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Determinants of Productivity of the Japanese SME Sector: The Impacts of Active and Passive SME Policies

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Abstract

This paper explores the impacts on productivity of policies, namely active policies, targeting Small and Medium-sized enterprises in contrast to the impacts produced by the economic environment, labeled passive policies. Using time series analysis in the Japanese case this study has found that even when a stable long term relationship exists among considered variables, (1) active policies do not have a significant impact in the short term and (2) the long term relationship adjusts too slowly to be measured. On the other hand the SME productivity is found to be affected by passive policies indicating that the average entrepreneur in Japan is more concerned with the economic circumstances than the assistance provided by government schemes.

1. Introduction

The Small and Medium-sized Enterprises (SME) Sector have been the objective of several policies in Japan, especially since the Second World War. The government, through a wide range of mechanisms, has actively promoted the SME Sector with different objectives and with different intensity. These are called **active policies**. Additionally there are other policies that affect the SME Sector even when those policies do not target SMEs specifically. Those are called **passive policies**.[1]

Not only in Japan but elsewhere, the SME sector is the target of policymakers since it is believed SMEs bring certain benefits to the whole economy. It is claimed that a "healthy" SME sector is expected to add competitiveness, innovation, employment and productivity.[2] It is argued that SMEs face special problems because of their relative small size. Being small produces problems when raising funds, training labor or conducting research, among others,[3] and if these problems were reduced then the SMEs benefits would be materialized. Thus, many justify actively helping SMEs. One of those benefits, productivity, and how it is influenced by policymakers is the objective of analysis of this paper.

It seems there is a general agreement that better passive policies, sometimes grouped in "good governance" or "easiness to do business", are associated with better economic performances, including higher productivity and growth rates. However the impacts on SMEs productivity are still

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not well researched.[4] Moreover, in the area of active policies and their impact on SMEs, academia has yet to come up with research dealing with the impact on productivity at the macroeconomic level.

Thus this study will explore the productivity of the Japanese SME sector's and the impacts of a group of active and passive policies. Additionally the policies' impacts on relative productivity will also be explored.

This paper starts by reviewing some productivity concepts and then exploring some policy ones. Following this, short term time series models are constructed for absolute and relative productivity, where due to the presence of unit roots first difference is used. Finally cointegration tests are performed and error correction models constructed to asses long term relationships.

2. Literature review

Some of the discussions regarding the impact of active policies limit their scope to micro economic analysis and in general to the impacts of specific programs. In the case of Japanese active policies there are for examples the works of Eshima (2003) and Harada (2005) that compare the performance of awarded companies against those that are not, under the Creative Business Promotion Law. Both have found positive, albeit small, links between the policy and firm investment or growth. Others, such as Masuda (2005) used more general measurements of policy involvement to assess the impacts on entrepreneurial activities. He has found insufficient arguments in favor of 'business start-up assistance' impacting the likelihood of individuals becoming entrepreneurs.

Even without focusing on the result, studies do not measure the impacts of active policies in the average SME, the macro level. Micro analysis seems reasonable for assessing the impacts of certain active policies on a group of assisted SMEs. However, since active policies are conducted with the SME sector benefits in mind, and ultimately the economy as a whole, one can expect some measurable impacts at a macro level. If that is not the case, those active policies help only a select group of companies that in turn does not help the average entrepreneur nor the economy as a whole. However it could be the case that active policies are quantitatively too small to have a traceable impact which again signifies no measurable benefit for the economy.

Consequently, besides studying micro level impacts, it is necessary to examine the macro level as well where there have been few studies, especially in the Japanese case. Most of these studies concentrate on entry rates or entrepreneurship, such as Noriyuki (1999) and Kawai (2002). In these studies creation of new companies are negatively linked with financial assistance policies. They argue that this happens when programs help incumbent companies thus creating entry barriers for new companies. Bruce (2006) using econometrics similar to this study has found no relationship between SME tax incentives and entrepreneurship. Though these studies are revealing they do not measure impacts on productivity.

In terms of productivity, studies such as Noriyuki (1992) or older, fail to include active policy variables and/or again limit their scope to the micro level. However, a recent study by Urata (2002) concentrates on historic changes of factor productivity citing firm size as explanation of productivity differences. This work includes an active policy at the macro level, subsidized public loans, which are found not to be significant. Following Urata's work this research further explores productivity by using improved time series analysis while focusing on policy impacts by including a more complete set of active policies.

Therefore, by exploring active policies and productivity at the macro level this research raises some critical questions: is it appropriate to use active policies when trying to help the SME sector's productivity at a macro level or is it more economical to do so by using passive policies instead? Is the average SME performance linked to government assistance or to general economic conditions?

3. Productivity discussions

3.1. Basic concepts

Productivity in the economic sense deals with the relationship between input and output. An increase in productivity will occur when there is a decrease in inputs and/or an increase in outputs. In other words, the net output (difference between outputs and inputs) is the core concern in productivity analysis.

Discussion on productivity can be traced back to Cubb-Duglas' (1928) overall production function. With the subsequent addition of Total Factor Productivity (TFP) their function can be reformulated as Urata (2002) has done:

$$TY = f_1(K, L, IP, TFP) \tag{1}$$

Where total output (TY) is a function of available capital (K), labor (L) and intermediate products/inputs (IP) as the only three inputs. If intermediate inputs (IP) are subtracted from total output (TY) the net output(Y), also called value added, is revealed:

$$Y = TY - IP = f_2(K, L, TFP) \tag{2}$$

Therefore whatever change in net output not explained by change in capital or labor is contained in the Total Factor Productivity (TFP) term (the residuals).

Equation (2) tends to be expressed in terms of labor productivity, thus labor (L) can be used as the denominator in the following manner:

$$\frac{Y}{L} = f_3\left(\frac{K}{L} + TFP\right) \tag{3}$$

Thus absolute productivity per employee depends on the capital per employee (K/L) while TFP

remains an isolated term which will be addressed later.

When interested in increases in productivity, that is elasticity, the change in labor productivity can be defined in terms of change in capital per employee and TFP with the help of natural logarithm, in the following way:

$$\ln\left(\frac{Y}{L}\right) = \alpha + \beta \ln\left(\frac{K}{L}\right) + \gamma TFP \tag{4}$$

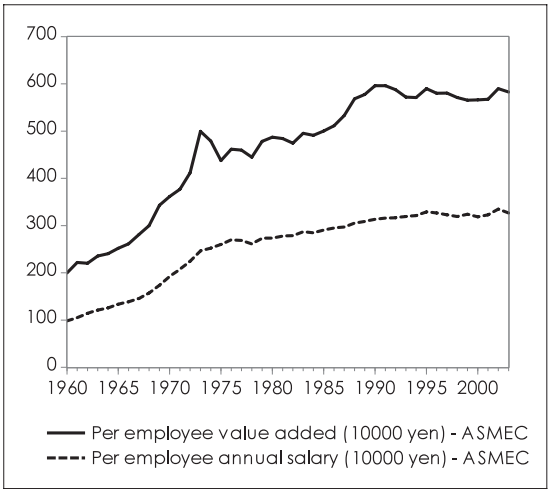
The change in output per employee (ln(Y/L)) is what is commonly known[5] as labor productivity in absolute terms, and is the definition that will be used in these studies.

Still the real sources of TFP remain unknown in this equation. Therefore there have been numerous authors who have tried to account for what is contained in TFP. Commonly cited components are human capital investments such as education, government consumption and regulatory pressure. Recently technology/innovation proxies such as patents have become popular. In the SMEs field authors such as Soderbom (2001) and Urata (2002) have added to the equation the size variable: bigger companies show higher productivity. Within this TFP term active and passive policy variables will be placed along with supplementary control variables in order to explain productivity variation.

3.2. Productivity definition and importance

Since output per employee will be computed as productivity, the first issue is to define output which in principle is the quantity or value of the total products and services produced. Since value added (per employee) is a standard measurement of productivity in academia, this measurement will

Figure 1. SME Productivity and salaries



Source: Ministry of Finance computed by author
Note: values are in year 2000 yen

also be employed in this study.

Value added is equal to the net operating profit plus personnel costs (managers and employees salaries and employee benefits) in addition to dividend and interest expenses and discount charges, rent of movable property and real estate and finally taxes and public impositions. In short it is the income created by the company for the economy that is distributed among the company, the employees, the government and others who profit from the business. Besides avoiding double counting, this may explain its popularity as a measurement of productivity among policy makers, who have, in principle, the economy as a whole as their main objective.

The importance of increasing productivity not only rests in increasing income for the economy as a whole. Productivity also has a close link with employee's income: value added per employee is widely recognized as the main source of wage increases. Figure 1 shows the evolution of annual value added per employee (productivity) and the annual salary per employee in Japan from 1960 to 2003 in SMEs. In general, increases in productivity are matched with increases in the income of employees.

3.3. Relative productivity

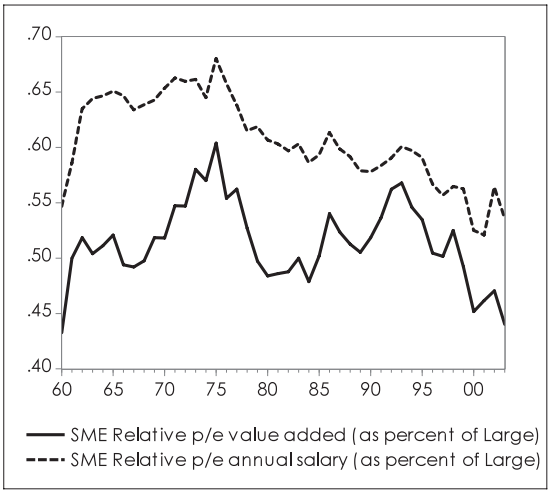
Absolute increases in productivity are important for the welfare of workers and for the economy. However SMEs should also increase productivity at a pace that prevent them, and their workers, from lagging behind bigger companies. Therefore not only absolute productivity needs to be analyzed. Relative productivity, as the productivity of SMEs compared to that of large companies, is to be scrutinized as well. Relative productivity can be defined by modifying equation 4 as follows:

$$\ln\left(\frac{\frac{Y_{SME}}{L_{SME}}}{\frac{Y_{LRG}}{L_{LRG}}}\right) = \alpha' + \beta' \ln\left(\frac{\frac{K_{SME}}{L_{SME}}}{\frac{K_{LRG}}{L_{LRG}}}\right) + \gamma' TFP^{*} \qquad (5)$$

Gross output of SMEs (YSME/LSME) is divided by that of large companies (YLRG/LLRG). In the same manner relative capital is accounted for. In equation 5, TFP* accounts for unexplained increases in relative productivity; that is, the reasons SMEs get close to being as productive as large companies that are not accounted for in changes in relative capital. Relative capital should have the same sign as capital in equation 4.

The implications of relative productivity are important. As stated before, policy makers are not only or should not only be concerned with absolute productivity when implementing active policies. Policies should help to reduce the gap between SMEs and large companies. Additionally the welfare of those working for SMEs compared with those working for large companies correlates to relative productivity as shown in Figure 2.

Figure 2. Relative productivity and relative salary



Source: Ministry of Finance computed by author
NOTE: p/e equal per employee

4. Policies

4.1. Active policies

Active polices are programs specially designed to target the SME sector. Schemes that provide some kind of assistance where only SMEs are eligible to benefit are called active policies.

Japan's public sector has actively promoted SMEs with a wide range of policies.[6] However this paper will mainly focus on three kinds of active polices that should impact absolute and relative productivity of the SME sector.[7] They are financial schemes, non-financial schemes and R&D funds.

Financial schemes

The first group of active policies is the financial schemes. As the Japanese SME Agency states,[8] these schemes were placed because "difficulty in procuring funds is one of the greatest managerial issues for SMEs, which are in most cases unattractive loan recipients for private financial institutions. Therefore, there were not enough suppliers that could provide funds to SMEs. Thus, financial institutions that can provide a stable supply of fixed long-term and low-interest funds to SMEs regardless of fluctuations in the economy, in the form of governmental SME financial institutions, were needed. The Japan Finance Corporation for Small Business, the National Life Finance Corporation, and the Shoko Chukin Bank were created and have been meeting these needs." Additionally it also states that "in accordance with policy needs at different times, governmental SME financial institutions also have a role in achieving policy stimulating effects (...) by extending special loans for the fund needs that meet the purpose of the policy, with advantageous conditions such as reduced interest rates and a flexible demand for collateral and guarantee." Thus the amount of

outstanding loans held by these three banks per SME[9] is to be used as quantitative measurement of financial schemes (labeled in the models "FINANCE").

Financial schemes should impact productivity positively in two manners. The first is by impacting capital itself. This happens because they provide access to credit for SMEs allowing them to investment a certain amount of capital that leads to improvements in productivity by impacting on K in equations 4 and 5. The impacts of these schemes should be positive if they encourage the acquisition of additional capital that under normal financial channels would not occur. However, the impact would be less noticeable if these schemes replaced normal financial channels making capital more accessible for SMEs without providing incentives to increasing or renewing capital at a faster pace. A further exploration of this indirect impact is treated in Annex 1.

The other means by which financial schemes impact productivity positively is by increasing the quality of not only capital (through renew of this) but also labor and management by allowing companies to additionally invest in training thanks to more accessible finance.

Non-financial schemes

The second group of policies is non-financial schemes. Besides financial help, the Japanese government has been involved in a wide range of non-financial activities that target the SME sector actively. Some have been ongoing schemes while many others are temporary programs. These various schemes include training courses, promotion fairs, and so on.

This group of schemes should positively impact, at least in the long term, both absolute and relative productivity of SMEs. Positive impacts are a consequence of improvements in quality of labor, managerial skills and other such improvements generated by implemented schemes.

Finding a correct way to measure these kinds of schemes over a long period of time is a daunting task. A time comparable, ongoing and readily available measurable variable is required. To quantify the level of involvement in non-financial schemes, the SMEs Agency budget per SME (labeled "AGENCY") is to be used[10] because it fits the description of the above requirements. Table 1 shows the composition of the agency budget as stated in the annual SMEs White Papers over a 35 year period.

R&D Funds

The third and last kind of policy to be quantified is the direct provision of funds by national and local governments. These funds are to assist SMEs that conduct research and development activities and are quantified in The Survey of Research and Development (R&D) conducted by the Japanese Statistics Bureau. However not all SMEs perform R&D activities and among those which do, not all receive funding. Thus the value to be used as variable is the percentage of companies that perform R&D and receive funds multiplied by the average amount of funds received (labeled "RDACTIVE"). This provides an estimate of average R&D funding per SME comparable year to year.

Table 1. SME Agency budget details

Year	1965	1975	1985	1995	2000
Total Budget (100 million yen)	214.36	1278.15	2161.57	1857.00	1943.00
Percentage composition					
Equipment modernization	50.78	50.86	7.76		
Training	1.36	1.60	1.56		
Promotion/Diversification	2.94	1.37	3.44		
Labor related assistance	33.52	4.87			
Micro enterprise help	8.18	13.50	18.95		
Retails & Service Industry assistance			3.44		
Advance enterprises help					
Agency operations & Others (including emergency subsidy to financial institutions)	0.93	15.30	10.93	48.63	
Investigation & reports	0.51	0.70		1.29	
Details no disclosure	1.77	11.81	53.92	50.08	100.00

Source: SME White Paper various years. Compile by the author
NOTE: monetary values in real yen 2000

4.2. Passive policies

Passive policies can be defined as policies, economic and non-economic, which affect not only SMEs but other actors of the economy. This is the policy/economic environment where SMEs, as well as other economic agents operate. Actually there are a number of policies and regulations that affect the daily operations of SMEs.[11] This paper will examine policies that relate to the active policies mentioned above. In this way it is possible to control for passive policies that should affect SMEs productivity by the same channels that the three kinds of active polices do.

Thus the first group of passive policies to be accounted for are those policies affecting financing. Again, these passive policies should affect financing across all sectors of the economy and independently of the size of firms. M2 is to be used as financial passive policy.[12] M2 accounts for money supply and to a certain extent measures the development of financial markets (labeled "M2").

For non-financial passive policies the Government's total expenditure on education and industrial promotion is to be used as it is disclosed in The General Accounts - Settlement of Expenditure by Purpose (labeled "EDUINDEXP"). These kinds of expenditure do not target SMEs but the economy as a whole. However SMEs benefit from the positive impacts of education, infrastructure improvements and industrial promotions directly or indirectly. Thus, a positive impact should be expected at least in absolute terms.

Finally, to account for R&D related passive policies, Universities and Institutes expenditure on

R&D is to be used as variable (labeled "UNIRDEXP"). Again SMEs should benefit indirectly by higher level of R&D that trickle down to companies of all sizes.

5. The models

Now it is possible to construct the corresponding models adding policy variables in pairs[13] to account for TFP in equations 4 and 5. Additionally GDP growth as a measurement of economic cycles and capacity utilization is controlled for. Finally, R&D needs to be controlled for as well. This is to be achieved by using as a measurement of intensity, or relative intensity, on R&D that is the number of researchers per employee multiplied by companies performing R&D.[14]

Thus the estimated absolute productivity model is to be calculated by adding to equation 4 active policies (AP－3 polices named FINANANCE, AGENCY & RDACTIVE) paired with passive policies (PP－3 policies named M2, EDUINDEXP and UNIRDEXP), changes in GDP, R&D intensity (RDINTENSITY), a constant and residuals as shown in the following equation:

$$\ln\left(\frac{Y}{L}\right)=\beta_0+\beta_1\ln\left(\frac{K}{L}\right)+\beta_2\ln(AP)+\beta_3\ln(PP)+\beta_4\Delta\ln(GDP)+\beta_5\ln(RDINTENSITY)+\hat{\varepsilon} \quad (6)$$

Accordingly relative productivity is specified by modifying equation 5 as such:

$$\ln\left(\frac{\frac{Y_{SME}}{L_{SME}}}{\frac{Y_{LRG}}{L_{LRG}}}\right)=\beta'_0+\beta'_1\ln\left(\frac{\frac{K_{SME}}{L_{SME}}}{\frac{K_{LRG}}{L_{LRG}}}\right)+\beta'_2\ln(AP)+\beta'_3\ln(PP)+\beta'_4\Delta\ln(GDP)+$$

$$\beta'_5\ln\left(\frac{RDINTENSITY_{SME}}{RDINTENSITY_{LRG}}\right)+\hat{\varepsilon}' \quad (7)$$

6. Econometrics

6.1. Unit Root test

Due to the nature of time series data, before proceeding to the execution of the models using ordinary least square (OLS), data must be tested for the presence of unit root processes to avoid spurious regressions. As is standard an (Augmented) Dickey-Fuller (ADF) test is to be carried out.[15]

Table 2 shows ADF test results for variables in log levels and in log first difference. Following Bruce (2006) and Thirtle (2002) test were carried out including an intercept and a trend.[16] Almost unanimously variables are I(1), only stable in the first difference and this will be taken into consideration for running the models. One exception is the R&D active policy (L_RDACTIVE). The unavoidable consequence is that this kind of policy will not show a long run stable relationship with productivity in a cointegration sense. Additionally R&D intensity (L_RDINTENSITY) is also a stable variable in levels and can not be used either for cointegration test purposes.

Table 2. Augmented Dickey-Fuller test statistics

	Levels		First difference	
	t-Statistic	Lag Length	t-Statistic	Lag Length
L_PRODUCTIVITY	−1.483	0	−6.174*	0
L_REL_PRODUCTIVITY	−2.834	0	−6.893*	0
L_CAPITAL	1.323	3	−5.011*	2
L_REL_CAPITAL	−1.537	0	−6.260*	0
L_FINANCE	−2.894	1	−3.753**	1
L_AGENCY	−1.477	3	−3.514**	0
L_RDACTIVE	−6.114*	0	−4.901*	4
L_M2	−2.668	1	−3.678**	0
L_EDUINDEXP	−0.259	0	−6.877*	0
L_UNIRDEXP	−2.051	0	−7.432*	0
L_GDP	−1.128	0	−5.122*	0
L_RDINTENSITY	−3.902**	0	−8.670*	0
L_REL_RDINTENSITY	−1.445	1	−11.679*	0

Source: Author estimates
* Unit root rejected at 1% confidence MacKinnon (1996) one-sided p-values
** Unit root rejected at 5% confidence MacKinnon (1996) one-sided p-values
Note: Lag length automatic based on Schwarz Info Criterion

6.2. First difference models

The presence of non-stationary I(1) processes in levels requires differentiating of variables,[17] which only allows short run interpretations. Differentiation does not allow for infinite dynamic models either, as explained in Asteriou (2007: 309), since by definition they are stable and their impacts are "worn out" as time lags tends to infinite. At most, variables can be lagged to add more dynamics to the model while considering the limitations of data length.

OLS results for both absolute and relative models and for all three pairs of policies can be observed in Table 3. Lagged first difference variables are expected to have no significance; however, some variables do show an impact in the first lag difference and thus were included when that occurred. Other variables lag or further lags were omitted since they hindered the magnitude of the adjusted r-squared while they did not yield a significant F-statistic.

Variables in absolute models generally provide higher explanatory power, that is bigger adjusted r-squared, than relative models. Non-finance policy variables however do provide relatively more satisfactory models. Additionally it is key to highlight that in relative terms R&D intensity plays an important role which is not observed in absolute terms.

A general observation taken from the results is that passive polices are significant and with expected sign in absolute models while active policies are not. The exception is the SME Agency budget which is significant but surprisingly negative, both in the absolute and relative models. This

Table 3. First difference models

Dependent Variable	**Absolute Models D(L_PRODUCTIVITY)**			**Relative Models D(L_REL_PRODUCTIVITY)**		
	FINANCE	**NON FINANCE**	**R&D**	**FINANCE**	**NON FINANCE**	**R&D**
Sample	1969–1998	1967–2001	1968–2001	1968–1998	1967–2001	1968–2001
Observations (after adjustments)	30	35	34	31	35	34
D(L_CAPITAL)/RELATIVE	0.401	0.444	0.258	0.276	0.393	0.386
	(0.099)***	(0.100)***	(0.093)***	(0.100)**	(0.079)***	(0.093)***
D(L_FINANCE) − AP	0.018			0.056		
	(0.138)			(0.155)		
D(L_M2) −PP	− 0.062			0.088		
	(0.173)			(0.138)		
D(L_M2(−1)) − PP	0.740					
	(0.210)***					
D(L_AGENCY) − AP		− 0.214			− 0.142	
		(0.111)*			(0.079)*	
D(L_AGENCY(−1)) − AP					− 0.166	
					(0.096)*	
D(L_EDUINDEXP) − PP		0.163			0.066	
		(0.056)***			(0.040)	
D(L_RDACTIVE) − AP			− 0.011			− 0.002
			(0.010)			(0.005)
D(L_UNIRDEXP) − PP			− 0.282			− 0.143
			(0.169)			(0.175)
D(L_UNIRDEXP(− 1)) − PP			0.497			
			(0.179)***			
D(L_GDP)	0.686	1.068	1.042	− 0.007	0.225	0.219
	(0.341)*	(0.205)***	(0.182)	(0.302)	(0.205)	(0.199)
D(L_RDINTENSITY)/ RELATIVE	− 0.002	− 0.027	− 0.034	0.114	0.098	0.102
	(0.037)	(0.033)	(0.030)	(0.039)***	(0.034)***	(0.043)**
C	− 0.048	− 0.043	− 0.034	0.000	− 0.016	0.003
	(0.009)***	(0.015)***	(0.011)***	(0.009)	(0.011)	(0.011)
R-squared	0.780	0.684	0.667	0.469	0.603	0.444
Adjusted R-squared	0.722	0.630	0.593	0.363	0.518	0.344
F-statistic	13.574	12.555	9.000	4.414	7.089	4.467

Source: Author

*** Significance at 1% confidence (two-sided)

** Significance at 5% confidence (two-sided)

* Significance at 10% confidence (two-sided)

Note: White Heteroskedasticity-Consistent Standard Errors & Covariance

PA and PP besides variables stand for active policies and passive policies.

/RELATIVE is used when variables are in relative terms under relative models (last three columns)

D(X) Denotes X variable is first difference and L_X denote X variable in natural logarithm.

could be explained by the Agency reacting to low productivity levels and at the same time acting to reduce the productivity gap between SMEs and large companies. However, under these dynamics, active policies for finance and R&D models are not impacting productivity. Moreover, apart from The SMEs Agency's budget, no other policy, neither active nor passive, has a significant impact on relative productivity,

Finally, the low explanatory power of control variables and passive policies in relative productivity can be interpreted as passive policies affecting absolute productivity of both SMEs and large companies in the same manner. Therefore these variables do not affect the rise or fall of relative productivity. This means changes in the economic environment do not specifically benefit or harm SMEs.

6.3. Cointegration and error correction model

Models in the previous section shed some light on the relationship between policies and productivity but the models didn't show long term dynamics thus cointegration analysis is the natural step to follow. Cointegration is the presence of a stable long term relationship among variables when they have the same order of integration, as explained in Engle and Granger's well known paper (Engle et al, 1987). Thanks to ADF it is possible to select the variables suitable for testing for cointegration. The Johansen Technique (Johansen et al, 1989) is used to test for the presence of cointegration. In total 6 tests need to be carried out for each of the three sets of variables in absolute and relative terms with attention to those non I(1) variables which are used outside the vector auto regressive term. The results are presented in Table 4 where the cointegrated relationships are shown.

Evidently there is for all cases at least one cointegration vector that is stable. It can be said that for the financial models, both absolute and relative, there are several long term stable relationships among the considered variables, including active and passive policies. The same can be said for the non-financial variables. In both cases, in the presence of other important variables both active and passive policies have a long term stable relationship with productivity. R&D related active policies can not be included in the test (only as exogenous variable), but passive policies do have a stable long time relationship among other important variables, both in absolute and relative terms.

Once cointegration is established, the short-term model as shown in section 8 can be modified into an error correction model (ECM). The specification to be used in this paper of an ECM, with one lag, is given by:

$$\Delta PRODUCTIVITY_t = \hat{\alpha}_0 + \hat{\alpha}_1 \Delta PRODUCTIVITY_{t-1} + \hat{\alpha}_2 \Delta CAPITAL_{t-1} + \hat{\alpha}_3 \Delta AP_{t-1} + \hat{\alpha}_3 \Delta PP_{t-1} + \hat{\alpha}_4 \Delta GDP_{t-1} + \hat{\lambda}\, ECT_{t-1} + \hat{\beta}_1 \Delta RDINTENSITY_1 \quad (8)$$

ECT represents the error correction term or speed of adjustment of the long term equilibrium. Thus this ECM includes both short run and long run relationships in the same model. Variables after

Table 4. Johansen cointegration test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Max-Eigen Statistic
Series: L_PRODUCTIVITY L_CAPITAL L_FINANCE L_M2 L_GDP			
Exogenous series: D(L_RDINTENSITY)			
None *	0.898	128.190	68.380
At most 1 *	0.731	59.810	39.381
At most 2	0.287	20.429	10.167
At most 3	0.199	10.262	6.661
At most 4	0.113	3.602	3.602
Series: L_PRODUCTIVITY L_CAPITAL L_AGENCY L_EDUINDEXP L_GDP			
Exogenous series: D(L_RDINTENSITY)			
None *	0.752	117.567	48.737
At most 1 *	0.580	68.830	30.349
At most 2 *	0.469	38.481	22.172
At most 3 *	0.270	16.309	11.020
At most 4 *	0.140	5.289	5.289
Series: L_PRODUCTIVITY L_CAPITAL L_UNIRDEXP L_GDP			
Exogenous series: D(L_RDACTIVE) D(L_RDINTENSITY)			
None *	0.687	69.688	39.495
At most 1 *	0.434	30.193	19.352
At most 2	0.266	10.841	10.511
At most 3	0.010	0.330	0.330
Series: L_REL_PRODUCTIVITY L_REL_CAPITAL L_FINANCE L_M2 L_GDP L_REL_RDINTENSITY			
None *	0.899	176.051	68.920
At most 1 *	0.816	107.131	50.773
At most 2 *	0.629	56.358	29.749
At most 3	0.444	26.608	17.613
At most 4	0.209	8.996	7.047
At most 5	0.063	1.949	1.949
Series: L_REL_PRODUCTIVITY L_REL_CAPITAL L_AGENCY L_EDUINDEXP L_GDP L_REL_RDINTENSITY			
None *	0.789	128.857	52.938
At most 1 *	0.601	75.919	31.233
At most 2	0.485	44.686	22.564
At most 3	0.330	22.122	13.634
At most 4	0.139	8.488	5.076
At most 5	0.095	3.412	3.412
Series: L_REL_PRODUCTIVITY L_REL_CAPITAL L_UNIRDEXP L_GDP L_REL_RDINTENSITY			
Exogenous series: D(L_RDACTIVE)			
None *	0.813	117.571	56.975
At most 1 *	0.697	60.596	40.556
At most 2	0.284	20.040	11.347
At most 3	0.135	8.693	4.933
At most 4	0.105	3.760	3.760

Source: Author
* Denotes rejection of the hypothesis at the 0.05 level
Trend assumption: Linear deterministic trend
Lags interval (in first differences): 1 to 1

Table 5. Error Correction models results

	Absolute Models D(L_PRODUCTIVITY)			Relative Models D(L_REL_PRODUCTIVITY)		
	FINANCE	**NON FINANCE**	**R&D**	**FINANCE**	**NON FINANCE**	**R&D**
Sample (adjusted)	1969–1998	1967–2001	1968–2001	1969–1998	1968–2001	1968–2001
Included observations (after adjustments)	30	35	34	30	34	34
CointegratingEquation(ECT)						
L_PRODUCTIVITY(−1)	1.000	1.000	1.000	1.000	1.000	1.000
L_CAPITAL(−1)	0.452 (0.096)***	− 2.081 (0.410)***	0.145 (0.131)	− 4.006 (2.158)*	6.450 (2.157)***	− 1.178 (0.132)***
L_FINANCE(−1)	0.517 (0.090)**			− 19.077 (2.751)***		
L_M2(−1)	− 0.340 (0.157)			− 35.742 (4.461)***		
L_AGENCY(−1)		0.047 (0.126)**			3.549 (1.237)***	
L_EDUINDEXP(−1)		− 0.447 (0.098)			− 1.550** (0.682)	
L_UNIRDEXP(−1)			0.882 (0.165)**			1.028 (0.277)
L_GDP(−1)	− 0.038 (0.259)	0.434 (0.361)	− 1.531 (0.225)***	53.466 (6.805)***	15.302 (2.625)***	− 2.688 (0.408)***
L_REL_RDINTENSITY(−1)				− 5.049 (1.309)***	3.057 (1.375)**	− 0.787 (0.131)***
C	− 11.430	0.371	5.673	59.920	− 209.031	24.308
Error Correction Model						
ECT(−1)	− 0.344 (0.087)***	0.013 (0.058)	− 0.150 (0.109)	0.001 (0.005)	− 0.016 (0.006)**	0.079 (0.054)
D(L_PRODUCTIVITY(−1))	− 0.140 (0.153)	− 0.355 (0.253)	− 0.067 (0.197)	0.270 (0.271)	− 0.156 (0.239)	0.100 (0.237)
D(L_CAPITAL(−1))	− 0.082 (0.121)	0.220 (0.208)	0.045 (0.171)	− 0.057 (0.153)	0.042 (0.134)	− 0.044 (0.144)
D(L_FINANCE(−1))	0.073 (0.126)			0.004 (0.216)		
D(L_M2(−1))	1.131 (0.171)***			− 0.156 (0.285)		

D(L_AGENCY(−1))		− 0.083			− 0.316	
		(0.148)			(0.124)**	
D(L_EDUINDEXP(−1))		0.024			− 0.047	
		(0.074)			(0.056)	
D(L_UNIRDEXP(−1))			0.468			− 0.192
			(0.219)**			(0.224)
D(L_GDP(−1))	− 0.951	1.218	0.352	0.315	− 0.197	− 0.038
	(0.471)**	(0.456)**	(0.439)	(0.566)	(0.303)	(0.335)
D(L_REL_RDINTENSITY(−1))				− 0.102	− 0.037	− 0.048
				(0.056)	(0.047)	(0.055)
C	− 0.003	− 0.027	− 0.019	− 0.005	0.007	0.010
	(0.015)	(0.024)	(0.018)	(0.017)	(0.017)	(0.017)
D(L_RDINTENSITY)	0.027	− 0.028	− 0.026			
	(0.027)	(0.045)	(0.040)			
D(L_RDACTIVE)			− 0.012			− 0.006
			(0.008)			(0.009)
R-squared	0.834	0.395	0.514	0.217	0.395	0.243
Adj. R-squared	0.781	0.239	0.383	− 0.032	0.232	0.040
F-statistic	15.748	2.522	3.930	0.870	2.428	1.195

Source: Author
*** Significance at 1% confidence (two-sided)
** Significance at 5% confidence (two-sided)
* Significance at 10% confidence (two-sided)
NOTE: Standard errors in brackets
PA and PP besides variables stand for active policies and passive policies.
/RELATIVE is used when variables are in relative terms under relative models (last three columns)
D(X) Denotes X variable is first difference and L_X denote X variable in natural logarithm.

the ECT are not included as part of the long run equilibrium as they don't share the same order of integration. Results for these models can be observed in Table 5. Variables that are not part of the ECT are listed after the constant (C) contemporaneously, including R&D active policy that is not an I(1) variable. Neither is R&D intensity included in the ECT. However relative intensity is.

Results are less conclusive than first difference models. In general ECM models fail to give robust results presenting small adjusted r-square. Therefore, though there are long run relationships they adjust too slowly to show significant ECT under the ECM specifications employed. However in the short term two passive policies are significant in absolute models. Meanwhile active policies are not significant. Thus active policies, in these finite samples, do not impact productivity in the Granger sense, while active policies do so in absolute models.

7. Conclusions

Like other studies it has been found that passive policies, the policy environment, plays a role in the performance of the average SME at the macro level both in the short and long terms. Additionally, passive policies neither benefit nor do more harm to SMEs when compared with bigger companies.

On the other hand active policies, though linked in the long run with performance, do not impact on SME productivity in the short term. The exception is the SME Agency budget on relative productivity which is attributed to a reactive behavior of the Agency.

In general the average entrepreneur and the SME sector as a whole are more concerned with the economic atmosphere than government assistance. This however, does not mean that assistance is not beneficial for some companies, but it is certainty not shown in the performance of the average SME. Moreover evidence of active policies benefits in the long run could not be found.

These results also implicate that those concerned with the SME sector development, in other countries for instance, should focus on stabilizing policies that would be conducive to growth for all sectors, including SMEs.

Table A1. K auxiliary model

Dependent Variable: D(L_ALLCAPITAL)				
Sample (adjusted): 1969 1998, Included observations: 30 after adjustments				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Probability**
D(L_ALLVALADD)	0.482	0.148	3.258	0.003
D(L_OUSTANDTOTAL)	−0.066	0.158	−0.420	0.678
D(L_OUSTANDTOTAL(−1))	0.269	0.166	1.618	0.119
D(L_M2)	0.402	0.165	2.431	0.023
D(L_M2(−1))	−0.786	0.159	−4.956	0.000
C	−0.041	0.033	−1.254	0.222
@TREND	0.003	0.001	2.683	0.013
R-squared	0.621			
Adjusted R-squared	0.522			
F-statistic	6.270			
Prob(F-statistic)	0.001			

Source: author
Note: significance is shown in Probability column- probability of the given coefficient being equal to 0).

ANNEX 1 Quantitative impact of policies on capital, a simple model

A simple model needs to be constructed to explore the impacts of financial active policies on the quantity of capital. To do so, total values of the whole SME sector are used in the regression instead of per SME variables. As such, total capital of SMEs (ALLCAPITAL) is expressed as a function of total value added of SMEs (ALLVALADD) and the policies: total outstanding loans (OUSTANDTOTAL) and M2. Results are shown in the table A1. M2 impacts with statistical significance contemporaneously and lagged while outstanding loans do not. This means that financial active policies do not impact capital quantity and could be part of the explanation for why they are not significant in the models explored in this study.

ANNEX 2. Variables and datasets details

Productivity (PRODUCTIVITY)(*): average value added per employee for companies with a capital of 10 million yen to 100 million yen.

Source: Ministry of Finance.

Capital (CAPITAL)(*): average paid-in capital per employee for companies with a capital of 10 million yen to 100 million yen.

Source: Ministry of Finance.

Finance Active policy (FINANCE)(**): The Japan Finance Corporation for Small Business, the National Life Finance Corporation, and the Shoko Chukin Bank amount of outstanding loans held by these three banks divided by the amount of SMEs (less that 100 million yen in capital, according to tax data).

Source: Research and Statistics Department, Bank of Japan.

Non-finance active policy (AGENCY): The SME Agency budget per SME as is yearly disclosed.

Source: Japan SME White Paper, years 1964 to 2003.

R&D active policy (RDACTIVE): Funds from national or local government for R&D per SME (10 million yen to 100 million yen in capital) multiplied by the proportion of SMEs receiving funds and by the percentage of companies performing R&D.

Source: R&D Survey, Statistical Survey Department, Statistics Bureau, Ministry of Internal Affairs and Communications.

Finance passive policy (M2)(**): Cash currency in circulation plus deposited money plus quasi-money plus Certificates of Deposit.

Source: Bank of Japan.

Non-finance passive policy (EDUINDEXP)(**): within the SNA's General Accounts - Settlement of Expenditure by Purpose, the sum of expenditure on "Education and Culture" and "Industrial development" without including "Agriculture, forestry and fisheries" industrial development expenditure.

Source: Budget Bureau, Ministry of Finance.

R&D passive policy (UNIRDEXP): research expenses by Research institutes and Universities.

Source: Statistical Survey Department, Statistics Bureau, Ministry of Internal Affairs and Communications.

GDP (GDP)(**): Source: Economic and Social Research Institute, Cabinet Office, Government of Japan.

R&D intensity (RDINTENSITY): number of researchers per employee multiplied by companies performing R&D.

Source: R&D Survey, Statistical Survey Department, Statistics Bureau, Ministry of Internal Affairs and Communications.

Deflator (**): All monetary variables have been deflated using a combination of a deflator from Japanese System of National Accounts 1963SNA and 1998SNA.

Source: Economic and Social Research Institute, Cabinet Office, Government of Japan.

Datasets: (*) Ministry of Finance financial survey datasets can be accessed from http://www.fabnet2.mof.go.jp/fsc/index.htm. (**) Most macroeconomic data on Japan can be found in Historical Statistics of Japan: New Edition by the Statistics Bureau (2006).

Notes

1 The naming and classification used by Snodgrass (1996) is followed. Active policies sometimes are also referred to as "direct policies" or "SME programs". On the other hand when referring to passive policies names such as "economic conditions", "policy environment", "regulation environment" or "easiness to do business" are used. Even when it could be argued that those last terms are not identical in nature it gives a good perspective of the wide range of policies included within passive policies.

2 Beck et al (2004).

3 For further information on SME problems and size disadvantages refer to Harper (1984).

4 A recent publication by Ayyagari (Ayyagari et al 2007), using cross-country analysis, explores policy impact on SME participation in the economy. However, the same kind of cross country analysis to compare productivity impacts would be difficult due to harmonization of data.

5 For example Nourzad (1995).

6 SMEs in Japan receive help not only from public sector but from private sector as well. Sometimes the latter is even greater than the former as exposed by Itoh and Urata (1994).

7 There are many kinds of active policies implemented in Japan, such as cluster formation promotion or employment assistance. Most of these schemes are difficult to measure and compare through time quantitatively.

8 SME Agency web page http://www.chusho.meti.go.jp/sme_english/outline/04/01_01.html access 03/17/2008.

9 Active policies are calculated per SME as it gives a better measurement of the "strength" of the policies that can be compared over a longer time period.

10 Financial schemes and the cost of providing credit are not accounted in the SME Agency budget but in the corresponding financial institutions. However, activities such as coordination among financial institutions, when conducted by the Agency, are included in the budget.

11 For an example list of grouped passive policies refer to Haggblade (1986).

12 Interest rates or discount rates could alternatively be used but they were discarded as they can not be used in

cointegration analysis because they do not follow unit root processes.

13 Variables were added by pairs to better organize the research. Additionally, if all policy variables were to be used, the significance would be reduced and the results would be cluttered and less conclusive.

14 It would be interesting to control for other variables such as subcontracting or business regulations, but due to the long time series data requirements such control variable datasets could not be constructed. These and other variables should be examined in further research.

15 For more details on the test refer to Dickey and Fuller (1979)

16 Unit root tests use first difference as dependent variables therefore trend specifications may not be necessary, however plotted graphs show some time trend even in first difference. In the Japanese case, there is a diminishing trend in growth thus the inclusion of a trends term in the test.

17 Even non I(1) variables are differentiated for interpretation purposes. In all cases first difference is denoted by D(GIVEN VARIABLE).

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