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Plant Size, Turnover and Productivity in Malaysian Manufacturing

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Abstract:

Malaysian manufacturing has an asymmetrical structure: small and medium-sized enterprises dominate in numbers, but contribute relatively little to total output, employment, and exports as compared to their larger counterparts. In light of an increasingly competitive environment arising from globalization, a sound knowledge of turnover patterns within the sector by plant size and its potential impact on aggregate productivity growth is imperative. We find that turnover, particularly of large plants, makes a substantial contribution to overall productivity growth in manufacturing. Hence, from a policy perspective, facilitating turnover might be as important as supporting existing plants in promoting aggregate productivity growth.

Keywords: Plant turnover; plant size; productivity; manufacturing; Malaysia

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1. Introduction

The manufacturing sector can be seen as an "engine of growth" for the Malaysian economy in terms of its contribution to gross domestic product (GDP), total exports, and total employment. According to the Ninth Malaysia Plan, the manufacturing sector is targeted to contribute to 31.8 percent of GDP, 82.5 percent to total exports and 29.4 percent to total employment during the Plan period from 2006 to 2010 (Malaysia, 2006). The high proportion of its contribution to total exports[3] is attributable to strong external demand for manufactured goods and successful adoption of a series of industrialization programs e.g. import-substituting industrialization policy in the 1960s, export-oriented industrialization initiatives in the 1970s and the Industrial Master Plans in the 1980s, 1990s, and 2000s (i.e. the first, second and third Industrial Master Plans)[4].

The Malaysian manufacturing, being highly linked internationally, is susceptible to competitive pressures from globalization, increased liberalization of trade, rapid advancements in technology, and the emergence of low-cost manufacturing producers operating in the countries located around the region, such as People's Republic of China and India (see Hussain and Radelet, 2000; SMIDEC, 2002). Exposure to greater competitive pressures is one of the key factors that fosters the sector's productivity growth. For instance, as indicated in previous studies, greater competition arising from the removal of barriers to entry, deregulation of a market, and trade liberalization clearly is an effective way to promote

[3] The manufacturing sector contributed 80.5% to total exports in 2005 (Malaysia, 2006).

[4] The focus of the First Industrial Master Plan (1985-1995) was implemented to further strengthen export-oriented industrialization. The Second Industrial Master Plan (1996-2005) contributed further to the development of the sector, by strengthening industrial linkages, increasing value-added activities and enhancing productivity, while the Third Industrial Master Plan (2006-2020) is intended to achieve long term global competitiveness through transformation and innovation of the manufacturing sector for the period (Ministry of International Trade and Industry, 2009). For an extended analysis of the benefits of Industrial Master Plans, see Ariff (1994), Jomo (1994), Mahmood (2001) and Malaysia (2006). In line with the Third Industrial Master Plan, manufacturing sector is expected to continue to lead in export expansion during the period 2006-2020.

productivity for individual firms as well as the industry as a whole because of the competition enhancing effects that induce firms to perform more efficiently (Bartelsman *et al*. 2004; Roberts and Thompson, 2007; Vial, 2008). However, these establishments[5] may be driven out of the industry later on when they can no longer compete with more efficient ones. This process of firm turnover could make an important contribution to overall productivity growth through the replacement of less efficient exiters by more efficient entrants (see Tybout, 2000; Hahn, 2000; Aw *et al*., 2001; Pavcnik, 2002; Roberts and Thompson, 2007; Vial, 2008, to name a few).

The studies on the contribution of turnover to productivity growth in developing economies are still relatively limited. This is especially true for Malaysia where SMEs (small and medium enterprises) are vibrant and have significant contribution to economic activity. To fill this gap, this paper aims to determine the contribution of turnover to productivity growth in Malaysian manufacturing industries between 2000 and 2005. For this purpose we compare the productivity of establishments that exited the manufacturing sector with the entrants and continuing firms. Aggregate productivity might grow for different reasons: firms might increase their productivity, high (low) productivity firms might upsize (downsize), and firms with increasing (decreasing) productivities might grow (shrink) in size. In addition to these contributions made by the surviving establishments to productivity growth, replacement of less productive establishments with the more productive ones (turnover effect) increases aggregate productivity as well. The purpose of this study is to quantify all these effects by decomposing aggregate productivity growth, and make some policy suggestions.

[5] We use the words establishment and plant synonymously throughout the paper.

The rest of the paper is organized as follows. Section 2 describes the data and addresses the data concerns, availability and use. Section 3 provides an overview of the Malaysian manufacturing and examines its salient features, which are pertinent to the analysis of turnover patterns of manufacturing establishments by firm size as well as the impact of turnover on aggregate productivity growth. Also in this section we give an account of how to track survivals, entrants and exiters, and calculate the turnover rates by firm size. Section 4 presents the methods of decomposing productivity growth followed by presentation and analysis of results by plant size. The main conclusions and the policy implications are presented in Section 5.

2. Data

Data come from unpublished Census of Manufacturing conducted by the Department of Statistics, Malaysia in 2000 and 2005. Census covers all manufacturing establishments registered with the Companies Commission of Malaysia. Census frame also uses information from other sources, such as trade associations, federal and state development authorities, and is updated annually. An establishment is a single unit, which could be a part of a multi-establishment firm (each unit of a multi-establishment firm operating at a different location has to submit a different census form).

We used value added and number of persons engaged to calculate labor productivity. Value added was deflated by Producer Price Index for the whole manufacturing sector. The number of persons engaged is the total number of persons who were on payroll during December or the last pay period of the reference year. We deleted 374 establishments from the dataset

because their value added in 2000 was negative or zero. Two establishments with extremely high productivities were also deleted.

Following the definitions used in Malaysian official publications we divide the establishments into four size groups: Micro, small, medium, and large. Micro establishments have fewer than five employees, small establishments have between five and 50, and medium establishments have between 50 and 150. The large establishments have more than 150 employees.

3. Turnover in Malaysian Manufacturing

There were 20080 establishments in 2000 and 28094 establishments in 2005 operating in one of the manufacturing industries in Malaysia. Table 1 makes it clear that contribution of different size groups to value added and their share in total employment were highly disproportionate to their numbers. For instance, while micro and small firms had the largest shares in total number of establishments (32 percent and 43 percent respectively) in 2000, their share in value added and employment were much smaller than that of medium and large establishments, which collectively made up of the 25 percent of all establishments. Thus, large and medium establishments generated most of the manufacturing employment and value added despite having the smaller shares in total number of establishments. Table 1 also indicates that share of micro establishments in total number of establishments increased by nine percentage points from 32 percent to 41 percent between 2000 and 2005 while the shares of other groups declined. Disproportionate effect of large establishments is even more pronounced when one looks at value of exports. For instance, in 2005, more than 91 percent

of total value of exports was accounted for large establishments even though they made up 35 percent of exporters (see Table 1).

[Insert Table 1 here]

We track survival, entry, and exit by tracing the appearance and disappearance of the unique identification number assigned to each establishment.[6] Establishments whose identification numbers appear both in 2000 and 2005 are survivors, exiters are the establishments whose identification numbers appear in 2000 but disappear in 2005, and entrants are the establishments whose identification number do not appear in 2000 but appear in 2005.

Entry and exit rates are calculated by dividing the number of entrants and exiters by the total number of establishments in 2000. Turnover rate is the sum of entry and exit rates. Out of 20080 establishments that were in business in the beginning of the period 8386 exited by 2005, which yields a 42 percent exit rate (see Table 2). Entry rate for all establishments was 82 percent, giving rise to a turnover rate of 124 percent. Turnover rates (as well as entry rates) of micro and small establishments were higher than the medium and large ones.

[Insert Table 2 here]

[6] We cannot identify the establishments that were sold or reorganized, or changed their names, and were given a different identification number. Hence, entry and exit rates will be biased to the extent this is true.

Micro and small firms in Malaysia tend to have lower capital intensity (i.e. fixed assets per employee)[7] than their larger counterparts owing to their lesser dependence on capital inputs on one hand, and greater dependence on labor-intensive operations on the other. As a consequence, the low capital intensity of micro and small firms in Malaysian manufacturing can imply easier entry condition (and therefore, could cause high turnover) for micro and small firms in the sector, conforming to the evidence found in Taiwanese manufacturing (Aw *et al*, 2001).

Data presented in Table 3 give some perspective on the contribution of turnover to the Malaysian economy. As a group, entrants made higher contributions to employment and value added than exiters. This is also true for micro, small, and medium entrants; large entrants contributed to employment less, but to value added more than large exiters. Although the percentage of the entrants which exported was higher than that of exiters which exported, entrants' share in value of exports was not higher than that of exiters. Entrants' lower contribution to the value of exports compared to exiters' was due to the lower contribution of large entrants.

Largest contributions to employment and value added were made by large survivors despite having an eight percent share of total number of establishments in manufacturing. When it comes to exports, contribution of large survivors, again, was disproportionate to their share in number of exporters, for instance large survivors made up of 32 percent of exporters in 2000, yet their share in value of exports in the same year was 78 percent.

[7] The overall average capital intensity of SMEs in Malaysia was RM36,805 in 2005 (SMIDEC, 2006). An enterprise is considered labor-intensive if the capital investment per employee fell below RM55,000 (SMIDEC, 2004).

[Insert Table 3 here]

4. Productivity decompositions

Aggregate labor productivity can be calculated as a weighted average of establishment level productivities:

$$P_t = \sum_i \omega_{i,t} p_{i,t} \qquad (1)$$

where ω_{it} is the share of establishment *i* in aggregate employment in year *t* and p_{it} is the labor productivity of establishment *i* in year *t*. We use labor productivity (value added over employment) instead of a measure of total factor productivity to avoid the problems[8] that would arise from using the book value of assets as a proxy for capital, which would be needed in the calculations. Using employment shares rather than market shares as weights for labor productivity is more common (Ahn, 2001), and also more intuitive (Van Biesebroeck, 2005) since the sum of weighted labor productivities over all establishments would add up to the aggregate productivity.

Our main method of decomposition is Foster, Haltiwanger and Krizan (FHK henceforth, 1998) method, which can be expressed as

[8] We don't have confidence in fixed assets data because there are many establishments reporting very low values, e.g. 1 ringgit, for their fixed assets.

$$\frac{\Delta P_t}{P_{t-k}} = \frac{\sum_{i\epsilon S} \omega_{i,t-k}\Delta p_{i,t}}{P_{t-k}} + \frac{\sum_{i\epsilon S} \Delta\omega_{i,t}(p_{i,t-k} - P_{t-k})}{P_{t-k}} + \frac{\sum_{i\epsilon S} \Delta\omega_{i,t}\Delta p_{i,t}}{P_{t-k}} + \frac{\sum_{i\epsilon N} \omega_{i,t}(p_{i,t} - P_{t-k})}{P_{t-k}} - \frac{\sum_{i\epsilon X} \omega_{i,t-1}(p_{i,t-k} - P_{t-k})}{P_{t-k}} \quad (2)$$

where *S*, *N*, and *X* indicate survivors, entrants, and exiters respectively. P_{t-k} is the aggregate (weighted average) productivity in year *t-k*, which is the year 2000 in our case. Δ indicates the change in respective variables.

The first term indicates the contribution of survivors to productivity growth due to increasing or decreasing establishment productivity holding base year employment shares constant, and is called within effect. The second term, between effect, reflects the contribution of survivors with above or below average productivity[9] to productivity growth through their expansion or downsizing. Cross effect, which is the third term, represents the contribution of survivors with increasing or decreasing productivities to productivity growth through their upsizing or downsizing. The sum of the last two terms, entry and exit effects, is the contribution of turnover to productivity growth or the net entry effect.

We also use Griliches and Regev (hereafter GR, 1995) method mainly for sensitivity analysis. GR method can be written as:

[9] We mean the aggregate (weighted average) productivity in the base year (2000) by average or average productivity throughout the paper.

$$\frac{\Delta P_t}{P_{t-k}} = \frac{\sum_{i\epsilon S} \bar{\omega}_i \Delta p_{i,t}}{P_{t-k}} + \frac{\sum_{i\epsilon S} \Delta\omega_{i,t}(\bar{p}_i - \bar{P})}{P_{t-k}} + \frac{\sum_{i\epsilon N} \omega_{i,t}(p_{i,t} - \bar{P})}{P_{t-k}} - \frac{\sum_{i\epsilon X} \omega_{i,t-1}(p_{i,t-k} - \bar{P})}{P_{t-k}} \quad (3)$$

where all variables are defined as before. A bar over a variable means that it is a time average. GR method differs from the FHK method in that it uses time averages of employment shares, plant and aggregate productivities instead of the initial (base year) values of these variables. Another difference is that due to time averaging there is no cross term in GR method. An advantage of GR method over the FHK method is that by using time averages effect of random measurement errors is reduced (Foster *et al*., 1998). One problem with the GR method is that interpreting within and between terms would be difficult since by including the time average of shares in the former and the time average of productivities in the latter we would no longer be holding these fixed at their initial values (Foster *et al*., 1998).

Exiters are allocated into different size groups by their size group in 2000, and entrants by their size group in 2005. A survivor's size group might be different than its base year group, for instance, 13 percent of establishments that were in micro size group in 2000 changed their size groups in 2005. Changes in size groups occurred for 20 percent of small, 33 percent of medium, and 17 percent of large establishments (see Table 4). For this reason, we present two sets of decomposition results in the tables below, the results shown in the upper panels are with respect to the size groups in 2000; the ones shown in bottom panels are with respect to the size groups in 2005.

[Insert Table 4 here]

The FHK decomposition results presented in Table 5 show that the aggregate productivity of manufacturing establishments increased over the sample period by 2.38 percent, which was due to positive between and net entry effects outweighing the negative within and cross effects.

[Insert Table 5 here]

Turnover made a positive contribution of 4.8 percent to aggregate productivity growth (positive net entry component), that is, establishments that made a lower contribution to aggregate productivity (exiters) growth were replaced by establishments that made a higher contribution (entrants) to it. It is also clear from the table that the net entry effect, which made a sizeable contribution to the aggregate productivity growth, was mainly due to the large entrants. Entry effects of micro and small entrants were smaller than their exit effects, yielding a negative turnover effect for these establishments.

Productivity of the exiters was lower than the average manufacturing productivity since exit terms were negative, which was true for all size groups. Negative entry terms for micro, small, and medium entrants indicate that their productivity was lower than the average. Only large entrants had above average productivities.

Survivors' contribution to aggregate productivity growth was negative two percent, which was mainly due to a large negative cross effect and a smaller but negative within effect.

Negative within effect indicates that the productivity of a substantial number of survivors decreased. Negative cross effect is due to decreasing employment shares of survivors whose productivity increased, and to increasing employment shares of survivors whose productivity decreased. A positive between effect was obtained because survivors with above average productivities, whose employment shares increased and survivors with below average productivities, whose employment shares decreased were dominant. As Van Biesebroeck (2005, pp. 572-573) points out, this indicates that labor market was efficient in shifting workers from less productive establishments to more productive ones. Large survivors were responsible for the sizeable between and cross effects, and on the whole made a large negative contribution to aggregate productivity growth.

Interpretation of within effects depends on the classification: when size groups in 2000 were used, micro, small, and medium establishments showed a negative within effect, but this did not happen when the size groups in 2005 were used (see Table 6). Also, when the grouping was done with respect to size in 2005, the within effect for large plants decreased considerably. A glance at Table 6 shows that the way in which the plants were divided into different size groups yielded slightly lower or higher between effects; in the case of cross effects this was also true for micro and small plants, but not for medium and large ones.

[Insert Table 6 here]

Table 6 provides another perspective of analyzing the results. It seems that during this period plants that *decreased* their scale, if a plant's changing of size group could be interpreted as a scale change, were able to make a *higher* contribution to aggregate productivity growth. For

instance, large plants that scaled down to become medium ones made 1.54 percent contribution to productivity growth while the ones that remained large contributed -3.81 percent.

It is clear from the last column of Table 5 that without entry and exit, which generate the net entry effect aggregate productivity, would have been much lower since the contribution of survivors (sum of within, between, and cross effects) to aggregate productivity is negative. Micro establishments made a negative contribution to the aggregate productivity growth, with medium and large establishments making a positive contribution. Results on the contribution of small establishments are mixed: their contribution was negative when plants were grouped by their size in 2000, positive when they were grouped by their size in 2005. We can conclude that the bulk of the aggregate productivity growth was accounted by turnover, upsizing of high productivity establishments, and downsizing of low productivity ones. Results are robust to change in methodology, that is, when we used GR method we got very similar results (reported in Table 7) for the turnover effect, survivor's contributions, and overall contributions to productivity growth.

[Insert Table 7 here]

Our finding that turnover makes a substantial contribution to aggregate productivity growth is consistent with vintage capital models, in which entrants start out with a capital stock of the latest vintage, and hence with new technology. Being able to use the latest technology assumed to be embodied in the new capital stock makes entrants more productive than the existing (surviving) establishments unless the latter retool their plants to upgrade their

technology. Retooling, however, might be costly, or difficult to do for other reasons. Hence, "if new technology can be better harnessed by new firms, productivity growth will be dependent upon the entry of new units of production that displace outpaced establishments (Bartelsman, *et al*., 2004, p.5)"

In addition to retooling, productivity of survivors might increase because of learning by doing, economies of scale, and managers becoming more efficient as they gain more experience. In short, as an establishment ages it might also become more productive, and this "survival effect" might make an important contribution to aggregate productivity growth (Jensen *et. al*., 2001). Results on within effect, which indicate that productivity of a large number of survivors decreased, suggest that this survival effect, did not materialize in Malaysian manufacturing during the period under study.

5. Conclusions

We find that establishment turnover made a considerable contribution to aggregate productivity growth in Malaysian manufacturing as the less productive exiters are replaced by the relatively more productive new entrants. We also find that the most of this contribution of turnover to the productivity growth came from the turnover of large establishments. Turnover of medium-sized establishments made a small but positive contribution to productivity growth. Large entrants had also above average productivities.

The evidence reported in this paper shows that the turnover rate in manufacturing was high. In particular, both the micro and small establishments had higher entry, exit, and turnover rates than their medium and large counterparts, suggesting that the entry was relatively easier for smaller establishments. However, as the decomposition results above show productivity of micro and small entrants were below average and below the productivity of exiters, which resulted in negative net entry effect for these groups of establishments. This finding might indicate that micro and small establishments, for some reason, found it difficult to raise their productivity in their first year of operation, which is also true for medium-sized establishments.

These findings suggest that there might be room for government action in certain areas. For instance, making the turnover of large establishments easier would be one action the government might consider taking. Since micro and small entrants have negative turnover effects, inducing these establishments to achieve higher productivity quickly would be another area in which using government policy might be helpful.

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Table 1. Total number of establishments, total employment, total value added, total output, total number of exporters, and total value of exports

	Micro	Small	Medium	Large	All
			2000		
Number of estab.	6384	8638	3028	2030	20080
Employment	18107	163811	266638	1094953	1543509
Value added	2.76	54.25	118.15	705.35	880.52
Gross output	866.50	22225.53	56443.47	335241.16	414776.66
Number of exporters	63	918	1078	1235	3294
Value of exports	25.49	2421.03	13742.21	199616.77	215805.50
			2005		
Number of estab.	11532	11122	3357	2083	28094
Employment	29967	204746	293295	1129728	1657736
Value added	4.52	69.26	140.84	753.58	968.21
Gross output	1488.78	37964.25	86174.30	474401.72	600029.05

Number of exporters	63	892	935	1025	2915
Value of exports	33.86	5280.57	17640.15	233867.70	256822.28
			Percent shares in (2000)		
Number of estab.	31.79	43.02	15.08	10.11	100.00
Employment	1.17	10.61	17.27	70.94	100.00
Value added	0.31	6.16	13.42	80.11	100.00
Gross output	0.21	5.36	13.61	80.82	100.00
Number of exporters	1.91	27.87	32.73	37.49	100.00
Value of exports	0.01	1.12	6.37	92.50	100.00
			Percent shares in (2005)		
Number of estab.	41.05	39.59	11.95	7.41	100.00
Employment	1.81	12.35	17.69	68.15	100.00
Value added	0.47	7.15	14.55	77.83	100.00
Gross output	0.25	6.33	14.36	79.06	100.00
Number of exporters	2.16	30.60	32.08	35.16	100.00
Value of exports	0.01	2.06	6.87	91.06	100.00

Notes: Ringgit values are in millions.

Table 2. Entry, Exit, and Survival

	Micro	Small	Medium	Large	All
			Number of establishments		
Survivors in 2000	2941	4921	2198	1634	11694
Exiters	3443	3717	830	396	8386
All in 2000	6384	8638	3028	2030	20080
Survivors in 2005	3043	4774	2194	1683	11694
Entrants	8489	6348	1163	400	16400
All in 2005	11532	11122	3357	2083	28094
			Entry, exit, and turnover rates (percent)		
Entry rate	133	73	38	20	82
Exit rate	54	43	27	20	42
Turnover rate	187	117	66	39	124

Table 3. Shares of survivors, exiters, and entrants in total number of establishments, total employment, total value added , total gross output, total number of exporters, and total value of exports (percent)

	Micro	Small	Medium	Large	All
			Establishments		
Survivors (2000)	14.65	24.51	10.95	8.14	58.24
Exiters	17.15	18.51	4.13	1.97	41.76
Survivors (2005)	10.83	16.99	7.81	5.99	41.62
Entrants	30.22	22.6	4.14	1.42	58.38
			Employment		
Survivors (2000)	0.55	6.5	12.64	58.29	77.98
Exiters	0.63	4.11	4.63	12.65	22.02
Survivors (2005)	0.51	5.85	11.72	57.64	75.71
Entrants	1.3	6.5	5.97	10.51	24.29
			Value added		
Survivors (2000)	0.16	4.04	10.43	69.97	84.59
Exiters	0.16	2.12	2.99	10.14	15.41

Survivors (2005)	0.14	3.46	9.56	65.3	78.46
Entrants	0.33	3.69	4.99	12.54	21.54
			Gross output		
Survivors (2000)	0.1	3.6	10.7	67.55	81.94
Exiters	0.11	1.76	2.91	13.28	18.06
Survivors (2005)	0.07	3.13	10.33	65.94	79.47
Entrants	0.18	3.2	4.03	13.12	20.53
			Exporters		
Survivors (2000)	0.94	19.37	25.08	31.82	77.2
Exiters	0.97	8.5	7.65	5.68	22.8
Survivors (2005)	0.79	15.64	21.99	29.61	68.03
Entrants	1.37	14.96	10.09	5.56	31.97
			Value of exports		
Survivors (2000)	0	0.86	5.17	78.58	84.62
Exiters	0.01	0.26	1.2	13.91	15.38
Survivors (2005)	0	1.03	4.92	78.77	84.72
Entrants	0.01	1.03	1.95	12.29	15.28

Table 4. Transition matrix by size group

	Size in 2005				
Size in 2000	Micro	Small	Medium	Large	Total in 2000
			Number of establishments		
Micro	2554	385	2	0	2941
Small	484	3958	456	23	4921
Medium	4	402	1483	309	2198
Large	1	29	253	1351	1634
Total in 2005	3043	4774	2194	1683	11694
			Percentage of the total in 2000		
Micro	86.84	13.09	0.07	0	100
Small	9.84	80.43	9.27	0.47	100
Medium	0.18	18.29	67.47	14.06	100
Large	0.06	1.77	15.48	82.68	100

Table 5. Decomposition of Labor Productivity Change (2000 and 2005),
By Foster, Haltiwanger and Krizan (1998) method

	Micro	Small	Medium	Large	Aggregate
			With respect to size in 2000		
Within *(w)*	-0.003	-0.15	-0.01	-1.24	-1.4
Between *(b)*	0.01	0.58	1.05	3.73	5.37
Cross *(c)*	-0.06	-0.67	-0.58	-4.65	-5.96
Entry *(n)*	-0.96	-2.73	-0.87	2.32	-2.23
Exit *(x)*	-0.47	-1.99	-1.64	-2.51	-6.61
Contributions to productivity growth	-0.54	-0.98	1.24	2.67	2.38
Turnover effect *(n-x)*	-0.49	-0.74	0.77	4.84	4.38
Contribution of survivors *(w+b+c)*	-0.05	-0.24	0.46	-2.17	-2
			With respect to size in 2005		
Within *(w)*	0.06	1.32	1.46	-4.24	-1.4

Between *(b)*	0.19	1.12	1.27	2.79	5.37
Cross *(c)*	-0.05	-1.26	-1.65	-3.01	-5.96
Entry *(n)*	-0.96	-2.73	-0.87	2.32	-2.23
Exit *(x)*	-0.47	-1.99	-1.64	-2.51	-6.61
Contributions to productivity growth	-0.3	0.44	1.86	0.38	2.38
Turnover effect *(n-x)*	-0.49	-0.74	0.77	4.84	4.38
Contribution of survivors *(w+b+c)*	0.19	1.18	1.09	-4.46	-2

Note: Contribution of each size group to productivity growth equals ($w+b+c+n-x$)

Table 6. Transition matrix for within, between, and cross effects

	Size in 2005				
Size in 2000	Micro	Small	Medium	Large	Total in 2000
			Within effect		
Micro	0.01	-0.01	0	0	0
Small	0.03	0.1	-0.24	-0.03	-0.15
Medium	-0.01	0.22	0.17	-0.39	-0.01
Large	0.03	1.01	1.54	-3.81	-1.24
Total in 2005	0.06	1.32	1.46	-4.24	-1.4
			Between effect		
Micro	0.04	-0.05	0.01	0	0.01
Small	0.13	0.36	0.08	0.01	0.58
Medium	0	0.54	0.35	0.16	1.05
Large	0.01	0.27	0.83	2.62	3.73

Total in 2005	0.19	1.12	1.27	2.79	5.37
			Cross effect		
Micro	-0.01	-0.04	-0.02	0	-0.06
Small	-0.02	-0.19	-0.36	-0.1	-0.67
Medium	0.01	-0.14	-0.16	-0.3	-0.58
Large	-0.03	-0.9	-1.12	-2.61	-4.65
Total in 2005	-0.05	-1.26	-1.65	-3.01	-5.97

Table 7. Decomposition of Labor Productivity Change (2000 and 2005),
By Griliches and Regev (1995) method

	Micro	Small	Medium	Large	Aggregate
			With respect to size in 2000		
Within *(w)*	-0.03	-0.48	-0.30	-3.57	-4.38
Between *(b)*	-0.02	0.24	0.76	1.44	2.41
Entry *(n)*	-0.98	-2.81	-0.94	2.20	-2.52
Exit *(x)*	-0.48	-2.04	-1.70	-2.66	-6.87
Contributions to productivity growth	-0.55	-1.01	1.21	2.73	2.38
Turnover effect *(n-x)*	-0.50	-0.77	0.76	4.86	4.35
Contribution of survivors *(w+b+c)*	-0.05	-0.25	0.46	-2.13	-1.97
			With respect to size in 2005		
Within *(w)*	0.03	0.69	0.64	-5.74	-4.38
Between *(b)*	0.17	0.51	0.47	1.27	2.41

Entry *(n)*	-0.98	-2.81	-0.94	2.2	-2.52
Exit *(x)*	-0.48	-2.04	-1.7	-2.66	-6.87
Contributions to productivity growth	-0.3	0.43	1.86	0.39	2.38
Turnover effect *(n-x)*	-0.5	-0.77	0.76	4.86	4.35
Contribution of survivors *(w+b+c)*	0.2	1.2	1.1	-4.47	-1.97

Note: Contribution of each size group to productivity growth equals (*w+b+c+n-x*)