we are interested in

the possibly different relationship between investment in physical investment (plant and equipment, bricks and mortar) versus investment in R&D with respect to utilization of temporary employment. Our null hypothesis is that of no relationship between the two types of investment and utilization of temporary employment. We find that we cannot reject the null hypothesis with respect to physical investment (heretofore Capex), but we must reject the null hypothesis with respect to investment in R&D. Specifically we find a negative and statistically significant relationship between R&D investment and utilization of temporary employees. The result, while surprising when viewed in terms of the cash flow-investment sensitivity literature and the results in table 1, is completely compatible with the human capital literature. This paper focuses on the results with respect to R&D investment and utilization of temporary employment from the perspective of firm specific human capital formation.

It is easy to focus on the overall trend in utilization of temporary employment and proclaim the end to lifetime employment. Such a conclusion would be overly simplistic and premature. Most economic explanations of lifetime employment in Japan during the high growth period (1955-1990) centered on the human capital model due to Becker (1962). Specifically, Hashimoto (1981) and others focused on human capital accumulation as a shared investment between the firm and its employees, especially where the acquired human capital was firm specific. It is widely understood that when human capital acquisition is firm specific that separations will be costly to both firms and workers, and therefore less common than in the case where human capital utilization and acquisition is more general.

We find that there are vestiges of lifetime employment in the post-bubble Japanese economy. Specifically, we find that the ratio of temporary employment is inversely and statistically significantly related to research and development expenditure for our sample of firms over the period 1990-2010. On the other hand, there seems to be no statistically significant relationship between investment in plant and equipment and the ratio of temporary

employees (as the cash-flow investment literature might suggest under the assumption that temporary employment eases the firm's financing constraints).

This finding is not surprising when considered within the context of human capital literature. Firms that invest more intensively in R&D may have more proprietary technologies to protect and would suffer from a high degree of labor mobility. While not surprising, we think the results are interesting, and suggest that some form of lifetime employment can be expected to persist in Japan for the foreseeable future. The organization of this paper is as follows. In the next section we turn to an examination of factors affecting utilization of temporary employees in Japan since the end of the 1990's. We then turn to a discussion of the data, our empirical model and results, after which we offer conclusions.

2. FACTORS AFFECTING UTILIZATION OF TEMPORARY EMPLOYEES

A naive interpretation of why Japanese firms have turned to greater utilization of temporary employees is simply that they wish to save money in the harsher low growth environment. While this is undoubtedly true for many firms, the magnitudes are very small, as seen above. Considering the literature on cash flow-investment sensitivity, there are good reasons to doubt that a clear relationship exists between use of temporary employees, cash flow generation and investment.

While the jury is still out on the more general question of cash flow-investment sensitivity, we believe that less tangible, more knowledge intensive investment, such as R&D expenditure, is more firm specific in nature, and therefore incompatible with some cash flow enhancing activities such as greater reliance on temporary employees (Williamson, 1979, 1985). Unlike many previous studies, our Japanese data set includes information on traditional capital expenditure and R&D investment as separate items. Our

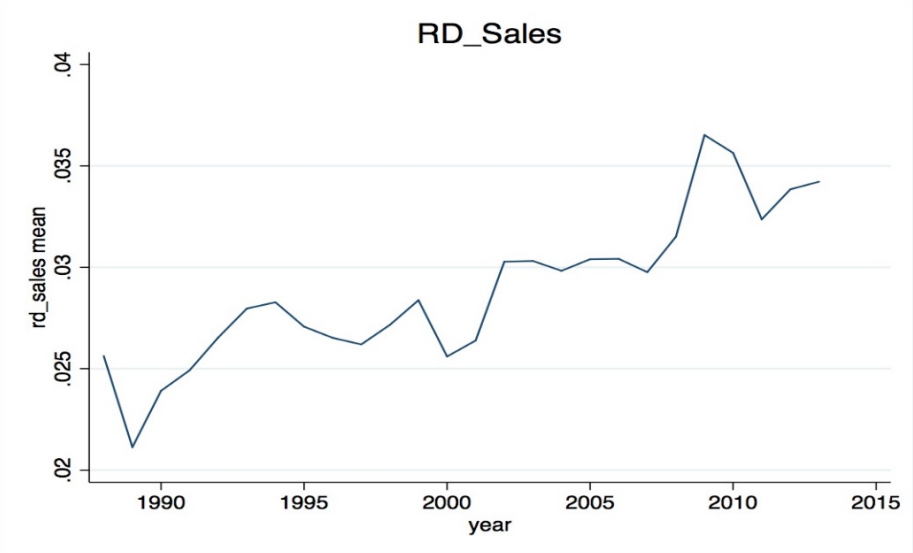
view is compatible with Gary Becker's (1962) seminal paper on investment in human capital and its numerous extensions. Hashimoto (1981) explored both theoretically and empirically the issue of investment in firm-specific human capital as a 'shared investment' by the firm and its employees resulting in the creation of firm-specific assets. Viewed this way, firms that invest heavily in R&D would be constrained in their ability to increase cash flow through utilization of temporary employees. That is, separations become costly to both the firm and employee when human capital is more firm specific. Indeed, in such a case there could be a negative relationship between intangible (R&D) investment and utilization of (cash flow enhancing) temporary employees. If this is indeed the case it is perfectly reasonable that overall utilization of temporary employees in Japan would grow as it has since the 'lost decade', while some forms of 'permanent employment' continue to be important.

Ultimately, the question is an empirical one that can be framed as two alternative and exclusive hypotheses with respect to the nature of investment and utilization of temporary employees. One hypothesis is that R&D expenditure, being more intangible than brick and mortar capex, should exhibit greater positive cash flow sensitivity as a result of information asymmetry between the firm and suppliers of capital (Brown and Peterson, 2009). Under this hypothesis, greater utilization of temporary employees could presumably help to alleviate financial constraints among research intensive firms. The alternative hypothesis, especially as related to Japan during the high growth period and possibly beyond, is based in the literature on firm specific human capital investment described above (and elsewhere, such as Okimoto and Saxonhouse, 2010; Hashimoto, 1981; Lacetera, 2001). That is, firms that engage in a higher degree of R&D investment will also tend to hire employees with whom they have shared human capital investment. While increasing the use of temporary employees would, all else equal, help to relieve financial constraints for these firms, the firm specific nature of R&D investment will generally dictate a greater reliance on permanent employees (see also Williamson, 1985).

Japan over the 'lost decades' represents an excellent opportunity to examine these two alternative hypotheses: that greater R&D investment will be enhanced by higher utilization of temporary employees (the cash flow-investment hypothesis) or that such investment will be negatively related to greater reliance on temporary employees (the firm specific human capital hypothesis). The outcome will be interesting given the fundamental changes in the Japanese labour market during the low growth period of the past 25 years, a period during which reliance upon temporary employees has grown dramatically.

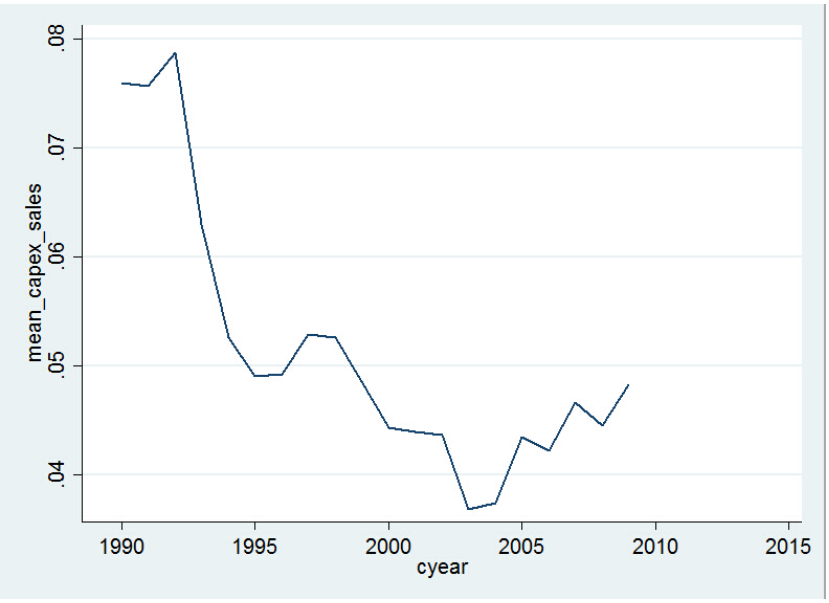
On first examination of the data, one might conclude that the investment-cash flow sensitivity hypothesis is correct with respect to idiosyncratic investment such as R&D during the 'lost decades'. After all, the ratio of R&D expenditure to sales has been on an increasing trend since the collapse of the bubble economy to the present, as has utilization of temporary employment since the late 1990's (see figure 2).

Figure 2 Ratio of R&D Expenditure to Sales in Japan



Note: Ratio of R&D expenditure to sales for both listed and unlisted registered firms in Japan between 1990 and 2009.

Figure 3 Ratio of Capital Expenditure to Sales for Both Listed and Unlisted Registered Firms in Japan between 1990 and 2009



On the other hand, investment in plant and equipment (Capex) steadily fell from 1990 until 2003, with some recovery thereafter (see figure 3). However, after we control for industry and time fixed effects together with firm characteristics and macroeconomic influences, we find that R&D investment is negatively related to utilization of temporary employment, while the relationship between Capex and temporary employment is statistically nugatory.

3. DATA AND EMPIRICAL MODEL

The data set includes 3,145 Japanese firms for the period 1990-2009 that are registered and present financial filings to the Treasury Ministry through the *Yuka shoken houkokusho* with market capitalization equivalent of over 500 million USD. Due to the market capitalization cut-off in the dataset,

some firms are added to the sample during the period, so observations would not be available for such firms for the entire period. Furthermore, a small number of firms would also become insolvent during the period. Finally, not all firms report all the data items used in this analysis. Specifically, firms that are not publicly traded will have no price data with which to calculate *Q* proxies.

Data on total employment, temporary employment, sales, revenue and cash measures and all other financial variables is from various issues of the *Yuka Shoken Houkokusho* or financial filings with the Treasury Agency. Digitalized (though typically not user friendly) versions of the filings are available from various sources. Price data needed for calculation of market capitalization, etc. are from *Toyo Keizai*. GDP data are available from many sources, including *Toyo Keizai*.

Variables used in the statistical analysis here are defined as follows. For our *Q* proxies, we used various alternative contemporary and lagged measures of market value divided by value of firm assets. Results were not sensitive to alternative measures. For cash measures, scaled and unscaled values of firm revenue or EBIT were used. Results were not sensitive to alternative measures except where noted in the paper. For leverage, scaled and unscaled values of the sum of short and long term borrowing were used. We used size measured by number of employees, value of assets or sales. Results were not sensitive to alternative measures, and unless otherwise specified the results presented used total number of employees as the size variable. The temporary employment ratio is calculated as the number of temporary employees relative to total employment for each firm for each year. The company code or 'ticker' used to identify firms in Japan is broken into 9 four digit categories, and the categories are mapped into industries. We used these groupings for our industry fixed effects. We would have liked to have completed the analysis including firm fixed effects in lieu of industry fixed effects, but did not have sufficient power to do so. Finally, year fixed effects are included as well to capture episodic variations in temporary employment and its effect on investment.

Table 2 Temporary Employment Ratio as a Function of Cash Measures and Controls

Dependent Variable Temporary Employment Ratio	Estimated Coefficient	*T*-ratio	*p*-value
Q-proxy	–0.0031	–2.13	0.033
Cash Measure	0.326	5.19	0.0001
Intercept	0.284	23.16	0.0001
Size	Yes		
Industry Dummies	Yes		
Time Fixed Effects	Yes		
Regression *F*	7.93		
Adjusted *R*-square	.04		
N Obs.	2,963		

Before tackling our primary hypothesis that idiosyncratic investment such as R&D is less compatible with increased utilization of temporary employees than is the case with (more tangible) Capex, it would be useful to consider whether utilization of such employees is the result of cash constraints. We present results for the temporary employment ratio as a function of various firm related factors, including cash, in table 2. The negative estimated coefficient on the *Q* proxy *could* be interpreted to mean that 'lower quality' firms make greater use of temporary employment, all else equal. This finding would be consistent with the human capital literature that finds a positive relationship between firm quality and utilization of permanent employees (Becker and Huselid, 1992; Huselid, 1995). The positive and significant estimated coefficient on the cash proxy, however, is confusing. From the perspective of *causality* we should expect a negative relationship, meaning lower cash entices firms to engage in money saving activities, including greater utilization of temporary employees. On the other hand, viewed in terms of *correlation*, it is perfectly reasonable that cash generation and the temporary employment ratio are positively and significantly related since both respond to underlying economic factors, ceterus paribus. Unfortunately, therefore, we are unable to draw any unambiguous inferences about the relationship between cash and utilization of temporary

employment.[1)]

In order to distinguish empirically between the alternative hypotheses of cash flow enhancing labor market activity giving rise to greater investment (investment-cash flow sensitivity approach) and the firm-specific human capital approach, we model investment (both capital expenditure and R&D separately) as:

$$Investment/sales=\alpha+\beta(Q)+\gamma(GDPgrowth)+\delta(Temp/Employment) +\sigma(size)+\varphi(industry)+\eta(year\ fixed\ effects)+\varepsilon. \quad (1)$$

The simple empirical model has investment as a function of 'observable' firm quality, firm size, industry fixed effects and year fixed effects. Variables are defined as described above. Estimating the model using firm fixed effects would have been the ideal approach, but there are not enough degrees of freedom to allow for this. As an alternative, we estimated (1) with industry and year fixed effects. GDP growth is included as a control variable in order to capture macroeconomic impact on the dependent variable as well as that on cash flow enhancing activity. We therefore expect multicollinearity between GDP growth and the (Temp/Employment) variable, which would bias *against* any finding of significance of both the impact of GDP and the temporary employment variable on the two types of investment. Given our null hypothesis and the nature of our empirical findings, therefore, the impact of any multi-collinearity is moot, and in any event, neither biases the coefficients, nor affects the overall F-statistic for the regression.

Still, as a robustness check, we have also performed our statistical analyses using a so-called two-step procedure. In the two-step procedure, the temporary employment ratio is first regressed as a function of GDP growth and residuals from this regression are saved and used in the second step. In the second step, the statistical analysis is performed as per model 1 above,

[1)] On the causality versus correlation issue, reverse regression and alternative specifications for cash do not give meaningful alternative results.

except that the residuals from the first step are used in place of the actual temporary employment ratio as an explanatory variable. This two-step procedure would eliminate both the problem of reduced statistical inference resulting from possible multicollinearity, as well as any endogeneity bias. On the other hand, the two-step procedure introduces problems associated with generated regressors. Overall, we find no significant difference in our results whether we use the basic ordinary least squares method with GDP growth as an explanatory variable, or instead use the two-step procedure. Therefore, we report only the OLS results. Additional robustness tests were also performed in terms of specification of the quality variable (*Q*) and firm size measures with no significant change in results. Similarly, using random effects GLS estimation does not affect results in any material way. Therefore, we feel highly confident in terms of our results.

4. RESULTS, DISCUSSION AND CONCLUSIONS

Results are presented in table 3. As in table 1, both Capex/Sales and R&D/Sales are both positively related to cash measures, and while the estimated coefficients are statistically significant, they are very small. This is consistent with the investment-cash flow sensitivity literature, which typically finds only a small or inconsequential influence. On the other hand, the negative and significant estimated coefficient on the temporary employment ratio found for R&D investment, but not capital expenditure, suggests that R&D investment may be idiosyncratic in nature and proprietary, meaning that high utilization of temporary employees might endanger proprietary technology and strategies employed by the firm. Again, while not particularly surprising from a human capital perspective, the finding suggests that some form of ‘permanent’ or long-term employment can be expected to endure in Japan into the future, despite the increase in utilization of temporary employees since the end of the 1990’s.

Table 3 Capex/Sales and R&D/Sales as a Function of Temporary Employment Ratio

Dependent Variable Capex/Sales	Estimated Coefficient	*T*-ratio	*p*-value
Q-proxy	0.001	0.46	0.6421
Cash Measure	0.0000001	1.97	0.049
Leverage Measure	0.17	12.12	0.0001
GDP Growth	0.041	0.15	0.882
Temporary Employment Ratio	–0.0098	–0.86	0.39
Intercept	0.021	2.21	0.027
Size	Yes		
Industry Dummies	Yes		
Time Fixed Effects	Yes		
Regression-*F*	12.15		
Adjusted *R*-square	0.115		
N Obs.	1,807		
Dependent Variable R&D/Sales	Estimated Coefficient	*T*-ratio	*p*-value
Q-proxy	0.0056	3.21	0.0014
Cash Measure	0.00000006	1.90	0.058
Leverage Measure	0.027	2.36	0.018
GDP Growth	–0.22	–1.21	0.225
Temporary Employment Ratio	–0.017	–1.99	0.047
Intercept	0.0013	0.14	0.89
Size	Yes		
Industry Dummies	Yes		
Time Fixed Effects	Yes		
Regression-*F*	8.48		
Adjusted *R*-square	0.116		
N Obs.	1,195		

Notes: The regression includes both industry and year fixed effets. All variables are defined as in the Data section above.

5. DATA APPENDIX

Data on total employment, temporary employment, sales, revenue and cash measures and all other financial variables is from various issues of the Yuka Shoken Houkokusho or financial filings with the Treasury Agency. Digitalized (though typically not user friendly) versions of the filings are available from various sources. Price data needed for calculation of market capitalization, etc. are from Toyo Keizai. GDP data are available from many sources, including Toyo Keizai.

Variables used in the statistical analysis here are defined as follows:

Q-proxy	We used various alternative contemporary and lagged measures of market value divided by value of firm assets. Results were not sensitive to alternative measures.
Cash Measures	Scaled values of firm revenue or EBIT were used. Results were not sensitive to alternative measures except where noted in the paper.
Leverage	Scaled values of the sum of short and long term borrowing were used.
Temporary Employment Ratio	Number of temporary employees relative to total employment.
Size	We used size measured by number of employees, value of assets or sales. Results were not sensitive to alternative measures. Unless otherwise specified the results presented used total number of employees as the size variable.
Industry Dummy Variables	The company code or 'ticker' used to identify firms in Japan is broken into 9 four digit categories, and the categories are roughly mapped into industries. We used these groupings for our industry dummy variables.

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