RIETI Discussion Paper Series 11-E-064

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August 2011

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Abstract

Following Foster, Haltiwanger, and Syverson (2008), we construct physical output based TFP (TFPQ) measures using data from the Census of Manufactures. We find that productivity differences among business establishments using TFPQ are larger than those using the traditional revenue-based TFP measures (TFPR). The negative correlation between physical output and output prices implies that establishments are facing a downward demand curve and the traditional measures of TFP are affected by idiosyncratic demand shocks. Probit estimations regarding exit behavior show that the combined effects of physical productivity improvement and higher prices through the increase in demand result in a lower probability of exit. Breaking down aggregate productivity growth using TFPQ, we find that the contribution of the net entry effects the largest factor to productivity improvement, in contrast to previous Japanese studies. Our results provide a more positive foundation for "creative destruction" policies than previous studies suggest.

Keywords: physical TFP, revenue-based TFP, and productivity difference.
JEL Classification: D22; D24; L11; L25

* * We thank Professor Masahisa Fujita (RIETI and Konan University), Mr. Masayuki Morikawa (RIETI), Professors Kyoji Fukao (Hitotsubashi University) and Kozo Kiyota (Yokohama National University) for excellent comments. This study is partly supported by a Grant-in-Aid for Scientific Research from the Ministry of Education, Culture, Sports, Science and Technology (No.22223004). The views expressed in this paper are those of authors and should not be attributed to any organization.

1. Introduction

Productivity is a main driver of long-term economic growth. To examine the role of productivity on economic performance, many economists have turned to a large collection of studies using firm-level or establishment-level data of the last two decades. What we have learned from the stock of productivity analyses are summarized as follows: there are persistent productivity differences between firms or establishments, and these productivity differences are a result of the differences in IT investment, R&D expenditures, market structure, human resources, firm turnover, and resource reallocation within an industry or a firm.[1]

However, we do not yet fully understand what causes productivity differences, and have more to do to understand these differences. One of these tasks is to identify the effect of the demand side on the productivity measurement. Under imperfect market conditions, idiosyncratic demand shocks can affect the price a firm or an establishment can set and induces price differences among firms and establishments. However, as the traditional TFP measure uses output deflators at the industry level, TFP differences measured in the traditional methods may include not only technological differences but also price differences at the firm or establishment level.

Foster, Haltiwanger, and Syverson (2008) (hereafter referred to as FHS) estimated three types of productivity measures using the Census of Manufacturers. The first is the traditional measure called TFPT mentioned above. The second measure is called TFPR. In TFPR, product sales are deflated by the product price, which is the revenue-weighted mean of product price for each establishment. The last measure, called TFPQ, uses physical output taken from the Census of Manufactures. FHS (2008) showed that physical output is negatively correlated with output price, while the traditional measures of output are positively correlated with output price. Their findings imply that the traditional measures of TFP are mixed ones that include technological and idiosyncratic demand effects. Thus they pointed out that the previous studies using traditional TFP measures were likely to bias the effects of entry and exit behavior on productivity improvement.

In Japan, the previous findings on entry and exit seemed puzzling. Nishimura, Nakajima, and Kiyota (2005), and Fukao and Kwon (2006) pointed out that the contribution of net entry on

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1 In addition to the above factors, Takii (2011) developed a model where accumulation in organizational capital supported skilled labors induced persistent productivity differences.

productivity growth at the aggregate level was small, because firms with low productivity stayed in the market and firms with high productivity exited the market. However, their findings are likely to depend on the productivity measure used. The purpose of our paper is to reexamine the reallocation mechanism and firm turnover in Japan based on the physical TFP constructed by the Census of Manufacturers.

Our results are similar to FHS(2008). Physical output is negatively correlated with output price, while traditional output measures show opposite correlations. Productivity differences using physical TFP are greater than those using traditional measures. In contrast to the previous Japanese studies, our results show that low productivity firms exit the market, although low productivity firms enter the market in studies using traditional measures. The breakdown of aggregate TFP growth also shows that low productivity firms exit the market, and the net entry effect is larger than the within effect, unlike in previous Japanese studies. Our results provide stronger support to the policies promoting the entry of high productivity firms like venture businesses and the exit of low productivity firms like zombie firms.

In the next section, we will explain our dataset and how we construct the three measures of TFP. In the third section, we will show some features of the three measures. In the fourth section, we will reexamine the effect of firm turnover on productivity at the firm and the aggregate levels. In the last section we will summarize our results and propose an agenda for future research.

2. Data Construction and the Three Measures of TFP

The data we use is from the Census of Manufactures (hereinafter referred to as CM) conducted by the Ministry of Economy, Trade, and Industry. From this census, we take the data of factor inputs, shipment values, and product amounts at the establishment level to measure the three types of TFP: traditional TFP (TFPT), revenue-based TFP (TFPR), and physical TFP (TFPQ).

The CM is conducted annually. However, only when the last digit in the year is 0, 3, 5, and 8, does the census cover all Japanese manufacturing establishments. As we can trace establishment level data consistently after the 1980 census and the data of tangible fixed assets are available when the last digit in the year is 0 and 5 after 2000, we select census years 1985, 1990, 1995, 2000 and 2005 for our sample. CM consists of three sub-censuses by size of establishment: Form A (“Kou Hyou” in Japanese) is for establishments with 30 or more employees, Form B (“Otsu Hyou” in Japanese) is for those with 4 to 29 employees, and Form C (“Hei Hyou” in Japanese) is for those fewer than 4 employees. Of the three types of censuses, we use the first two forms. 276,686 establishments responded to the census in the year 2005, accounting for 55.5% of all Japanese manufacturing establishments. CM collects information on number of employees, book value of physical capital, cost of materials and shipment values, and product amounts. Shipment values are expressed in terms of “million yen”. On the other hand, product amounts are measured in physical terms. For example, a unit of sake is expressed in “kilograms,” socks are expressed in “pairs” and tatami are expressed in “mats”. Our classification of products follows the seven-digit JSIC product classification system.

In CM, we often come across establishments that produce multiple-products. However, we do not have input data corresponding to each product. As a result, the exact productivity index cannot be calculated in terms of each product at multiple-product establishments. Thus, we focus on single-product establishments and choose 12 products for our study; “Rice wine called ‘sake’ including unrefined”, “Semi-finished green tea”, “Miscellaneous yarn-dyed narrow silk fabrics”, “Women's and girls’ knitted sweaters, cardigans and vests ”, “Socks”, “Flexible plastic film for packaging, less than 0.2 mm thickness”, “Women's and children's leather footwear”, “Fresh concrete”, “Smoked roofing tile”, “Iron castings for machinery”, “Iron wire gauze, including welded wire gauze and wire-cylinders”, “Tatami (Straw-mats and mat bases)”.

TFP at the establishment level is measured as follows:

$$TFP_{it} = Y_{it} - \alpha_L L_{it} - \alpha_K K_{it} - \alpha_M M_{it}$$

TFP_{it} is establishment i ’s total factor productivity at year t . Y_{it} is gross output, K_{it} is capital stock, L_{it} is labor inputs and M_{it} is material inputs. All variables are expressed as logarithm values. α_j denotes the shares of each input $j(j = K, L, M)$.

The type of TFP measures estimated depends on the output measure Y_{it} . TFPQ (physical productivity) uses the amount produced in the establishment as the output measure. TFPR (revenue-based productivity) uses the revenue from the sales of the product for the establishment as the output measure. Measuring TFPR, we deflate the revenue of establishment by the product price index. The product price index is constructed as follows; 1) The price index at the establishment level is found following the equation: $p_{it} = r_{it}(= p_{it}q_{it})/q_{it}$, r_{it} denotes the revenue, p_{it} is the price and q_{it} is the quantity of the output for establishment i. 2) Using the revenue weights we calculate the geometric mean p_{gt} in the price p_{it} by each product g and year t. 3) We construct the price index of product g by deflating p_{gt} by p_{g2000} which is the product price at 2000. TFPT (Traditional TFP) also uses revenue-based output, but deflated by price deflator p_{mt} at the industry level taken from JIP 2010 database[2]. Industry m is one to which establishment i belongs.

All factor inputs are common to all types of TFP measure. Using the nominal book values of tangible fixed assets in CM, we calculated the net capital stock of establishment in constant 2000 prices as follows:

$$K_{it} = BV_{it} * (INK_{mt} / IBV_{mt})$$

where BV_{it} represents the book value of firm *i*'s tangible fixed capital in year *t*, INK_{mt} stands for the net capital stock of industry *m* in constant 2000 prices, and IBV_{mt} denotes the book value of industry *j*'s capital. We calculate INK_{mt} and IBV_{mt} from JIP 2010. Labor inputs are total working hours, that is the product of total workers taken from CM and working hours taken from JIP 2010 database. Material inputs are the reported material expenditures taken from CM, deflated by the corresponding input price taken from JIP 2010.

The cost share of each input is calculated by dividing each cost of input by total costs. Costs of labor input are total wage in each establishment, which is taken from CM. The costs of material inputs are total expenditures of material inputs also taken from CM. As for the cost of capital c, we calculated as follows:

$$c = \frac{p(1-\tau Z)}{1-\tau}\left(r + \delta - \frac{\Delta p}{p}\right), \quad Z = \sum_{t=1}^{\infty} \frac{(1-\delta)^{t-1}\delta}{(1+r)^t} = \frac{\delta}{t+\delta}$$

[2] JIP 2010 contains annual data on 108 sectors covering the entire Japanese economy from 1970-2007 and can be used for total factor productivity (TFP) analyses. The database includes detailed information on sectoral capital service input indices and labor service input indices. It also contains information on real capital stocks and the nominal cost of capital by type of capital and by industry, annual nominal and real input-output tables, and supplementary tables that include statistics on trade, outward FDI, and Japan's industrial structure. All real values are based on 2000 prices.

p is the investment deflator taken from the JIP 2010 database, τ is the effective corporate tax rate, r is the Japanese national bond rate taken from the website of the Bank of Japan, and δ is the depreciation rate of tangible assets (the value is 0.079 following Masuda(2000)). Z represents the expected present value of tax saving due to depreciation allowances on one unit of investment.

Number of observations by product and by year is shown in Appendix A2. Using 28,941 observations, we measured TFP.

3. Features of the Three Measures of TFP

Table 1 shows the means and variances of the three measures of TFP and product prices. We find that the variances of TFPQ are larger than those of TFPT and TFPR in all products. The results imply that the traditional TFP measures underestimate differences in total factor productivity. Although the variance of TFPQ in the total sample is affected by the inclusion of different types of products, we find that the variances of TFPQ are larger than those of TFPT and TFPR in each product.

(Place Table1 around here)

We examine the persistence of TFP differences using simple autoregressive regressions. Table 2 shows the coefficients of lag variables of each TFP measure and product price. We estimated not only simple unweighted regressions but also revenue-weighted regressions. As each lag variable is from five years earlier than a corresponding dependent variable, we calculated implied one-year persistence rates. In Table 2, we find strong persistence in all regressions. In particular, the persistence in the difference in TFPQ is stronger than that in the traditional measures of TFP. These results imply that productivity differences are more persistent than previous studies suggested.

(Place Table 2 around here)

We examine correlations between each output measure, each TFP measure and product price in Table 3. Each output measure is positively correlated with each TFP measure. Although the revenue-based output measure is positively correlated with product price, physical output is negatively correlated with product price as shown in FHS (2008). These results suggest that firms face downward-sloping demand curves, and idiosyncratic demand shock affects TFP measures.

(Place Table 3 around here)

Following FHS (2008), we estimated the following equation to extract the idiosyncratic demand shock.

$$\ln q_{it} = \alpha_0 + \alpha_1 \ln p_{it} + \sum_t \beta_i YEAR_t + \mu_{it} \qquad (1)$$

In Equation (1) q_{it} is the physical output of product i, p_{it} is the price of product i , and *YEAR* denotes the year dummy. We estimate Equation (1) by not only OLS but also the instrumental variable method, because product price is correlated with μ_{it}, which indicates idiosyncratic demand shock. The instruments are physical TFP levels.

Estimation results are shown in Table 4. Coefficients of product price indicate the price elasticity of output. As all price elasticities of output are negative and significant, we confirm firms face downward demand curves. Although the price elasticities of some products are less than 1 in OLS estimations, we find that price elasticities of all products are greater than 1 in IV estimates. The results are consistent with those in FHS(2008).[3]

(Place Table 4 around here)

In Equation (1), the other factors including the residual are recognized as idiosyncratic demand factors. Thus, using the estimation results of Equation (1), we are able to extract the idiosyncratic demand factors. Table 5 shows the correlations between the idiosyncratic demand factor and each TFP measure. Although each TFP measure is positively correlated with the

[3] Because physical output and product price have persistence as shown in Table 2, the residual term is likely to have a serial correlation. Even though there is a serial correlation in the estimations in Equation (1), the coefficients are consistent estimators. When we estimate Equation (1) using $q_{it} - q_{it-k}$ and $p_{it} - p_{it-k}$ instead of q_{it} and p_{it}, our results do not change.

demand factor, the correlation between TFPQ and the demand factor is much smaller than that between TFPT or TFPR and the demand factor. The results imply that TFPQ indicating pure technological efficiency is not related to the demand factor, while the traditional measures of TFP include the effects from the demand side.

(Place Table 5 around here)

4. TFP and Entry and Exit Behaviors

Based on the studies in the previous section, we examine the effects of entry and exit on productivity. Entry and exit rates in our sample data are shown in Appendix A3. As entry and exit rates in the whole economy are less than 10%, these rates in our sample are higher than those in the whole economy.

To compare the performances of entry and exit firms with incumbents, we estimate the following equation.

$$f_{it} = \gamma_0 + \gamma_1 Exit_{it} + \gamma_2 Entry_{it} + \gamma_3 Young_{it} + \gamma_4 Old + \sum_{gt} \lambda INDYEAR_{gt} + \varepsilon_{it} \qquad (2)$$

In Equation (2), f_{it} is each TFP measure, output price or demand factor. *Exit* and *Entry* are exit and entry dummies. In *Exit,* firms that exit the market in the period from t-k to t are 1. Similarly, in *Entry*, firms that enter the market in the period from t-k to t are 1. *Young* is also a dummy variable where an establishment that appeared after 2000 is 1. *Old* is a dummy variable for a firm operating from *the year 1980 or 1985*. INDYEAR is a product-year dummy. Like Table 2, we estimated Equation (2) by not only by simple OLS but also revenue-weighted regressions.

The estimation results are summarized in Table 6. Although FHS (2008) showed that the TFPQ in establishments entering the market was higher than that of incumbents, our results show that all types of TFP in exit and entry establishments are lower than those of incumbents. Compared to the previous Japanese studies on entry and exit behavior, our results show that all TFP measures in exit establishments are lower than those in incumbents, while the previous studies showed the opposite findings. Although our results show that the establishments with a relatively lower TFP are entering the market, we find that younger establishments are more productive than older establishments. These results imply that newcomers continued to improve in productivity after their entrance as shown in Kawakami and Miyagawa (2008). Furthermore, prices and demands of exit and entry establishments are lower than those of incumbents. These results are consistent with those in FHS (2008).

(Place Table 6 around here)

When we estimate Equation (2) by product, we find that the productivities of new entrants is higher than those in incumbents in some products (semi-finished green tea, miscellaneous yarn-dyed narrow silk fabrics, women's and girls' knitted sweaters, cardigans and vests, socks, women's and children's leather footwear, smoked roofing tile).[4] The sizes of these establishments measured by number of employees or capital stock is similar to those of establishments that produce other products. However, the number of establishments that produce the above products is lower than those that produce other products. In addition, the price cost margins in the above products are lower than those in other products. Hence, we expect that the more competitive the market and the smaller the market size measured by number of establishments, the more easily high productivity firms enter a market.

Following FHS (2008), we examine the selection mechanism by probit estimation. Kiyota and Takizawa (2007) showed that relatively high productivity lowered the probability that firms would exit the market. Consistent with their study, Table 7 indicates that productivity improvements by any measure lower the exit probability. However, the marginal probability of TFPQ is lower than those in other TFP measures when the variable that we focus on is isolated. Yet, in the joint estimations including TFPQ and product price or TFPQ and idiosyncratic demand, the effects of TFPQ on exit probability are greater. The results imply that the effects of revenue-based measures of TFP on exit probability are likely to be mixed effects of pure technological efficiency effects and other factors. The price effect on exit behavior is complicated. If product price is affected by high idiosyncratic demand, a higher product price will lower the exit probability. On the other hand, if product price is determined by production costs, a higher product price will lead to a greater exit probability. The results in Table 7 show

[4] The estimation results of Equation (2) by product are shown in Table A1.

that product price is affected by the demand effect in the joint estimation, while the price effect is ambiguous when product price is an isolated independent variable.

(Place Table 7 around here)

.Finally, we examine the effects of entry and exit on the aggregate productivity growth to break down TFP growth into components following Bailey, Hulten , and Campbell (1992) and Foster, Haltiwanger, and Krizan (2001). Their decomposition is shown as follows;

$$\Delta TFP_t = \sum_{i\in C} s_{it-k}\Delta TFP_{it} + \sum_{i\in C}(TFP_{it} - \overline{TFP}_{t-k})\Delta s_{it} + \sum_{i\in C}\Delta TFP_{it}\Delta s_{it} + \sum_{i\in E} s_{it}(TFP_t - \overline{TFP}_{t-k}) + \sum_{i\in X} s_{it-k}(TFP_{it-k} - \overline{TFP}_{t-k}) \quad (3)$$

TFP_t is the output share-weighted aggregate TFP at t. TFP_{it} is total factor productivity for establishment i. We measure three types of TFP in the decomposition. s_{it} is the output share for establishment i. *C*, *E*, and *X* denote a group of incumbent establishments, entry establishments and exit establishments, respectively. The first term in the right hand side of Equation (3) represents the "within" effect, the second term represents the "between" effect, and the third term represents the covariance effect. The fourth term in the right hand side in (1) is called the entry effect and the last term is called the exit effect.

The results of decomposition are summarized in Table 8. [5]The results using revenue-based TFP are similar to the previous Japanese studies. The net entry effects are negative, while the contributions of the "within" effect to aggregate productivity growth are not positive although they were in previous studies. On the other hand, the decomposition using TFPQ shows that both entry and exit promote productivity improvement and the contribution of the net entry effect to the aggregate productivity growth is the largest factor, also in contrast to previous studies. The contribution of the "within effect" in the decomposition using TFPQ is smaller than that in the decomposition using TFPT or TFPR. Our results imply entry and exit contribute

[5] To include both samples of new entrants and exit firms, we use the data of Census of Manufacturers in 1990, 1995, and 2000.

more than we expected to the aggregate productivity improvement based on the previous studies and provide positive foundations for policies of “creative destruction”.

(Place Table 8 around here)

When we estimate Equation (2) by product, we found that productivities of new entrants are higher than those of incumbents in some products. We separate the establishments that make these products from the total sample and decompose TFP following Equation (3). We call this sample subsample (1). We also decompose TFP in other products following Equation (3). We call this sample subsample (2). The results of this decomposition in two subsamples are also shown in Table 8. As expected, we find that the net entry effect in subsample (1) is much greater than that in the decomposition using the total sample. On the other hand, the net entry effect is negative in subsample (2). Although, the results of the decomposition of TFP depend on the type of new entrants, our results are different from the previous studies in the sense that the labor productivity growth depends on the sign of the net entry effect.

5. Concluding Remarks

Following Foster, Haltiwanger, and Syverson (2008), we construct a physical output based TFP (TFPQ) measure using the Census of Manufactures. TFPQ shows different evidence regarding productivity differences and firm turnover from other traditional TFP measures.

We find that productivity differences measured by TFPQ are greater than those measured by traditional TFP measures. The finding shows that the traditional TFP measures including the effect of product price and demand effect underestimate productivity differences induced by technological efficiency among establishments. The correlation between each output measure and product price show that revenue-based output is positively correlated with output price, while physical output is negatively correlated with output price. The results show that the traditional TFP measures are affected by the effect of output price and idiosyncratic demand shock, although establishments face a downward demand curve.

The difference in the TFP measures affects the interpretation of the selection mechanism in Japan. The previous studies in Japan on the selection mechanism showed that high productivity firms exited from the market and low productivity firms stayed in the market. However, we find that low productivity establishments exit from the market. Although the productivity levels of new entrants are lower than those of incumbents in the whole sample, in the competitive and small-sized product market, productivities of new entrants are higher than those of incumbents. We also find that exit behavior is affected not only by productivity but also by changes in product price induced by demand shocks. In the decomposition of aggregate productivity growth in the previous studies in Japan, the "within effect" was the largest factor of productivity growth, and the contribution of the net entry effect to productivity growth was not crucial because high productivity firms exited from the market. However, our study on the productivity decomposition using TFPQ shows that the net entry effect is the largest factor of productivity growth, in contrast to previous studies. When we focus on products in competitive and small-sized markets, the contribution of new entrants to TFP growth is larger than that of the total sample.

Although the previous studies would not strongly support "creative destruction" policies unless the government and financial institutions stop supporting "zombie" firms, our results using TFPQ provide more positive foundations for "creative destruction". Our results suggest features of markets where high productivity firms can easily enter. In addition, our studies show that the demand factor affects the "creative destruction mechanism".

The limitation of our study is that we focus on single-product establishments that produce homogenous goods. As shown in Kawakami and Miyagawa (2010), multi-product firms are more productive than single-product firms. Although it is difficult for us to extend our analysis to multi-product establishments, we believe that their performances are also affected by the demand factor, because firms that produce differentiated goods face downward demand curves.

Furthermore, although we find that the demand factor affects the selection mechanism, we are not able to address what kind of demand policy is required,. The aggregate demand policy may support low efficiency firms. To attain efficiency in the whole economy, we have to consider the optimal demand allocation policies as a next task.

References

Baily, Martin N., Hulten, Charles and Campbell, David (1992) "Productivity Dynamics in Manufacturing Plants," *Brookings Papers on Economic Activity: Microeconomics*, Vol.1992, pp. 187-249.

Foster, Lucia, John Haltiwanger, and C.J. Krizan (2001), "Aggregate Productivity Growth: Lessons from Microeconomic Evidence," Edward Dena, Michael Harper, and Charles Hulten eds., *New Development in Productivity Analysis*, The University of Chicago Press, Chicago, pp. 303-363.

Foster, Lucia, John Haltiwanger, and Chad Syverson (2008), "Reallocation, Firm Turnover, and Efficiency: Selection on Productivity or Profitability?" *The American Economic Review* Vol. 98, No.1 pp. 394-425.

Fukao, Kyoji and Kwon, Hyeog Ug (2006) "Why Did Japan's TFP Growth Slow Down in the Lost Decade? An Empirical Analysis Based on Firm-Level Data of Manufacturing Firms," *Japanese Economic Review*, Vol.57, pp. 195-228.

Kawakami, Atsushi, and Tsutomu Miyagawa (2008), "Productivity and Finance of New Entrants (Shinki Sannyuu Kigyou no Seisansei to Shikin Choutatsu)," Kyoji Fukao and Tsutomu Miyagawa eds., *Productivity and Japan's Economic Growth (Seisansei to Nihon no Keizai Seichou),*" The University of Tokyo Press, Tokyo, pp. 269-292 (in Japanese).

Kawakami, Atsushi, and Tsutomu Miyagawa (2010), "Product Switching and Firm Performance in Japan," *RIETI Discussion Paper Series* 10-E-043.

Kiyota, Kozo, and Miho Takizawa (2007), "The Shadow of Death: Pre-exit Performance of Firms in Japan," *Hi-Stat Discussion paper Series* No. 204, The Institute of Economic Research, Hitotsubashi University.

Masuda, Muneto (2000), "A Perception of Japan's Capital Stock Statistics: A Trial Calculation of Capital Stock in Market Value（Shihon Sutokku Tokei no Mikata: Shijo Hyoka Shihon Sutokku no Shisan ）" (*Research and Statistics Department Discussion Paper Series*, No.00-5, Bank of Japan, Tokyo (in Japanese).

Nishimura, Kiyohiko G., Nakajima, Takanobu and Kiyota, Kozo (2005) "Does the Natural Selection Mechanism Still Work in Severe Recessions? -- Examination of the Japanese

Economy in the 1990s," *Journal of Economic Behavior and Organization*, Vol.58, No.1, pp. 53-78.

Takii, K. (2011), "Persistent Productivity Differences between Firms," *RIETI Discussion paper Series* 11-E-048, Research Institute of Economy, Trade, and Industry.

Table 1. Summary Statistics

1 Rice wine called 'sake' including unrefined	Obs	Mean	Variance	2 Semi-finished green tea	Obs	Mean	Variance	3 Miscellaneous yarn-dyed narrow silk fabrics	Obs	Mean	Variance
TFPT	4447	0.51	0.18	TFPT	257	0.11	0.30	TFPT	781	-0.10	0.46
TFPR	4447	0.27	0.19	TFPR	257	-0.01	0.31	TFPR	781	0.09	0.45
TFPQ	4447	-3.63	0.31	TFPQ	257	1.90	0.48	TFPQ	781	-6.98	1.48
lnPrice	4447	4.09	0.15	lnPrice	257	-1.83	0.15	lnPrice	781	6.91	1.02

4 Women's and girls' knitted sweaters, cardigans and vests	Obs	Mean	Variance	5 Socks	Obs	Mean	Variance	6 Flexible plastic film for packaging, less than 0.2 mm thickness	Obs	Mean	Variance
TFPT	1855	0.23	0.20	TFPT	831	0.36	0.27	TFPT	1563	0.39	0.15
TFPR	1855	0.25	0.21	TFPR	831	0.46	0.28	TFPR	1563	0.49	0.16
TFPQ	1855	-0.71	0.68	TFPQ	831	-2.51	0.43	TFPQ	1563	-3.21	0.29
lnPrice	1855	0.97	0.50	lnPrice	831	2.89	0.19	lnPrice	1563	3.63	0.15

7 Women's and children's leather footwear	Obs	Mean	Variance	8 Fresh concrete	Obs	Mean	Variance	9 Smoked roofing tile	Obs	Mean	Variance
TFPT	908	0.33	0.17	TFPT	13129	0.47	0.05	TFPT	428	0.00	0.32
TFPR	908	0.28	0.17	TFPR	13129	0.44	0.05	TFPR	428	-0.05	0.33
TFPQ	908	1.03	0.31	TFPQ	13129	0.29	0.07	TFPQ	428	-2.78	1.10
lnPrice	908	-0.72	0.18	lnPrice	13129	0.17	0.03	lnPrice	428	2.80	0.74

10 Iron castings for machinery	Obs	Mean	Variance	11 Iron wire gauze, including welded wire gauze and wire-cylinders	Obs	Mean	Variance	12 Tatami (Straw-mats and mat bases)	Obs	Mean	Variance
TFPT	2781	0.24	0.12	TFPT	1208	0.27	0.16	TFPT	753	0.09	0.15
TFPR	2781	0.45	0.12	TFPR	1208	0.33	0.15	TFPR	753	0.00	0.16
TFPQ	2781	-2.68	0.24	TFPQ	1208	-2.55	0.37	TFPQ	753	0.94	0.30
lnPrice	2781	3.08	0.10	lnPrice	1208	2.85	0.23	lnPrice	753	-0.82	0.17

Note: We test the equality of variances between TFPT and TFPQ, and between TFPR and TFPQ in each product. The results show that TFPT, TFPR and TFPQ do not have the same variances, and the variance of TFPQ is significantly larger than that of TFPT or TFPR.

Table 2. Persistence of Productivity, Price and Demand Shock

Unweighted regression

Dependent Variable	Five-Year Horizon Coef.	Std. Err	Implied One Year Persistence Rate
Traditional TFP	0.679	0.010	0.925
Revenue TFP	0.665	0.010	0.922
Physical TFP	0.975	0.003	0.995
lnPrice	0.973	0.003	0.995

Weighted regression

Dependent Variable	Five-Year Horizon Coef.	Std. Err	Implied One Year Persistence Rate
Traditional TFP	0.700	0.000	0.931
Revenue TFP	0.715	0.000	0.935
Physical TFP	0.963	0.000	0.992
lnPrice	0.971	0.000	0.994

Notes: Sample includes continuing establishments only.
Weighted regressions are weighted by revenue.
All regressions include a constant term and product-year interaction dummies.

Table 3. Correlations for Output, Price, and Productivity Measures

	Traditional Output	Revenue Output	Physical Output	Traditional TFP	Revenue TFP	Physical TFP	lnPrice
Traditional Output	1						
Revenue Output	0.991 ***	1					
Physical Output	0.9191 ***	0.9046 ***	1				
Traditional TFP(TFPT)	0.5862 ***	0.5577 ***	0.5369 ***	1			
Revenue TFP(TFPR)	0.5669 ***	0.5832 ***	0.5079 ***	0.9218 ***	1		
Physical TFP(TFPQ)	0.3562 ***	0.3253 ***	0.6147 ***	0.6721 ***	0.5855 ***	1	
lnPrice	0.0796 ***	0.1025 ***	-0.3176 ***	0.042 ***	0.0892 ***	-0.7018 ***	1

Notes: We remove product-year effects from each variable before computing the statistics. N=28941.
*** indicates statistical significance at 1%.

Table 4. Estimating Price Elasticities by Products

OLS Estimation

Products	Price Coefficient	Std. Err
1 Rice wine called 'sake' including unrefined	-0.74	0.03
2 Semi-finished green tea	-0.45	0.06
3 Miscellaneous yarn-dyed narrow silk fabrics	-0.67	0.02
4 Women's and girl's knitted sweaters, cardigans and vests	-0.62	0.03
5 Socks	-0.49	0.05
6 Flexible plastic film for packaging, less than 0.2 mm thickness	-0.75	0.08
7 Women's and children's leather footwear	-0.56	0.06
8 Fresh concrete	-1.10	0.03
9 Smoked roofing tile	-0.97	0.02
10 Iron castings for machinery	-1.11	0.05
11 Iron wire gauze, including welded wire gauze and wire-cylinders	-1.16	0.05
12 Tatami (Straw-mats and mat bases)	-1.26	0.02

Note: All regressions include a constant term and product-year interaction dummies.

IV Estimation

Products	Price Coefficient	Std. Err
1 Rice wine called 'sake' including unrefined	-4.51	0.14
2 Semi-finished green tea	-10.78	1.87
3 Miscellaneous yarn-dyed narrow silk fabrics	-1.57	0.05
4 Women's and girl's knitted sweaters, cardigans and vests	-1.87	0.06
5 Socks	-3.93	0.27
6 Flexible plastic film for packaging, less than 0.2 mm thickness	-3.58	0.19
7 Women's and children's leather footwear	-3.53	0.24
8 Fresh concrete	-14.19	0.44
9 Smoked roofing tile	-1.73	0.07
10 Iron castings for machinery	-6.27	0.24
11 Iron wire gauze, including welded wire gauze and wire-cylinders	-3.99	0.18
12 Tatami (Straw-mats and mat bases)	-3.01	0.14

Instrumented: lnprice
Instruments: TFPQ

Table 5. Correlations between Productivity Measures and Demand Shock

	Traditional TFP(TFPT)	Revenue TFP(TFPR)	Physical TFP(TFPQ)	Demand Shock
Traditional TFP(TFPT)	1			
Revenue TFP(TFPR)	0.9196 ***	1		
Physical TFP(TFPQ)	0.2705 ***	0.2434 ***	1	
Demand Shock	0.2802 ***	0.3409 ***	0.0727 ***	1

Notes: *** indicates statistical significance at 1%.

We use our pooled sample of 28,941 plant-year observations.

Table 6. Effects of Entry and Exit on Productivities

Unweighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.135	0.005	-0.125	0.005	-0.402	0.024	0.272	0.023	-0.523	0.029
Entry_dummy	-0.079	0.007	-0.069	0.007	-0.140	0.032	0.067	0.030	-0.398	0.038
Young	-0.001	0.014	-0.022	0.014	-0.041	0.063	0.028	0.060	-0.022	0.076
Old	-0.003	0.005	-0.001	0.005	-0.027	0.023	0.035	0.022	-0.090	0.028

Weighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.071	0.000	-0.067	0.000	-0.007	0.000	-0.067	0.000	-0.354	0.000
Entry_dummy	-0.088	0.000	-0.080	0.000	-0.162	0.000	0.077	0.000	-0.462	0.000
Young	0.116	0.000	0.087	0.000	0.080	0.000	0.025	0.000	0.190	0.000
Old	-0.014	0.000	0.010	0.000	0.176	0.000	-0.176	0.000	-0.040	0.000

Notes: The sample is our pooled sample of 28,941 plant-year observations.
Weighted regressions are weighted by revenue.
All regressions include a constant term and product-year interaction dummies.

Table 7. Probit Estimation of Plant Exits

Unweighted Regressions

Specification	【1】		【2】		【3】		【4】		【5】		【6】		【7】	
	Coef	Std. Err	Coef	Std. Err	Coef	S.E.	Coef	Std. Err	Coef	Std. Err	Coef	Std. Err	Coef	Std. Err
Traditional TFP	-0.5475	0.0210												
Revenue TFP			-0.5139	0.0211										
Physical TFP					-0.0735	0.0044					-0.5258	0.0214	-0.0871	0.0049
lnPrice							0.0541	0.0047			-0.4875	0.0226		
Demand Shock									-0.0759	0.0046			-0.0795	0.0047

Weighted Regressions

Specification	【1】		【2】		【3】		【4】		【5】		【6】		【7】	
	Coef	Std. Err	Coef	Std. Err	Coef	S.E.	Coef	Std. Err	Coef	Std. Err	Coef	Std. Err	Coef	Std. Err
Traditional TFP	-0.4410	0.0001												
Revenue TFP			-0.4266	0.0001										
Physical TFP					-0.0138	0.0000					-0.4778	0.0001	-0.0290	0.0000
lnPrice							-0.0024	0.0000			-0.4702	0.0000		
Demand Shock									-0.0408	0.0000			-0.0457	0.0000

Notes: Dependent variables are Exit dummies.

Weighted regressions are weighted by revenue.

All regressions include a constant term and product-year interaction dummies.

Table 8. Decomposition of Industry Productivity Growth

All products

		Components of Decomposition					
	Total growth	Within	Between	Cross	Entry	Exit	Net entry
TFPT	-0.010	-0.004	-0.002	0.009	-0.015	-0.001	-0.013
TFPR	-0.005	-0.001	-0.002	0.008	-0.012	-0.001	-0.011
TFPQ	0.025	-0.009	0.001	0.002	0.024	-0.007	0.031

Subsample (1)

		Components of Decomposition					
	Total growth	Within	Between	Cross	Entry	Exit	Net entry
TFPT	-0.031	-0.006	-0.003	0.007	-0.027	0.002	-0.029
TFPR	-0.018	-0.005	-0.003	0.005	-0.014	0.002	-0.016
TFPQ	0.057	-0.015	0.003	0.000	0.052	-0.016	0.068

Subsample (2)

		Components of Decomposition					
	Total growth	Within	Between	Cross	Entry	Exit	Net entry
TFPT	0.009	-0.002	-0.001	0.011	-0.003	-0.005	0.002
TFPR	0.007	0.002	-0.001	0.012	-0.011	-0.005	-0.006
TFPQ	-0.006	-0.003	-0.001	0.003	-0.003	0.002	-0.005

Notes: This table shows decompositions of industry level productivity growth for the three different productivity measures using equation (3) from the text.

Subsample(1) includes product nos. 2, 3, 4, 5, 7, 9 and subsample (2) includes product nos. 1, 6, 8, 10, 11, 12.

Table A1. Effects of Entry and Exit on Productivities by Product

Product1: Rice wine called 'sake' including unrefined

Unweighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.234	0.016	-0.234	0.016	-0.142	0.021	-0.092	0.014	-1.206	0.065
Entry_dummy	-0.108	0.024	-0.108	0.024	-0.113	0.030	0.005	0.020	-0.510	0.094
Young	-0.260	0.079	-0.260	0.079	-0.171	0.100	-0.089	0.068	-0.243	0.312
Old	-0.087	0.039	-0.087	0.039	-0.153	0.050	0.066	0.034	-0.190	0.154

Weighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.255	0.000	-0.255	0.000	-0.102	0.000	-0.153	0.000	-1.937	0.000
Entry_dummy	-0.240	0.000	-0.240	0.000	-0.154	0.000	-0.086	0.000	-2.124	0.001
Young	0.044	0.000	0.044	0.000	-0.018	0.000	0.062	0.000	1.877	0.002
Old	0.003	0.000	0.003	0.000	-0.001	0.000	0.004	0.000	0.295	0.001

Product2: Semi-finished green tea

Unweighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.028	0.069	-0.061	0.070	-0.052	0.087	0.026	0.048	-0.214	0.471
Entry_dummy	0.005	0.079	0.071	0.081	-0.084	0.099	0.071	0.055	0.839	0.539
Young	-0.215	0.097	-0.210	0.099	-0.283	0.122	0.098	0.067	0.444	0.662
Old	0.015	0.093	-0.141	0.094	0.130	0.116	-0.151	0.064	-1.653	0.632

Weighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	0.010	0.000	-0.039	0.000	-0.086	0.000	0.091	0.000	0.601	0.003
Entry_dummy	-0.079	0.000	-0.025	0.000	-0.173	0.000	0.078	0.000	1.339	0.003
Young	-0.034	0.000	-0.025	0.000	-0.080	0.001	0.075	0.000	0.220	0.004
Old	-0.058	0.000	-0.212	0.000	-0.098	0.000	-0.006	0.000	0.309	0.003

Product3: Miscellaneous yarn-dyed narrow silk fabrics

Unweighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.204	0.051	-0.140	0.051	-0.121	0.092	-0.062	0.076	-0.468	0.100
Entry_dummy	0.175	0.075	0.171	0.075	0.357	0.137	-0.189	0.114	0.203	0.148
Young	-0.277	0.131	-0.343	0.131	-0.159	0.238	-0.138	0.198	-0.591	0.258
Old	-0.100	0.052	0.020	0.052	-0.143	0.094	0.077	0.078	0.013	0.102

Weighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.138	0.000	-0.070	0.000	-0.002	0.001	-0.115	0.001	-0.437	0.001
Entry_dummy	0.000	0.000	0.003	0.000	0.434	0.001	-0.438	0.001	-0.181	0.001
Young	-0.227	0.001	-0.311	0.001	0.065	0.002	-0.315	0.001	-0.999	0.002
Old	-0.001	0.000	0.132	0.000	-0.076	0.001	0.112	0.001	0.339	0.001

Product4: Women's and girls' knitted sweaters, cardigans and vests

Unweighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.055	0.023	-0.055	0.023	0.189	0.042	-0.227	0.036	-0.599	0.058
Entry_dummy	-0.050	0.027	-0.048	0.026	0.100	0.048	-0.151	0.041	-0.223	0.067
Young	-0.018	0.068	-0.022	0.068	-0.082	0.124	0.049	0.106	0.175	0.171
Old	0.123	0.023	0.144	0.023	0.273	0.042	-0.105	0.036	0.021	0.058

Weighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.045	0.000	-0.042	0.000	0.257	0.000	-0.286	0.000	-0.596	0.000
Entry_dummy	-0.005	0.000	-0.004	0.000	0.127	0.000	-0.134	0.000	-0.257	0.000
Young	-0.089	0.000	-0.090	0.000	-0.186	0.001	0.084	0.001	0.078	0.001
Old	0.097	0.000	0.120	0.000	0.284	0.000	-0.142	0.000	0.147	0.000

Product5: Socks

Unweighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.029	0.043	-0.016	0.043	0.091	0.054	-0.104	0.035	-0.805	0.135
Entry_dummy	-0.042	0.057	-0.049	0.058	0.096	0.072	-0.141	0.047	-0.704	0.182
Young	-0.096	0.108	-0.134	0.108	0.046	0.136	-0.154	0.088	-0.354	0.341
Old	0.063	0.039	0.156	0.039	0.115	0.049	-0.003	0.032	-0.056	0.123

Weighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	0.006	0.000	0.007	0.000	0.147	0.000	-0.127	0.000	-0.725	0.001
Entry_dummy	-0.096	0.000	-0.106	0.000	0.078	0.000	-0.177	0.000	-0.608	0.001
Young	-0.118	0.001	-0.142	0.001	0.019	0.001	-0.149	0.000	-0.606	0.002
Old	0.052	0.000	0.145	0.000	0.105	0.000	-0.005	0.000	-0.038	0.001

Product6: Flexible plastic film for packaging, less than 0.2 mm thickness

Unweighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.125	0.023	-0.042	0.023	-0.213	0.031	0.109	0.023	-0.445	0.097
Entry_dummy	-0.155	0.024	-0.172	0.025	-0.175	0.033	0.014	0.024	-0.584	0.104
Young	0.101	0.042	0.045	0.042	0.089	0.057	-0.003	0.041	0.302	0.176
Old	-0.059	0.023	0.113	0.023	-0.157	0.031	0.148	0.023	0.329	0.097

Weighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.040	0.000	0.050	0.000	-0.205	0.000	0.188	0.000	0.141	0.000
Entry_dummy	-0.132	0.000	-0.142	0.000	-0.057	0.000	-0.079	0.000	-0.735	0.000
Young	0.311	0.000	0.269	0.000	0.166	0.000	0.136	0.000	0.569	0.001
Old	-0.046	0.000	0.136	0.000	-0.239	0.000	0.247	0.000	0.691	0.000

Table A1. Effects of Entry and Exit on Productivities by Product (Cont'd.)

Product7: Women's and children's leather footwear

Unweighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.036	0.030	-0.076	0.030	0.099	0.041	-0.139	0.031	-0.877	0.112
Entry_dummy	-0.086	0.035	-0.032	0.035	0.077	0.048	-0.135	0.036	-0.612	0.132
Young	0.085	0.059	0.088	0.059	0.007	0.080	0.063	0.060	0.220	0.220
Old	0.067	0.030	-0.011	0.030	0.135	0.041	-0.091	0.031	-0.485	0.113

Weighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	0.049	0.000	0.012	0.000	0.163	0.000	-0.117	0.000	-0.771	0.000
Entry_dummy	-0.082	0.000	-0.036	0.000	0.120	0.000	-0.178	0.000	-0.583	0.001
Young	0.086	0.000	0.089	0.000	0.029	0.000	0.043	0.000	0.085	0.001
Old	0.078	0.000	0.010	0.000	0.132	0.000	-0.072	0.000	-0.381	0.000

Product8: Fresh concrete

Unweighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.010	0.005	-0.009	0.005	-0.013	0.006	0.000	0.004	-0.111	0.056
Entry_dummy	-0.059	0.007	-0.049	0.007	-0.017	0.008	-0.029	0.005	-0.525	0.074
Young	0.032	0.013	0.023	0.013	0.028	0.015	-0.007	0.010	-0.019	0.141
Old	0.046	0.004	0.017	0.004	0.042	0.005	-0.013	0.003	-0.045	0.045

Weighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.004	0.000	-0.004	0.000	-0.002	0.000	-0.005	0.000	-0.136	0.000
Entry_dummy	-0.045	0.000	-0.036	0.000	0.000	0.000	-0.032	0.000	-0.480	0.000
Young	0.047	0.000	0.038	0.000	0.028	0.000	0.008	0.000	0.215	0.001
Old	0.021	0.000	-0.008	0.000	0.026	0.000	-0.020	0.000	-0.187	0.000

Product9: Smoked roofing tile

Unweighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.121	0.061	-0.178	0.061	-0.085	0.113	-0.035	0.092	-0.526	0.115
Entry_dummy	0.004	0.074	0.045	0.075	0.088	0.138	-0.072	0.113	0.020	0.141
Young	0.407	0.261	0.388	0.262	1.020	0.487	-0.648	0.399	-0.161	0.496
Old	0.010	0.056	-0.160	0.056	0.004	0.104	-0.012	0.085	-0.314	0.106

Weighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.033	0.000	-0.083	0.000	-0.115	0.001	0.087	0.001	-0.166	0.001
Entry_dummy	0.010	0.000	0.047	0.000	0.314	0.001	-0.289	0.001	0.110	0.001
Young	0.150	0.001	0.136	0.001	0.636	0.003	-0.528	0.002	-0.940	0.003
Old	-0.063	0.000	-0.227	0.000	-0.090	0.001	0.010	0.000	-0.335	0.001

Product10: Iron castings for machinery

Unweighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.132	0.015	-0.150	0.015	-0.159	0.021	0.013	0.014	-0.560	0.087
Entry_dummy	-0.035	0.021	-0.008	0.022	-0.074	0.030	0.047	0.020	0.141	0.123
Young	-0.125	0.044	-0.124	0.045	-0.006	0.062	-0.088	0.042	-0.563	0.255
Old	-0.078	0.014	-0.001	0.014	-0.020	0.019	0.018	0.013	-0.114	0.079

Weighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.105	0.000	-0.140	0.000	-0.230	0.000	0.092	0.000	0.199	0.000
Entry_dummy	-0.086	0.000	-0.084	0.000	-0.189	0.000	0.094	0.000	0.154	0.001
Young	-0.011	0.000	0.014	0.000	0.193	0.000	-0.157	0.000	-1.210	0.001
Old	-0.076	0.000	-0.004	0.000	-0.021	0.000	0.012	0.000	0.109	0.000

Product11: Iron wire gauze, including welded wire gauze and wire-cylinders

Unweighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.154	0.025	-0.148	0.025	-0.215	0.039	0.057	0.031	-0.253	0.110
Entry_dummy	-0.034	0.028	-0.030	0.028	-0.047	0.044	0.019	0.034	-0.114	0.123
Young	0.008	0.047	-0.030	0.047	-0.012	0.074	0.004	0.058	0.031	0.207
Old	-0.029	0.025	0.001	0.025	-0.062	0.038	0.043	0.030	0.102	0.108

Weighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.127	0.000	-0.120	0.000	-0.248	0.000	0.117	0.000	-0.138	0.001
Entry_dummy	-0.051	0.000	-0.047	0.000	-0.039	0.000	-0.007	0.000	-0.563	0.001
Young	0.033	0.000	-0.009	0.000	-0.134	0.000	0.148	0.000	0.543	0.001
Old	-0.056	0.000	-0.025	0.000	-0.137	0.000	0.092	0.000	0.199	0.001

Product12: Tatami (Straw-mats and mat bases)

Unweighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.148	0.029	-0.158	0.029	-0.073	0.041	-0.054	0.030	-0.525	0.084
Entry_dummy	-0.056	0.037	-0.036	0.038	-0.164	0.052	0.105	0.038	0.072	0.106
Young	-0.076	0.104	-0.089	0.106	-0.129	0.147	0.018	0.107	0.038	0.299
Old	-0.074	0.028	-0.211	0.029	0.165	0.040	-0.203	0.030	-0.660	0.082

Weighted Regressions

	TFPT		TFPR		TFPQ		lnPrice		Demand shock	
	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err	Coef.	Std. Err
Exit_dummy	-0.125	0.000	-0.137	0.000	-0.039	0.000	-0.062	0.000	-0.499	0.001
Entry_dummy	-0.026	0.000	-0.008	0.000	-0.076	0.000	0.049	0.000	-0.145	0.001
Young	0.020	0.001	0.016	0.001	-0.003	0.001	-0.005	0.001	0.154	0.002
Old	-0.071	0.000	-0.207	0.000	0.173	0.000	-0.206	0.000	-0.702	0.001

Notes: Weighted regressions are weighted by revenue.

All regressions include a constant term and product-year interaction dummies.

Table A2. Characteristics of the Sample by Product

	Number of Observations					
Products	1985	1990	1995	2000	2005	Total
All	6839	6736	6184	5210	3972	28941
1 Rice wine called ‘sake’ including unrefined	1145	1078	932	746	546	4447
2 Semi-finished green tea	55	33	54	53	62	257
3 Miscellaneous yarn-dyed narrow silk fabrics	342	198	100	68	73	781
4 Women's and girls' knitted sweaters, cardigans and vests	493	504	427	285	146	1855
5 Socks	199	204	183	148	97	831
6 Flexible plastic film for packaging, less than 0.2 mm thickness	262	326	377	328	270	1563
7 Women's and children's leather footwear	213	242	173	158	122	908
8 Fresh concrete	2820	2935	2896	2558	1920	13129
9 Smoked roofing tile	108	102	99	68	51	428
10 Iron castings for machinery	759	675	552	425	370	2781
11 Iron wire gauze, including welded wire gauze and wire-cylinders	225	258	239	259	227	1208
12 Tatami (Straw-mats and mat bases)	218	181	152	114	88	753

Table A3. Entry and Exit Rates by Products

Products	Entry Rate	Exit Rate
All	15.21%	25.12%
1 Rice wine called ‘sake’ including unrefined	8.01%	21.48%
2 Semi-finished green tea	52.92%	50.19%
3 Miscellaneous yarn-dyed narrow silk fabrics	16.65%	51.09%
4 Women's and girls' knitted sweaters, cardigans and vests	21.94%	40.65%
5 Socks	15.04%	27.32%
6 Flexible plastic film for packaging, less than 0.2 mm thickness	28.09%	27.58%
7 Women's and children's leather footwear	26.76%	36.78%
8 Fresh concrete	12.45%	19.31%
9 Smoked roofing tile	17.76%	31.07%
10 Iron castings for machinery	13.09%	27.08%
11 Iron wire gauze, including welded wire gauze and wire-cylinders	28.48%	28.31%
12 Tatami (Straw-mats and mat bases)	19.52%	36.79%