Firm demography and aggregate productivity growth

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Abstract

This paper examines the dynamic relation between firm demography and aggregate productivity firm in Sweden during the period 1997-2003. By using enterprise demography data, the interaction between micro dynamics and aggregate productivity growth is discerned. The result of the decomposition shows that the contribution of entry and exit of firms on aggregate productivity growth is small but still positive for the total economy, suggesting that entering firms are more productive than exiting firms. The paper shows that the productivity growth within the continuing firms is the key factor of the aggregated productivity growth.

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1 Introduction

The present study examines the dynamic contemporary relation between firm demography and aggregate productivity growth in Sweden using panel data from 1997 to 2003. This is believed to be a particularly apt topic of research given that the creation of new business and decline of unproductive firms often is regarded as key characteristic of business dynamics. Indeed, economic theory predicts that successful firms will grow, while less successful firms will shrink or die and policy makers often believe that intense firm creation is important for productivity growth and job creation.[1]

The analysis of firm demography, especially births and deaths of enterprises, could contribute to the understanding of the growth process in several key regards. First, the aggregate productivity growth is affected by the large ongoing reallocation of outputs and inputs across enterprises. Secondly, the intensity to witch this reallocation varies between sectors could have an impact on the industry productivity growth. Third, most of the reallocation could reflect firm dynamics rather than industry dynamics.[2] In accordance, structural change and aggregate productivity growth decomposed by the shift-share method, concordant report small shift effects.[3] Fourth, there are large differences in productivity levels and growth across firms in the same industry.[4] Given that firm demography has a significant impact on aggregate productivity growth, this may skew the analysis of the relative importance of different factors of production. In particular, the effect of market dynamics may be erroneously attributed to technological progress when in fact the effect is a question of increased economic efficiency, because of increased usage of better technology. By offering a large sample of firms and, not only manufacturing industry, the contribution of firm demography on aggregate productivity growth can be discerned.

Focusing on the key aspects of firm demography, this paper addresses the issue of the relative importance of entry and exit of firms, and within-firm growth and market dynamics. Using a comprehensive dataset of Swedish firms, with firm-level data on employment and value added, we try to establish the relative importance of resource reallocation and firm dynamics on productivity growth. Since tentative results shows that surviving new firms have lower productivity but a higher productivity growth that existing firms, the following hypothesis are addressed: (1) *New firms have a limited impact on productivity growth, because of a high infant mortality rate. Dynamics of existing firms is more important for productivity growth than firm entry. (2) Reallocation of resources to the most productive firms is an important contributor to "technological advancement".*

The rest of the paper is structured as follows. Section 2 describes methodology and data applied in the study. Section 3 outlines the contribution of entry, exit and incumbent on aggregate productivity growth. Section 4 concludes.

[1] *OECD (2002); Ahn (2001);Bertelsman and Doom; Caves (1998);Geroski (1995),*
[2] *Foster, Haltiwanger and Krixan (1998)*
[3] *Peneder (2003); Fagerberg (2000); Timmer and Szirmai (2000).*
[4] *Geoski (1995).*

2 Method and data

In discerning productivity, the most frequently applied measures are labour productivity and multi-factor productivity. As the latter is accounting for the distinct effects of capital/labour inputs together with technological progress, it is often seen as favourable.[5] However, due to the lack of proper capital stocks on micro level, it has not been possible to measure total factor productivity. Therefore, the "second best" measure i.e. labour productivity is employed in the study. In this regard, it should also be noted that labour productivity has advantages: the risk of error measurement is reduced and the correlation with other productivity measures is high.[6]

The literature on the linkages between firm dynamics and productivity growth offers a wide range of methods. One of the most frequently applied methods is decomposition, where the contribution of productivity components or factors is discerned. The ways to accounts for the factors behind productivity differs between the methods of decomposition chosen. Following the suggestions of Ahn (2001), the aggregate productivity in a given industry can be measured by a weighted average of each firm's productivity in the sector:

$$LP_t = \sum_i \theta_{it} LP_{it} \qquad 1.$$

Where θ_{it} is the market share of the *i*th firm, ln LP_{it} is the firm labour productivity. The employment or value added share may be used as weights. This study employes labour shares.

In line with the preferred method by Haltiwanger (1997) and Foster, Haltiwanger and Krizan, the aggregate LP growth can be decomposed as follows:

$$\Delta LP_t = \frac{\overbrace{\sum_{i\varepsilon C} \theta_{it-k} \Delta LP_{it}}^{Within\,effect} + \overbrace{\sum_{i\varepsilon C} \Delta\theta_{it} (LP_{it-k} - LP_{t-k})}^{Between\,effect} + \overbrace{\sum_{i\varepsilon C} \Delta\theta_{it} \Delta LP_{it}}^{Cross\,effect} + \overbrace{\sum_{i\varepsilon N} \theta_{it} (LP_{it} - LP_{t-k})}^{Entry\,effect} - \overbrace{\sum_{i\varepsilon X} \theta_{it-k} (LP_{it-k} - LP_{t-k}}^{Exit\,effect}}{LP_{t-k}} \qquad 2.$$

Where Δ denotes to change between the *k*-year interval between the first year (*t*-*k*) and the last year (*t*). C, N and X refers to continuing, entering and exiting firms. LP_{t-k} is the aggregate productivity level of the industry. The contribution of the factors decomposed is interpretated as follows. (1) The firm productivity growth weighted by initial market shares is defined as *within effect*. (2) The second term represent the *between-firm* component that reflects changing shares, adjusted for the average productivity. (3) This term represent a *cross* (covariance) *effect*, that is positive when the market share growth for firms with growing labour productivity. (4) The *entry effect* denotes the sum of differences between each firm's productivity and initial aggregate productivity, weighted by its market share. (5) The sum of differences between every existing firm's labour productivity and initial aggregate labour productivity, weighted by its market share represent the *exit effect*. In sum, the components defined in equation 3, involve deviations of firm-level labour

[5] *Foster, Haltiwanger and Krizan (1998)*
[6] *Hakkala (2004).*

productivity from the initial productivity level of the industry. Therefore, the risk of over aggregating the effect of the between, entry and exit effect is reduced.

Alternative methods for decomposing productivity growth, such as suggested by Campbell (1992) and Griliches and Regev (1992) is more sensitive for the over aggregating problem of between, entry and exit terms. Moreover, the difficulty of interpretation the components distinctively is another reason for preferring the method defined in equation 3.[7]

In this study, the contribution of continuers, entering and exiting firm's is decomposed. By referring to firms according to these categories, it is necessity to have robust definitions. In this study, the definition employed by statistics Sweden is suggested to be appropriate to meet these needs.[8] The information on firm dynamics and statistics are supplied by the *IFDB database*, created by the *Swedish institute for Growth Policy Analysis (ITPS)*. With this database it is possible to use organisation numbers to identify firms and the firms have the same number of the period of study. An exiting firm is defined as a firm with that belongs to the industry in 1997, but where the organizational number is missing for the industry group in 2003. In accordance, an entering firm is defined with an organizational number that belongs to the examined industry group in 2003, but not in 1997. With this database, it is possible to discern the links between different entry and exit categories. Genuine entering and exiting firm is separated from split and mergers.

Besides the use of organisational numbers as a key to identify firm dynamics, this study employs a demographic method denoted *FAD* (*Dynamics of firms and working places*). With the FAD method, comprehensive details on entering and exiting firms can be uncovered. The risk of double counting a firm that change organisational number is avoided. The FAD method classifies firms as an entry, exit and incumbent firm depending on changes of labour force within the firm. This firm dynamic data can be joined with data on value added and number of employed (and also financial statements) by matching organisational numbers. In the present study, the decomposition of productivity will be conducted using FAD-data, in addition to using organisation numbers.[9]

The dataset employed in the present study include information on value added and persons employed by the different categories of firms. The period of study is limited to 1997-2003, since the sample of firms included in the database changed in 1996/97. Subsequently, calculations based on the 1996 data can not be compared with that form 1997 onwards without invoking measurement problems.

One problem of the dataset is to measure labour productivity from micro firms. Micro firms with (<1 employed) and unincorporated enterprises (where the owner not is counted as employed) is left out to avoid these measurement problems. The risk is however, that the dynamic of micro firms is neglected. Still, with zero employed it is impossible to calculate labour productivity. In line with the latter are firms with negative value added excluded. To avoid mixing up different categories of entering and exiting firms, only genuine entering and exiting firms is included. Splits and mergers, witch falls between incumbents and entering/exiting, are excluded. Based on these arguments is the sample delimited according to the following criteria: (1) Firms with less than one employed: (2) Firms with negative value added: (3) Unincorporated enterprises. (4) Firms that merge and split. All firms that meet these criteria are excluded.

[7] *Heden (2005); Foster, Haltiwanger and Krizan (1998); Ahn (2001); Campbell (1992).*
[8] *Andersson and Arvidson (2006)*
[9] *Details of the FAD method is presented in appendix 2.*

3 Results of productivity decomposition

This study covers a sample of firms that are entering, exiting and continuing over the present study period. The study covers firms from all industries. In table 1 below the number of firms by industry and by category is presented.

Table 1. Number of entering, exiting and continuing firms in sample.

ISIC rev. 3	Sector	Entering	Exiting	Continuing
01-14	1. Primary sector	1696	1285	3121
15-37	2. Manufacturing	4839	4145	13471
40-45	3. Construction and infrastructure	5470	3810	11502
50-55	4. Trade, hotel and restaurants	18602	14640	24916
60-64	5. Transport and communications	3637	2882	6691
65-74	6. Financial and business services	20107	11762	16249
80-95	7. Education, social services	5950	3289	6480
01-95	Total	60301	41813	82430

Source: IFDB database, own calculations

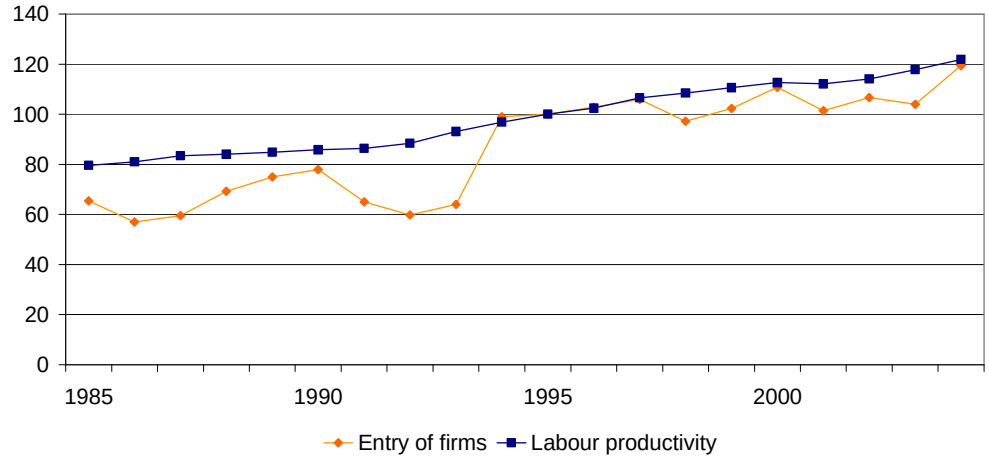
The number of entering, exiting and continuing firms over the period 1997 to 2003 is 60 301, 41 813 and 82 430 respectively. At a closer look we find that the entering firms are concentrated to sector 4 (trade, hotel and restaurants) together with sector 6 (financial and business services). The table shows a similar distribution among the exiting firms. About two thirds of the firms are located sectors 4 and 6. In difference, about one half of the continuing firms are located in sector 4 and 6. The continuing firms have a stronger presence in sector 2 (manufacturing) and sector 3 (construction and infrastructure). About 30 per cent of the continuing firms are located in the two latter sectors. In comparison, some 20 per cent of the entering and exiting origin from sector 2 and 3. The differences in firm distribution are an important feature to note. Given that the productivity level and growth differ between sectors, the contribution of firm, origin from different sectors, also is likely to differ.

To measure the contribution of firm dynamics on aggregated productivity growth, the decomposition of labour productivity is reported in the following section. Focus will be put into examining the seven sectors presented above. In addition, theses sectors will be disaggregated into industries to show how the contribution may differ at a more detailed level. And to put these results into a context, stylized facts on productivity growth and firm dynamics is outlined as background.

Over the last fifteen years, the number of entering and exiting firms has developed rapidly. Focusing on the previous, we find that the number of entering of firms almost has doubled. Back in 1985, some 23 thousand firms were created and in 2004, almost 42 thousand new firms emerged. Over this period, the entry rate has fluctuated considerably.

In figure 1 below, the development of labour productivity and entry is outlined. The figure shows that the number of entering firms developed rapidly up until the economic crises of the 1990s. After the crises the firm creation gathered strength up until the late 1999s. In the end of the period, the growth of new firms has been more slowly, except for the final year.

Figure 1. Entry of firms and labour productivity, index 1995=100, 1985-2004.

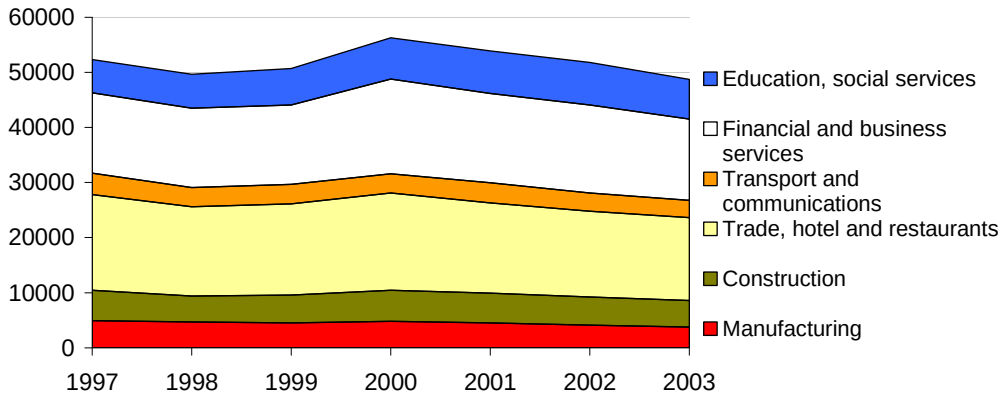


Source: ITPS, Nyföretagandet i Sverige 2004 och 2005; SCB, Nyföretagandet i Sverige 1994/95; GGDC, total economy database.

The figure shows that the growth of labour productivity and entry of firms over the period 1985 to 2004 equals to 2,1 and 3,0 per cent respectively. During the study period (1997-2003), the growth of labour productivity is somewhat lower and the growth in entry is much lower during the study period compared to the previous period.

Taking the period 1997 to 2003 into closer examination, we find that the most intense firm creation is taking place in financial and business services. An equal important sector is gross, retail trade, hotel and restaurants. Both sectors accounts for about 60 per cent of the population Surprisingly few firms are created in the manufacturing sector. This pattern resembles of that seen in table 1.

Figure 2. Number of entering firms (all categories) by sector 1997-2003.



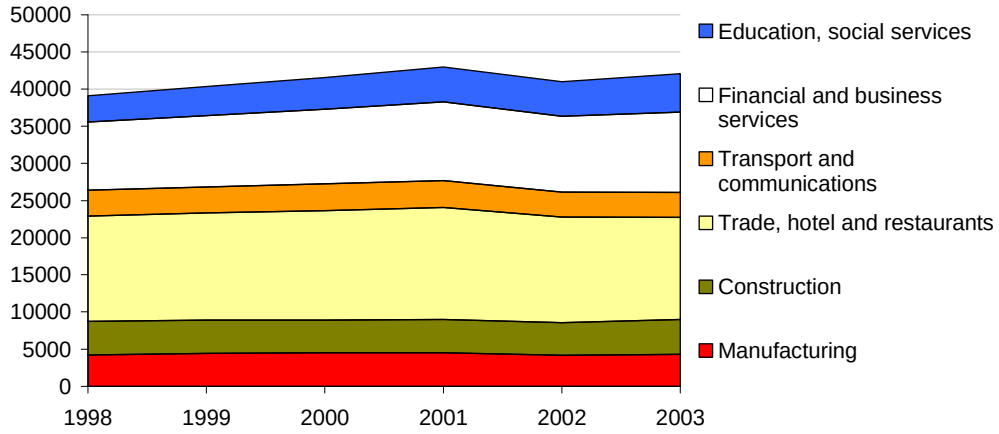
Source: IFDB, own calculations.

Note: The primary sector (agriculture, fishing, forestry) is excluded. All categories of entering firms (genuine new, splits and mergers) are included.

The development of exiting firms by industry over the period 1998 to 2003 share much of the same features as that of entering firms. Most of exiting firms is located in the financial

and business services sector together with the sector of trade, hotel and restaurants. We also find that the overall number of exiting firms have changed somewhat. In 1998, some 39 thousand firms left the market, while about 42 thousand abandon in 2003. The largest two sectors (trade and business services) accounted for 60 per cent of the population.

Figure 3. Number of exiting firms (all categories) by sector 1998-2003.



Source: IFDB, own calculations.

Note: The primary sector (agriculture, fishing, forestry) is excluded. All categories of exiting firms (genuine new, splits and mergers) are included.

The number of entering and exiting firms includes all genuine new firms together with splits and mergers of firms. The latter two account for a proportion of 20 per cent of the entering firms. The development of splits and mergers follows much of the fluctuations seen in overall entry rate, although the amplitude is lower.

The overview shows that the number of entering and exiting firms is changing slowly, compared to historical record. In comparison, we find that the growth in number of entry and exit was significant higher over the period 1985 to 1996, the gorwth rate was significant higher. The overview also shows that most of the firms (60 per cent) origin from two sectors (Trade, hotel and restaurants together with financial and business services sectors. To account for how this business dynamics have affected the aggregated productivity growth, the following sector offers a decomposition of labour productivity growth in Sweden for the period 1997 to 2003.

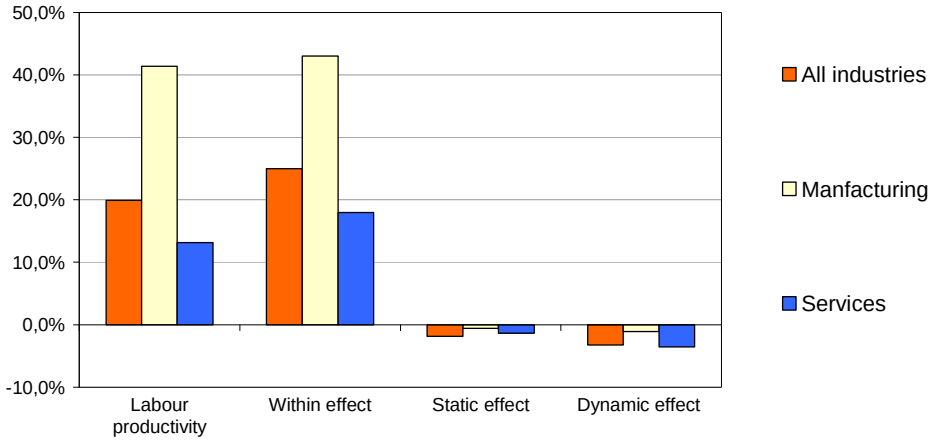
Before presenting the decomposition on the firm level a decomposition at the industry level first is conducted. The method employed is the traditional shift-share analysis. [10] The data cover industries at the 2 and 3-digit industry level. Labour shares have been used as weights. Labour productivity has been deflated by 2 and 3 digit industry price indices. [11]

Figure 4 shows the results of the decomposition of labour productivity growth in Sweden in 1997 to 2003. The decomposition is presented for total economy, manufacturing and services sectors. We find that the total labour productivity was close to 20 per cent over the

[10] *The shift share method is presented in appendix 1.*
[11] *Due to the lack of price indices, services are covered at the 2-digit level and manufacturing at the 3-digit level. Therefore is the shift-share based on 3-digit data on manufacturing data and 2-digit data on services. The data is derived from the IFDB database.*

period (3,2 per cent per year) The results of the shift-share shows that the within effect is of crucial importance for the aggregated productivity growth. The shift-effects are small and negative. The impact of reallocation of labour between the sectors is small on total productivity growth.

Figure 4. Shift-share analysis of labour productivity growth in Sweden 1997-2003 (all industries)



Source: IFDB, own calculations.

The figure shows that the static effect is negative, suggesting that the labour force moves from industries with high productivity level towards industries with lower productivity level. Similarly the dynamic effect indicate that the labour force moves from industries with high productivity growth to industries with lower productivity growth. The service sector has the relatively largest negative shift effects. In the manufacturing sector, the shift effects may be overlooked. The manufacturing sector contributes most to the aggregated productivity growth.

Following the result on the reallocation between industries, the following section decomposes the reallocation between firms. The following decomposition is based on micro data and the method is denoted by equation 2. In table 2 below, the result by sectors is shown. We find that the aggregated productivity growth over the period 1997-2003 reached 22 per cent (3,3 per cent per year). We also see that the figure of aggregated labour productivity in table 2 is somewhat higher compared to that in figure 4 above, (22 per cent compared to 20 per cent). This is because of differences in the dataset, where mergers and splits are excluded in the firm data. Considering table 2, the result shows that the contribution on total productivity growth is concentrated to the manufacturing sector. The latter have a share of 66 per cent of the total contribution.

Following the contribution list in table 2, we find that transport and communication is the second most important sector, having a share of 22 per cent. The third most contributing sector is trade, hotel and restaurants, representing a share of 20 per cent. Taken together, sector 2, 4 and 5 leave a contribution of more than 100 per cent implying that the other four sectors have a negative contribution.

Table 2. Labour Productivity decomposition by industries, labour shares as weights.

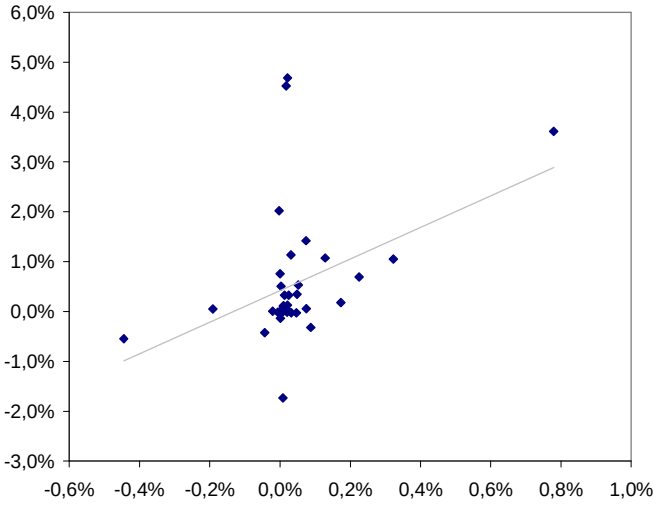
ISIC rev. 3	Sector	Labour productivity growth	Within effect	Between effect	Cross effect	Net entry effect	Contri-bution
01-14	1. Primary sector	9,0%	0,1%	0,0%	0,0%	0,1%	0,2%
15-37	2. Manufacturing	41,3%	14,8%	-0,1%	-0,4%	0,4%	14,7%
40-45	3. Construction and infrastructure	-5,5%	-0,7%	0,0%	0,0%	0,1%	-0,5%
52-55	4. Trade, hotel and restaurants	22,2%	3,6%	0,0%	0,0%	0,8%	4,4%
60-64	5. Transport and communications	56,7%	4,6%	0,0%	-0,3%	0,6%	4,9%
65-74	6. Financial and business services	-9,1%	-1,3%	0,4%	-0,1%	-0,2%	-1,3%
80-95	7. Education, social services	-0,2%	0,1%	0,0%	0,0%	-0,2%	-0,2%
01-95	Total	22,1%	21,2%	0,2%	-0,9%	1,6%	22,1%

Source: IFDB, own calculations.

Studying the decomposed components closer, we find that the sectors with a positive continuing effect (sum of within, between and cross effect) also have a positive net entry effect (entry effect – exit effect). The largest net entry effect comes from sector 4 and 5. The positive effect counterbalances the negative effects from sector 6 and 7. The total effect of entry and exit is positive, implying that new firms have a higher productivity level than the ones closed down.

The positive relation between net entry effect and continuing effects are also indicated at the 2-digit industry level. In figure 5, a scatter plot of this relation is shown. The figure indicates that positive continuing effects are correlated with positive net entry effects.

Figure 5. Correlation between net entry/ exit effect and continuing effects.



Source: IFDB, own calculations.

A regression analysis shows that the impact is significant, when net entry is dependent and continuing effect is independent. One hypothesis could be that entering firms, by using new production technology, developing production methods, can utilize the within effect

that is pertinent to incumbents. An analysis of the relation shows that the continuing effect has a significant impact on the net entry effect.

Table 3. The relation between Result of regression analysis

Variable	Parameter estimates	t Value	Pr > |t|
Intercept	0,0001	0,46	0,6503
Within effect	0,0534	2,43	0,0206
Between effect	0,0723	0,59	0,5609
Cross effect	0,0329	0,27	0,7864

The regression results in table 3 should be seen as an indication of dependence between within effect and net entry effect. Still, the result support the notion that in industries experiencing rapid technological change, the entry of new firms is important in fostering aggregated productivity growth.[12] However, to support the results, a more theoretically funded argumentation together with more comprehensive empirical analysis is needed.

Considering the development of the manufacturing sector, we previously noted that it has the most significant impact on the total productivity growth. To account for this strong performance, the development of the manufacturing sector is examined more closely.

Table 4. Labour productivity decomposition, manufacturing industry, labour shares as weights.

ISIC rev. 3	Industry	Labour productivity growth	Within effect	Between effect	Cross effect	Net entry effect	Contri-bution
15-16	2.1 Food, drink & tobacco	14,2%	1,0%	0,0%	-0,1%	0,1%	1,0%
17-19	2.2 Textiles, clothing and leather industry	4,6%	0,1%	0,1%	0,0%	0,1%	0,2%
20	2.3 Wood products	23,1%	1,0%	0,0%	0,0%	0,1%	1,1%
21	2.4 Pulp & paper products	25,3%	2,5%	-0,4%	-0,4%	0,0%	1,6%
22	2.5 Printing & publishing	-2,2%	-0,1%	0,1%	0,0%	0,1%	0,1%
23	2.6 Mineral oil refining	-43,1%	-0,4%	0,0%	0,1%	0,0%	-0,4%
24	2.7 Chemicals	126,5%	9,6%	0,7%	2,4%	0,0%	12,7%
25	2.8 Rubber & plastics	9,9%	0,3%	0,0%	0,0%	0,0%	0,3%
26	2.9 Non-metallic mineral products	15,3%	0,3%	0,0%	0,0%	0,0%	0,4%
27	2.10 Basic metals	38,3%	1,8%	0,0%	0,3%	0,0%	2,1%
28	2.11 Fabricated metal products	-1,9%	-0,2%	0,0%	0,0%	0,1%	0,0%
29	2.12 Mechanical engineering	23,7%	3,0%	0,0%	0,1%	0,1%	3,2%
30	2.13 Office machinery	2,5%	0,0%	0,0%	0,0%	0,0%	0,0%
31	2.14 Electrical machinery	32,7%	0,8%	0,0%	0,1%	0,0%	0,9%
31	2.15 Industry for electronics and communication equipment	33,3%	1,9%	1,2%	0,9%	0,2%	4,2%
32	2.16 Precision instruments	2,4%	0,1%	-0,1%	0,0%	0,1%	0,1%
34	2.17 Industry for motor vehicles	97,2%	12,0%	0,1%	1,0%	0,1%	13,1%
35	2.18 Other transport equipment	5,2%	0,1%	0,0%	0,0%	0,0%	0,1%
36-37	2.19 Other manufacturing	12,2%	0,3%	0,0%	0,0%	0,1%	0,4%
15-16	2. Manufacturing	41,3%	34,2%	1,7%	4,3%	1,2%	41,3%

Source: IFDB, own calculations.

[12] *OECD 2001.*

In table 4, the labour productivity growth is decomposed in relation to the aggregated productivity in the manufacturing industry, i.e. the contribution sum up to 41.3 per cent. Besides the development in the manufacturing sector, the transport and communication sector had a strong impact on the aggregated productivity growth for total economy. The transport and communication sector accounted for 22 per cent of the total productivity growth. In table 6 below is the sector contribution distributed on the 2-digt industry level. As shown, the communications sector has a strong impact on the sector figure. Indeed, almost half of the sector effect origin from the industry for communications. At a closer look we find that the within effect is dominating, while the net entry effect is nonexistent. On the contrary, we find a significant net entry effect in inland transport together with supporting and auxiliary transport activities. The result of the sector is scattered when it comes to net entry effects. It is difficult to discern a distinct pattern.

Table 5. Labour productivity decomposition, transport and communication sector.

ISIC rev. 3	Industry	Labour productivity growth	Within effect	Between effect	Cross effect	Net entry effect	Contri-bution
60	5.1 Inland transport	26,2%	7,5%	-1,5%	1,2%	2,4%	9,6%
61	5.2 Water transport	113,2%	6,6%	0,0%	-0,4%	0,6%	6,8%
62	5.3 Air transport	10,0%	0,1%	0,1%	0,1%	0,2%	0,4%
63	5.4 Supporting and auxiliary transport activities	49,7%	11,5%	0,0%	0,6%	3,7%	15,8%
64	5.5 Communications	108,9%	35,7%	-2,6%	-9,0%	0,0%	24,1%
60-64	5. Transport and communications	56,7%	61,5%	-4,0%	-7,6%	6,8%	56,7%

Source: IFDB, own calculations.

The development of labour productivity has not, however, been positive across all sectors in the economy. To find out more about the negative contribution recognised in table 2, the financial and business service sector, having the largest negatively contribution (-1,3% of total 22,1), is put under closer examination. The result is reported in table 6.

Table 6. Labour productivity decomposition, financial and business services.

ISIC rev. 3	Industry	Labour productivity growth	Within effect	Between effect	Cross effect	Net entry effect	Contri-bution
65-67	Financial institutions and insurance companies	-2,3%	0,0%	0,0%	0,0%	0,0%	0,0%
70	Real estate activities	14,0%	4,7%	-6,4%	-1,9%	-0,7%	-4,2%
71	Renting of machinery and equipment	47,5%	1,0%	0,0%	-0,1%	0,8%	1,7%
72	Computer and related activities	-16,6%	-2,1%	0,1%	-0,4%	0,2%	-2,2%
73-74	Institute for research and development	-5,9%	-2,0%	-0,2%	0,0%	-2,3%	-4,4%
65-74	Financial and business services	-9,1%	1,7%	-6,5%	-2,5%	-1,9%	-9,1%

Source: IFDB, own calculations.

In overall we find a relatively large impact of entry and exit in the sector. This follows from the result reported in table 1, showing a large number of entry and exit, compared to incumbents, i.e. high turnover rates. In detail we find that especially real estate activities

together with institute for research and development have the most negative effect on the aggregated productivity growth of the sector. Obviously, institutes for research and development could have positively externalities that are not taking into account with the method employed. Another explanation could be that measuring of labour productivity is mixed up due to the wide range of activities included (legal and technical and advertising together with other business activities, nec.) in institute for research and development. This mix of activities makes correct measurements difficult, especially since detailed price indices are not accessible. Cautionary interpretations should also be applied for financial institutions and insurance companies as only a small number of companies are covered. The development of these covered companies should also be taken cautionary due to the difficult measurement of value added in banking and insurance. The activities associated with financial and business services could also have positive effects that are not measured by the method employed in this study.

Considering finally the creation and destruction of firms in the financial and business services, we find that industries for renting of machinery and equipments and computer and related activities have positive net effects. In the latter sector, the net entry effect is positive while the within effect is negative. This result suggests that entering firms are more productivity than incumbents and exiting firms respectively. In overall the productivity growth of the sector is more dependent of entry and exiting, compared to the other sectors.

4 Concluding remarks

This paper has examined the dynamic relation between firm demography and aggregate productivity firm in Sweden during the period 1997-2003. By using enterprise demography data, the interaction between micro dynamics and aggregate productivity growth has been discerned. The result of the decomposition shows that the contribution of entry and exit of firms on aggregate productivity growth is small for the total economy. Indeed, the contribution of net entry is 1,6 per cent of total 22,1 per cent. Still, this result suggests that entering firms are more productivity than exiting firms. The effect of net entry seem to play only a modest role in manufacturing sector, while it boost the development of labour productivity in services sectors. The net effect is especially significant in domestic trade, hotel and restaurants together with transport and communications. For the total economy is the net entry effect more important than shifts in reallocation of labour between incumbents.

The results of the present study both show similarities but also differences with reference to the body of literature on firm dynamics and aggregate productivity growth. Importantly, this study support the result that a large part of the aggregate labour productivity is driven by what happens in each individual firm, while shifts in reallocation of labour form incumbents in decline to those that are growing play less role.[13]

A number of studies have reported that the growth of labour productivity is boosted by the destruction of low productivity firms and the creation of high productivity firms. This study supports this notion in general. Although the contribution is small in the Swedish manufacturing section, the entry of new units is important in fostering the growth of labour productivity in services sectors. The analysis of the relation between within effect (used as a proxy for technological progress) and net entry effect also support the result that the entry of new firms contributes to the aggregated productivity growth.[14]

In the present study is the contribution of net entry on aggregated productivity smaller than that reported in a number of other studies. This may be explained by a number of factors. A longer time period of study generally leads to greater emphasis on net entry effect. Moreover is the within effect is relatively smaller when the decomposition is applied on multifactor productivity. The decomposition on labour productivity generally give the within effect a greater role. This could be the effect of incumbents raising labour productivity by increasing capital intensity and or shedding of labour. The use of different decomposition method and obviously data sources could also have an impact on the result. Comparisons between different studies should be made carefully accordingly.

[13] *Ahn (2001); OECD (2001); Foster, Haltiwanger and Krizan (1998);*
[14] *Ibid.*

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6 Appendix 1: the shift-share method

The shift-share method provides a tool to account for how the aggregate productivity growth is mechanically linked to different growth of labour productivity and the reallocation of labour between industries. In accordance, the method relates directly to the two contrasting mechanism previous denoted structural burden or bonus to the aggregate productivity growth. Following the methodology suggested by Fagerberg (2000) or Pender (2003), we decompose the aggregate productivity growth into three separate effects:

$$Growth(LP_T) = \frac{LP_{T,t1} - LP_{T,t-1}}{LP_{T,t-1}} =$$

$$\frac{\overbrace{\sum_{i=1}^{n}\left(LP_{i,t1} - LP_{i,t-1}\right)S_{i,t-1}}^{(1)\text{Within shift effect}} + \overbrace{\sum_{i=1}^{n} LP_{i,t-1}(S_{i,t1} - S_{i,t-1})}^{(2)\text{ Static shift effekt}} + \overbrace{\sum_{i=1}^{n}(LP_{i,t1} - LP_{i,t-1})(S_{i,t1} - S_{i,t-1})}^{(3)\text{ Dynamic shift effect}}}{LP_{T,t-1}}$$

Where LP is labour productivity; t-1, base year; t final year; T, $\sum$ over industries I; S_i share of industry I in total employment. (1) The first component, the within effect, capture the change in labour productivity, under the constrain that not structural shifts have taken place and that each industries has maintained the share amount of shares in total employment as in the base year. (2) The second component, the static shift effect, is calculated as the sum of relative changes of labour across industries between t-1 and t, weighted by the initial value of labour productivity in t-1 (3) The third component, dynamic shift effect, is calculated as the sum of changes in labour shares and labour productivity of industries.