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FOREIGN-OWNED FIRMS AND PRODUCTIVITY-ENHANCING RESTRUCTURING IN FINNISH MANUFACTURING INDUSTRIES**

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ABSTRACT: The direct contribution of foreign-owned companies (FOCs) to productivity-enhancing intra-industry restructuring in Finnish manufacturing is analyzed by means of a productivity decomposition method. It is found that the FOCs have had an increasing role on the micro-level productivity dynamics after the liberalization of the foreign-ownership legislation in 1993. However, when proportioned to the employment share, the change of their contribution seems less outstanding. Initially the restructuring component of the FOCs was disproportionally large but had normalized by the end of the 1990s.

Keywords: Foreign ownership, productivity decomposition, productivity-enhancing restructuring

JEL-code: F23, O33, O47

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TIIVISTELMÄ: Tutkimuksessa selvitetään ulkomaalaissomisteisten yritysten suoraa vaikutusta tuottavuutta vahvistavaan, toimialojen sisällä tapahtuvaan toimipaikkarakenteiden muutokseen Suomen teollisuudessa. Kysymystä on tutkittu tuottavuuden hajontamenetelmää käyttäen. Havaitaan, että ulkomaalaisomisteisten yritysten merkitys tuottavuuden mikrotason dynamiikalle on lisääntynyt vuonna 1993 tapahtuneen ulkomaalaisomistuksen liberalisoinnin jälkeen. Toisaalta kun ulkomaalaissomisteisten yritysten kontribuutio suhteutetaan niiden työllisyysosuuteen, kontribuution muutoksen merkitys näyttää vähemmän esiinpistävältä. Alussa ulkomaalaisomisteisten yritysten merkitys oli suhteellisesti ottaen suuri, mutta tilanne tasaantui 1990-luvun jälkipuoliskolla.

Avainsanat: Ulkomaalaisomistus, tuottavuuden dekomponointi, tuottavuutta vahvistava rakennemuutos

JEL-koodi: F23, O33, O47

Ei-tekninen tiivistelmä:

Yritysten ulkomaalaisomistusta koskevia rajoituksia vapautettiin merkittävästi vuonna 1993. Tässä tutkimuksessa tarkastellaan sitä, kuinka ulkomaalaisomistuksen nopea lisääntyminen tuon jälkeen on vaikuttanut toimipaikkarakenteiden tuottavuutta vahvistavaan rakennemuutokseen Suomen teollisuuden toimialoilla. Analyysivälineenä käytetään tuottavuuden hajotelmamenetelmää. Sen avulla toimialan tuottavuuden muutos voidaan jakaa erillisiin tekijöihin.

Näistä yksi on toimipaikkatekijä (niin sanottu ”within” komponentti), joka kertoo toimialan toimipaikoilla tapahtuneen tuottavuuden kasvun. Se on toimipaikkojen painotettu keskimääräinen tuottavuuden kasvuvauhti – painona on toimipaikan osuus toimialan tuotannontekijöiden käytöstä.

Tämän komponentin lisäksi toimialan tuottavuuden kasvuun vaikuttavat erilaiset rakennemuutoskomponentit. Näistä tärkeä on niin sanottu ”osuussiirtymäkomponentti”, joka vaikuttaa toimialan tuottavuuden kasvua lisäävästi silloin, kun korkean tuottavuuden toimipaikat kasvavat tuotannontekijöiden määrällä mitattuna enemmän (tai pienevät vähemmän) kuin heikon tuottavuuden toimipaikat. Muut tuottavuuden kasvun rakennemuutoskomponentit ovat ilmestymisvaikutus (entry effect) ja poistumisvaikutus (exit effect). Ilmestymisvaikutus on positiivinen silloin, kun uudet toimipaikat ovat tuottavampia kuin vanhat toimipaikat. Poistumisvaikutus on positiivinen silloin, kun tuottavuudeltaan keskimääräistä heikommat toimipaikat katoavat toimialalta.

Tässä tutkimuksessa tuottavuuskasvun komponentit jaetaan vielä osiin toimipaikan omistajayrityksen kansallisuuden mukaan. Neljä eri toimipaikkaryhmää erotellaan sen mukaan, onko omistaja ollut kotimainen vai ulkomaalainen lähtö- ja päätevuonna. Ensimmäinen ryhmä on kotimaisena säilyneet, ja toinen ryhmä ulkomaalaisena säilyneet toimipaikat. Kolmas ryhmä koostuu toimipaikoista, jossa omistaja on muuttunut kotimaisesta ulkomaalaiseksi. Neljännessä ryhmässä muutos on tapahtunut päinvastoin. Tällaista ryhmittelyä käyttäen toimipaikkatekijä ja osuussiirtymäkomponentti voidaan siis jakaa vielä neljään osakomponenttiin. Ilmestymis- ja poistumisvaikutus voidaan jakaa kahteen osaan: kotimaisten vai ulkomaisten toimipaikkojen kontribuutioon. Tuottavuuden muutosta mitattaessa tässä tutkimuksessa käytetään viiden vuoden (liukuvia) intervalleja.

Tulokset kertovat, että talouslaman jälkeen, eli noususuhdanteen aikana, kasvava osa tuottavuutta vahvistavasta rakennemuutoksesta voidaan lukea ulkomaalaisomisteisten toimipaikkojen ansioksi. Ulkomaisten yritysten perustamilla toimipaikoilla on ollut myönteisempi vaikutus toimialan tuottavuuskasvuun kuin kotimaisilla. Sama havainto saadaan käytettäessä suorituskyvyn mittana työn tuottavuutta ja kokonaistuottavuutta. Näistä jälkimmäinen on työn tuottavuuden ja pääoman tuottavuuden yhdistelmä. Kotimaisissa yrityksissä tapahtuneet tehottomien toimipaikkojen poistumiset ovat nopeuttaneet toimialojen tuottavuuskasvua. Ulkomaisten yritysten kohdalla tämä tekijä on ollut vähämerkityksellinen.

Tuloksia tulkittaessa on otettava huomioon myös se, että ulkomaalaisomisteisten toimipaikkojen osuus panoskäytöstä kasvoi merkittävästi ulkomaalaisomistuksen liberalisoinnin jälkeen. Jatkavista toimipaikoista ulkomaalaisomisteiset toimipaikat näyttivät olevan jonkin verran kotimaisia toimipaikkoja alttiimpia tuottavuutta vahvistavalla rakennemuutokselle varsinkin heti laman jälkeen, mikä nähdään, kun eri toimipaikkaryhmien osuussiirtymäkomponentit suhteutetaan niiden panoskäytön osuuteen toimialalla. Osuussiirtymäkomponentin suhteellinen merkitys ei kuitenkaan enää poikkea merkittävästi kotimaisten ja ulkomaalaisten toimipaikkojen välillä vuosituhannen lopulla. Ulkomaalaisten yritysten uudet toimipaikat ovat kuitenkin vaikuttaneet kotimaisia uusia toimipaikkoja myönteisemmin toimialojen tuottavuuskasvuun vuosituhannen loppuun saakka.

Tässä tutkimuksessa tarkastellaan ulkomaalaisten toimipaikkojen suoraa vaikutusta suomalaisten toimialojen tuottavuuskasvuun rakennemuutoksen välityksellä. Tämän lisäksi ulkomaiset uudet toimipaikat tai kotimaisilta yrityksiltä hankitut vanhat toimipaikat voivat vaikuttaa tuottavuutta vahvistavaan rakennemuutokseen epäsuorasti. Ne voivat stimuloida kotimaisten toimipaikkojen välillä tapahtuvaa valikointia ja rakennemuutosta tuottavuutta vahvistavalla tavalla. Tätä kysymystä on tarpeen selvitellä muissa tutkimuksissa.

Tutkimuksen tulokset kertovat, että ulkomaiset yritykset ovat tuoneet Suomen toimialoille korkean tuotavuuden teknologiaa uusia toimipaikkoja perustamalla. Toisaalta tulokset antavat jonkin verran viitteitä siitä, että ulkomaiset yritykset ovat ottaneet suomalaisia yrityksiä tarkemmin huomioon toimipaikkojensa tehokkuuden päättäessään lisäinvestoinneista, rekrytoinneista ja irtisanomisista.

1. Introduction

Globalization has been accused or praised for various economic developments that industrial countries have witnessed during the past decades. Foreign direct investments (FDIs) are one part of this broader phenomenon. In a host country they are often regarded highly welcome while foreign-owned companies (FOCs) can be expected to have various direct or indirect positive effects on the host country's productivity (see survey in e.g. Blomström and Kokko, 1998).

It is frequently argued that positive direct effects on an industry's productivity in the host country arise due to the fact that companies operating in multiple nations have some firm specific assets, which enable them to achieve high productivity performance. Causality may run both ways: they may be multinational thanks to their asset or being multinational may provide them with productivity improving capabilities. In both cases, however, these companies can be expected to be beneficial to the economy of the host country.

Valuable company specific assets can be expected to be reflected particularly clearly in the productivity of the establishments built by the multinational companies themselves (greenfield entry). Starting from scratch the FOCs may build plants that are furnished with high technology machinery and an organization with a suitable mix of skills. The FOCs may also acquire indigenous companies and their plants and retool them with more productive technology or improve the efficiency of the use of current technology by means of better management, for example. Of course, finding that the FOCs have high productivity plants does not prove that FDIs have positive independent direct productivity effects on a host country's industry. Positive productivity gaps between domestic-owned and foreign-owned plants (acquired sometimes in the past) may solely reflect "cherry picking" aspiration (see e.g. Almeida, 2003; Castellani and Zanfei, 2003; 2004). This may be the case when managers have other incentives than productivity and profitability maximization, like empire building for instance (see Baumol, 1959; Williamson, 1964). If this is the case and, in addition, the presence of the foreign ownership does not involve productivity spillovers, no favorable productivity effect will emerge at the firm or establishment level (see Harris and Robinson, 2004).

However, even when FDIs involve only acquisitions of incumbent indigenous companies without any productivity contribution to them in the short or long term they may still have a favorable impact on the host country at the industry level by contributing positively to the micro-level dynamics (cf. e.g. Girma, Greenaway and Wakelin, 2001). An important challenge of the markets is to reallocate resources from less productive units to more productive ones. Less constrained financially and having higher required returns on capital, the FOCs can be expected to boost the restructuring process in the host country. The FOCs may expand their high productivity plants quickly and may be eager to downsize or shut down low productivity plants. For example, Girma and Görg (2004) provide evidence that plants that are owned by FOCs have weaker survival prospects than those owned by domestic companies, when various factors are controlled in the analysis. So, it may be the case that the FOCs pick up the cherries, drop the bad ones out, put the good ones to grow and by this way nourish the economy's aggregate productivity indirectly.

It should be noted that in this case the positive productivity effects cannot be found at the plant level but solely at the industry level. More specifically, what is needed is a method for gauging how much reallocation of resources at the plant and/or company levels have contributed to aggregate productivity growth and how much of this reallocation effect can be ascribed to the FOCs.

The focus of this paper is to examine, how much the FOCs have contributed to productivity-enhancing restructuring through entries, exits and reallocation among continuing plants in the Finnish manufacturing industries over the past decades.

The remainder of the paper is organized as follows. Section 2 provides a short review of existing empirical evidence on foreign-ownership and its productivity effects in Finland. Some earlier non-Finnish results concerning the role of the FOCs in the productivity-enhancing restructuring are discussed as well. In Section 3 a productivity decomposition method is presented, which allows restructuring components of the industry productivity growth to be identified. This method differs somewhat from the alternatives that are now common but provides more easily interpreted results. Section 4 gives empirical results for Finnish manufacturing industries and Section 5 concludes.

2. Earlier empirical findings

As late as in the early 1990s FDIs were still strictly regulated in Finland. According to a measure constructed by the OECD, Finland had in 1990 the highest level of restrictions among OECD countries after Norway and Iceland (Golub, 2003). During the 1990s the liberalization of inward foreign investments had been particularly dramatic in Portugal, France, Norway, and Finland. In Finland this change stems from a new law that came into force in the deepest stage of the great depression, in 1993, and abolished essential parts of restrictions concerning foreign ownership.

Thereafter, indeed, the penetration of foreign ownership exhibited strong and sustained growth. According to calculations made in a study by Ilmakunnas and Maliranta (2004), the employment share of foreign-owned plants in Finnish manufacturing increased from about 10 percent in 1994 to about 20 percent in 2001.

Several empirical analyses have shown that there is a statistically and economically significant total factor productivity gap (about 10-15 percent) between foreign and domestic plants in Finnish manufacturing but the gap is substantially narrower when fixed plant effects are controlled in the panel analyses (being 1-6 percent) (Maliranta, 1999; Ilmakunnas and Maliranta, 2004; Ilmakunnas, Maliranta and Vainiomäki, 2004). It is also found that the wage gap is also positive but so much narrower than the total factor productivity gap that there should be positive profitability gap to the advantage of foreign-owned companies. Consistently with this view, Ali-Yrkkö and Ylä-Anttila (2003) report evidence on high profitability of foreign-owned companies.

Foreign-owned plants seem to grow faster than domestic-owned plants mainly due to a lower outflow rate of workers (Ilmakunnas and Maliranta, 2005). Nurmi (2004) finds weak evidence that foreign-owned plants have a higher survival rate. It should be noted that productivity level was then controlled for and found to have a significant independent positive effect on the plant's survival. The hypothesis that the FOCs "screen and grow" according to productivity suggests that the effect of the productivity level on subsequent growth (or survival) might be higher for foreign-owned than for domestic-owned companies and plants.[1] To my knowledge this issues has not been studied empirically in Finland or internationally.

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[1] A tight positive relationship between efficiency and subsequent growth characterizes intensive competition according to the insight advocated, for example, by Boone (2001).

Another approach to study whether foreign companies lift industry productivity in the home country through micro-level restructuring is to decompose aggregate productivity change into various micro-level sources. A study by de Backer and Sleuwaegen (2003) provides evidence from Belgian manufacturing for period 1990-95 in support of the view that FOCs have contributed disproportionately to aggregate productivity growth through reallocation. They use the decomposition method suggested by Griliches and Regev (1995).

One problem with this method is that the productivity level of the entering plants, or the exiting plants, is not compared with that of the continuing ones in the current year but with the average level in the initial and the end year. This implies, for example, that an entrant may be identified to contribute positively to aggregate productivity growth even when average productivity growth would have been higher without its appearance. The results reported by de Backer and Sleuwaegen indicate that the entering FOCs had slightly lower labor productivity than the incumbent FOCs in 1995, but clearly higher productivity than domestic incumbents and, especially, domestic entering companies.

Finally, the results by de Backer and Sleuwaegen suggest that a disproportionately large within company contribution and disproportionately small between companies component can be attributed to the FOCs. This kind of analysis directs our attention to the fact that the FOCs may contribute to aggregate productivity not only by transmitting productivity spillovers to indigenous businesses but also by stimulating productivity-enhancing restructuring. On the other hand, since their study uses firm-level data, it ignores selection of plants and reallocation of resources within multi-unit companies, which may have a significant effect on industry productivity growth (Disney, Haskel and Heden, 2003).

3. Productivity decomposition method

The productivity level of plant *i* is defined as follows:

$$P_i = \frac{Y_i}{X_i} \tag{1}$$

where Y is output and X is input. In this study, output is measured by value added. For labor productivity, input X is measured here by hours worked. In the case of total factor productivity (TFP) input X is an index of different types of inputs. A simple Cobb-Douglas formula is used here:

$$X = \prod_{m=1}^{M} X_m^{\alpha_m} \quad (2)$$

where m denotes input type and α is a parameter. It is required that $\sum_{m=1}^{M} \alpha_m = 1$, which means that constant returns to scale are imposed in the computation of TFP. In fact, there is econometric evidence in support of the view that constant returns to scale are not an unreasonable assumption at the plant level (see e.g. Baily, Hulten and Campbell, 1992; Dwyer, 1998). In this study, the input index includes labor (L) and capital (K), i.e. M=2. Thus, total input is a weighted geometric average of labor and capital. The weight parameter α_L is defined as the proportion of labor compensation (wages plus supplements) to value added. The parameter for capital input (i.e. α_K) is one minus α_L. TFP can then be expressed as: TFP = $\exp(\alpha_L * \ln(Y/L)+(1-\alpha_L)*\ln(Y/K))$. In other words, with these definitions, TFP can be interpreted as a weighted geometric average of labor and capital productivity.

An advantage of the labor productivity measure is that it is closely related to the most commonly used measure of living standards, which is the gross national product divided by the number of inhabitants. TFP, on the other hand, provides a more comprehensive measure of economic performance than labor productivity, because it takes into account the efficiency of capital input usage, which is evidently an important element of competitiveness. One problem with TFP is that it requires the measurement of capital input, a task that is plagued with various troubles.

In this study capital input is measured with capital stock estimates, which are constructed by the perpetual inventory method (PIM) from the past investments of each plant. If needed, the initial value of capital stock is estimated by using fire insurance value of the stock. The assumed depreciation rate is 10%.[2] If information on a plant is, for some reason, lacking in the sample for a certain year, the capital input is not computed for subsequent years even in the event that the plant happens to reappear in the data. Usually these plants are relatively small. It is worth noting that these plants are not

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[2] For a more detailed description of the capital input measure, see Maliranta (2003).

treated as exits in the analysis, which probably would have caused some bias in the results.[3]

This study focuses on the sources of productivity change from the initial year *s* to end year *t* and in particular how foreign companies and their plants have contributed it at the industry level.

3.1. The effects of entry and exit

The productivity effect of entries and exits will be measured by a method proposed by Maliranta (1997b). It has a lot of similarity with the method used by Vainiomäki (1999) for analyzing micro-level sources of skill-upgrading.[4] The effect of entry and exit is the difference between two aggregate productivity growth rates. The first one includes all plants in the initial and the end year, while the second one comprises only those who appear both in the initial and the end year. Formally, the net entry effect (*NETENT*) is calculated as

$$\ln\left(\frac{P_t}{P_s}\right) - \ln\left(\frac{P_t^C}{P_s^C}\right) = NETENT \quad (3)$$

The entry and exit effects can be distinguished by noting that

$$\ln\left(\frac{P_t}{P_s}\right) - \ln\left(\frac{P_t^C}{P_s^C}\right) = \ln\left(\frac{P_t}{P_t^C}\right) + \ln\left(\frac{P_s^C}{P_s}\right) \quad (4)$$

The initial year is denoted by *s*, the end year by *t* and the aggregate productivity level of the continuing plants by P^C. The first term in the right-hand side of Equation (4) is positive if in the end year *t* the total aggregate productivity level is higher than the aggregate productivity level among continuing plants (those that appeared also in the initial year). Thus this term can be used as an indicator of the entry effect. The second

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3 Maliranta (2003) provides diagnostics of the plant-specific perpetual inventory method (PIM) estimates. It is shown that at the aggregate level, PIM estimates give a very similar pattern of the changes in capital stock in the years 1975-84 as those produced with an alternative measure using fire insurance estimates. Estimation of the so-called 'reliability ratios' with the two independent indicators of capital input indicates that the reliability of our PIM estimates is at least satisfactory. The reliability ratio is about 90 per cent.

4 See the discussion about the differences between different ways of defining, measuring and interpreting the entry and exit effects in Vainiomäki (1999) and Maliranta (2003).

term, in turn, is positive if the aggregate productivity level among continuing plants (those that will appear also in the final year) is higher than among all plants (disappearing plants in addition to continuing plants). This term thus provides us with an indicator of the exit effect.

The determinants of the entry and exit components can be seen from the following equation:

$$\ln\left(\frac{P_t}{P_t^C}\right)+\ln\left(\frac{P_s^C}{P_s}\right)=\ln\left(1+w_t^N\left(\frac{P_t^N}{P_t^C}-1\right)\right)-\ln\left(1+w_s^E\left(\frac{P_s^E}{P_s^C}-1\right)\right), \tag{5}$$

where P^N refers to aggregate productivity level of the entrants (those that appear in *t* but not in *s*), P^E that of the exiting plants (those that appear in *s* but not in *t*), $w_t^N = 1-\sum_{i\in C}\left(\prod_{m=1}^{M} X_{it}^{S_{mt}}\right)\Big/\sum_i\left(\prod_{m=1}^{M} X_{it}^{S_{mt}}\right)$ is the current input share of the new plants in year *t*, and $w_s^E = 1-\sum_{i\in C}\left(\prod_{m=1}^{M} X_{is}^{S_{mt}}\right)\Big/\sum_i\left(\prod_{m=1}^{M} X_{is}^{S_{mt}}\right)$ is the current input share of those plants in the initial year *s* that do not exist in the final year *t*. The cost share of input *m*, i.e. S_{mt}, is calculated by

$$S_{mt}=\frac{1}{2}\cdot\left(\frac{p_{mt}X_{mt}}{\sum_m p_{mt}X_{mt}}+\frac{p_{ms}X_{ms}}{\sum_m p_{ms}X_{ms}}\right) \tag{6}$$

where p_m denotes the unit price of input type *m*.

The first term on the right-hand side of equation (5) is the entry effect and the second term (minus included) is the exit effect. We see that the magnitude of the entry effect (exit effect) is dependent on the input share of those plants in the end year that have appeared after the initial year *s* (of those plants in the initial year that will disappear before the end year *t*) and the average productivity level of the new plants (the disappearing plants) relative to the continuing plants. One great advantage of this decomposition method is that the productivity of the exiting and entering plants is compared to the other plants in the current year (the year *s* in the case of exits and the year *t* in the case of entries). So, the entry (exit) effect is roughly equal to the product of the input share of entering (exiting) plants and the productivity gap in percentages between entering (exiting) plants and incumbent plants in the end (initial) year.

The interest of this paper is to decompose the entry and exit effect further according to the ownership. Therefore entry can be calculated separately for domestic and foreign ownership:

$$\ln\left(1+w_t^{DN}\left(\frac{P_t^{DN}}{P_t^C}-1\right)\right)=\text{domestic entry effect} \tag{7}$$

$$\ln\left(1+w_t^{FN}\left(\frac{P_t^{FN}}{P_t^C}-1\right)\right)=\text{foreign entry effect} \tag{8}$$

where *DN* denotes domestic and *FN* foreign entries. It should be noted that $w_t^{DN}+w_t^{FN}=w_t^N$ and $\left(w_t^{DN}/w_t^N\right)\cdot P_t^{DN}+\left(w_t^{FN}/w_t^N\right)\cdot P_t^{FN}=P_t^N$.

The exit effect is dealt with in an analogous manner.

It should be noted that the foreign entry plus the domestic entry effect is not identical to the entry component computed in (5). However, computations undertaken for the purpose of this study confirm that they are very close to each other (the results are not reported here), i.e.

$$\ln\left(1+w_t^{N}\left(\frac{P_t^{N}}{P_t^C}-1\right)\right)\approx\ln\left(1+w_t^{DN}\left(\frac{P_t^{DN}}{P_t^C}-1\right)\right)+\ln\left(1+w_t^{FN}\left(\frac{P_t^{FN}}{P_t^C}-1\right)\right) \tag{9}$$

$$\ln\left(1+w_t^{E}\left(\frac{P_t^{E}}{P_t^C}-1\right)\right)\approx\ln\left(1+w_t^{DE}\left(\frac{P_t^{DE}}{P_t^C}-1\right)\right)+\ln\left(1+w_t^{FE}\left(\frac{P_t^{FE}}{P_t^C}-1\right)\right) \tag{10}$$

The so-called Griliches-Regev decomposition method (Griliches and Regev, 1995) is commonly used in the literature (see e.g. Foster, Haltiwanger and Krizan, 2001). One problem with this method is, however, that the productivity level of the entering (exiting) plants is not compared to the productivity level of the incumbent plants in the current year but with the average of the initial and the end year. As a consequence, when the productivity growth rates are high among continuing plants, or the period is long, the exit component tend to be low and the entry component high. This also might explain the positive correlation between the within components and the entry component of this method, reported for instance by Bartelsman, Haltiwanger and Scarpetta (2004). When productivity growth is fast it is more probable that the new plants have higher productivity levels than the old ones in the past, especially in the distant past. Arguably this makes the interpretation of the results of such methods difficult, because two different productivity growth mechanisms (disembodied technological change reflected in the within plants effect and embodied technological change in the entry effect) are mutually related by construction. Another advantage of the method used in the present study over the alternatives is that there is no need to use price indexes for measuring the entry and exit components.

3.2. Reallocation between continuing firms

An application of the method proposed by Griliches and Regev (1995) provides us with a useful tool for the analysis of micro-level sources of productivity growth among continuing plants. This method is less sensitive to measurement errors than a more recent method proposed by Foster, Haltiwanger, and Krizan (2001). When applied to the continuing plants, both components of the method, i.e. the within and between component, have intuitive interpretation. The within component indicates the average rate of productivity growth among plants, where each plant is weighted by the input market share. The between component shows how much the reallocation of inputs between continuing plants has contributed to aggregate productivity growth in the period.

Industry-level productivity is now given by:

$$\ln \underline{P} = \sum_i w_i \ln \frac{Y_i}{X_i} \tag{11}$$

The rate of productivity growth can be decomposed according to:

$$\Delta \ln \underline{P} = \sum_G \left[\sum_{i\, in\, G} \overline{w}_i \cdot \Delta \ln P_i + \sum_{i\, in\, G} \Delta w_i \cdot \left(\overline{\ln P_i} - \overline{\ln \underline{P}} \right) \right] \tag{12}$$

where a bar over a variable denotes the average in the initial and end year. This method thus allows aggregate productivity change to be decomposed into two components and, in addition, each component further by groups (G). All continuing plants are classified into four groups: the plants that were owned by domestic companies both in the initial and the end year (G=DD), the plants that were owned by domestic companies in the initial year and by foreign companies in the end year (G=DF), the plants that were foreign-owned in the initial and the end year (G=FF), and the plants that were foreign-owned in the initial year and domestic-owned in the end year (G=FD).

In order to measure the components of productivity growth among continuing plants, a chain-type approach is being used in this study. Value added in the initial year is converted into the end year prices by using implicit industry-specific price indexes of value added obtained from the Finnish National Accounts.

This application of the productivity decomposition method provides us with a tool bag for analyzing different productivity growth channels that the FOCs might take. These are illustrated in Figure 1. The vertical axis shows the productivity level and the horizontal axis indicates passing time. The size of the ball indicates the size of the plant in terms of input usage.

<Figure 1 here>

In case (a) a domestic-owned plant (D) is acquired by a FOC (F), which leads to a productivity growth in that plant. This is indicated by an upward-sloping line of that plant. In this case, the increased aggregate productivity growth, which is indicated by an upward-sloping dashed line, can be attributed to productivity growth within an initially-domestic plant acquired by a FOC (DF-plant). In case (b) the increase in aggregate productivity growth is due to the entry of a new high productivity plant, which is owned by a FOC. In case (c) aggregate productivity increase arises while a FOC expands its high-productivity plant, which it has acquired during the period. In other words, the DF-plant contributes to industry productivity growth through the between component. Case (d) is otherwise similar to (c) but now the plant has been owned by a FOC both in the initial and the end year, which also contributes to industry productivity growth though the between component.

The role of plant births and deaths is limited in the annual snapshots of productivity evolutions for various reasons. A dominant proportion of job flows takes place among continuing establishments. Entries and exits typically account for 10-20 percent of total job creation and job destruction in manufacturing (Davis, Haltiwanger and Schuh, 1996, for the United States; Ilmakunnas and Maliranta, 2003, for Finland). In addition, the bulk of investments occurs among the continuing plants. Consequently, in the short run, micro-level restructuring is mainly driven by them. Decomposition methods of productivity growth assume that entries and exits of plants are one-time events by their nature. However, Maliranta (1997b) has shown that the labor productivity of new plants relative to existing ones in Finnish manufacturing increases over time and reaches its highest level in a decade (for non-Finnish evidence, see e.g. Dwyer, 1998). The employment share of the new plants also grows over time. Another important feature is that among existing plants there is a “shadow of death” effect, documented by Griliches and Regev (1995) in Israeli manufacturing and by Maliranta (1999) in Finnish manufacturing. This means that the relative productivity of plants starts falling as early as several years before their exits while, at the same time, their employment share shrinks. Entries and exits can be viewed as gradual processes that take place essentially among incumbent plants. It is not at all surprising that Maliranta (2003) found a strong positive relationship in the patterns of the exit and the between component in Finnish manufacturing.

One more reason why the between component might be preferable over the entry and exit components as a measure of productivity-enhancing restructuring is that there are always inaccuracies when one is identifying entries and exits of plants in comprehensive data sets. Entries and exits observed in data include true as well as some artificial births and deaths, possibly in somewhat varying proportions. The series of the entry and exit components can therefore be argued to be subject to less reliability (see for example Baldwin, Beckstead and Girard, 2002). This may be the case even in Finland, where the comprehensive administrative registers are integrated with statistical data that supports the construction of micro-level data sets equipped with accurate longitudinal linkages.[5] In the quite typical circumstances, the presence of artificial deaths and births in the data will result in a systematic upward bias in the entry component in the GR and FHK methods, if the errors in the longitudinal linkages are uncorrelated with the productivity levels. This is because "an average plant" erroneously identified as an entrant, will contribute positively to the entry component, when there is a general positive productivity growth tendency. However, the decomposition method applied here is not subject to such biases (see Maliranta, 2003).

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[5] One problem with the commonly used decomposition methods is that errors in longitudinal linkages yield an upward bias in the entry component in a situation when the average productivity growth of the continuing plants is positive as typically is the case. The method applied here, however, does not give systematically biased results as long as the probability of having erroneous change in the identification code is uncorrelated with the current productivity level of the plant or firm (Maliranta, 2003).

4. Empirical analysis of the contribution of the FOCs to industry productivity growth

This chapter aims to identify empirical counterparts of the above cases in the Finnish manufacturing industries. All computations are made separately for each of 21 manufacturing industries. Interesting mechanisms take time to materialize and therefore 5-year moving windows are used in the computations. Furthermore, this approach provides us with more robust results than investigating annual changes. For the purpose of summarizing the industry-level tendencies at the total manufacturing level, the employment weighted averages of the components are reported. In other words, aggregate productivity growth derived from the reallocation of inputs between industries is eliminated in the following analysis and we focus on productivity enhancing intra-industry restructuring.[6]

The data are from the manufacturing census that basically covers all local-kind-of activity units in Finnish manufacturing that employ at least 5 persons.[7] The threshold changed a bit in 1995 to cover all plants that are owned by a firm that has at least 20 persons. As a consequence, since then the data cover also very small establishments of larger companies but, on the other hand, many single-unit firms employing less than 20 persons were dropped. From the point of view of the present analysis it is useful that the data still cover a very large proportion of total input usage. In order to check the robustness of the findings, computations are replicated by using varying thresholds. For example, the use of similar thresholds for all years yields insignificant changes in the results for the between component and the within component. The consequences for the entry and exit components are somewhat larger but still not dramatic.

4.1. Exit and entry

Figure 2 shows the patterns of the entry and exit components by ownership computed for labor and total factor productivity (TFP). We see that the exits of low-productivity domestic plants have substantially contributed to industry productivity growth especially during the great depression of the early 1990s but also during the recovery period

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[6] Nordhaus (2002b; 2002a) points out that from the point of view of economic welfare productivity growth within industries is more interesting than productivity growth due to inter-industry reallocation.

[7] An in-depth description of the data is provide by Maliranta (2003).

of the late 1990s with a declining trend, however. The domestic exits have contributed also to an increase in TFP in the 1990s. The foreign exits have played a minor role both for labor productivity and TFP growth. It is worth noting that positive exit effects appear in the period of recovery and positive employment growth in Finnish manufacturing after 1992. In other words, there were creative elements in the development both in terms employment and industry productivity growth in times when there were plant shut downs among domestic companies on a large scale.

<Figure 2 here>

The domestic entries have had a negative impact on labor productivity growth, but a positive effect on TFP growth. This is a direct consequence of the fact that new domestic plants have currently lower labor productivity level than incumbent plants, but their TFP level is higher. This difference in the results implies that new plants have relatively high capital productivity. These results are consistent with the earlier findings from Finland (Maliranta, 2003) and from many other countries (OECD, 2003).[8] As it comes to plant births made by a FOC, we find them to have had a non-negative contribution to industry labor productivity growth and a positive contribution to industry TFP growth.

4.2. Productivity-enhancing restructuring among the continuing plants

Figure 3 repeats the twin peaks pattern in the development of the productivity-enhancing restructuring between plants within Finnish manufacturing industries documented earlier by Maliranta (2003). The productivity-enhancing restructuring of input shares between the continuing plants started to play an increasingly important role in the mid-80s

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[8] It is possible that some important investments are made at the very beginning of a plant's life cycle, which is not always covered in these data. Therefore the relative capital productivity of young plants may seem too high because some initial investments are not captured in our capital input indicator, which is computed by means of perpetual inventory method. In addition, Maliranta (1997a) provides evidence that the proportion of rented capital, which is not included in our capital input measure, is somewhat higher in the younger than in the older plants. So, there is need for some cautiousness when interpreting the entry component of TFP growth.

and achieved its first peak at the turn of the 80s and 90s and its second peak during the recovery from the great depression of the early 90s.

<Figure 3 here>

The first peak can be attributed primarily to the domestic-owned plants. This is also to be expected due to the simple fact that the share of the FOCs was so low in those days, about 5% in our data.

At a first glance it seems that the foreign penetration generated a final blow to the sclerotic microstructures derived from the 70s and the early 80s and resulted in additional increases in industry productivity levels in the latter part of the 1990s. A finding that increasing proportions of productivity-enhancing restructuring can be attributed to the FOCs does not, of course, need to imply that foreign penetration has caused the second wave found in these figures. A more relevant is to study whether or not the contribution to productivity-enhancing restructuring of the plants that were acquired or owned by FOCs has been disproportionally large, as is being done in the end of this paper. In order to make proper comparisons between the different groups of plants it is useful to normalize each group's component by the inverse of their input share.

The results shown in Figure 4 seem to indicate that the plants of the FOCs gave rise to disproportionally large between components for both labor and total factor productivity right after the liberalization of foreign ownership in 1993. Later, however, the component came down. It can also be seen that foreign acquisitions do not seem to contribute to productivity enhancing restructuring differently from the domestic-owned ones.

<Figure 4 here>

5. Conclusions and discussion

This paper examines the role of the FOCs in the productivity dynamics at the micro-level in Finnish manufacturing industries. An earlier analysis by Maliranta (2003) has shown that a great leap in productivity growth started in the mid-80s and that it was largely based on productivity-enhancing restructuring. The intensity of "creative destruction" chilled towards the mid-90s, which probably had to do with the fact that a large proportion of inefficient plants of the "sclerotic era" was cleaned away. In addition, empirical evidence provided by Maliranta (2005) indicates that innovation activities, measured by R&D, and exposure to global competition, measured by import and export intensity, have had a role to play in stimulating "creative destruction" in Finnish manufacturing industries.

One of the motivations of this study was the liberalization of foreign-ownership in Finland in 1993, which lead to rapid and sustained increase in the employment share of FOCs in Finland. This can be hypothesized to have provided an additional stimulus to micro-structures in Finland. Indeed, an increasing contribution can be attributed to the FOCs in the productivity-enhancing restructuring. However, when proportioned to the increasing employment share in the Finnish economy, it is found that the importance of the foreign companies seems less outstanding.

Two points are, however, worth noting here. Firstly, this paper focused on the direct contribution of the FOCs to creative destruction. The presence of the FOCs may also indirectly affect the productivity-enhancing restructuring among the indigenous firms and their plants by making the markets more competitive. The present study, however, documented a declining productivity-enhancing restructuring among domestic-owned plants. On the other hand, no attempts were made to evaluate the counterfactual of what would have happened among domestic companies without the presence of the FOCs. After a long-lasting and profound restructuring process, which has taken place since the mid-80s, chilling may have been unavoidable. Furthermore, while a majority of the domestic-owned firms are nowadays exposed to global competition, the presence of the FOCs can be expected now to have a minor, if any, competition effect in many manufacturing industries.

The situation varies between different industries and sectors. The presence of the FOCs may have an important role to play in turning the economic environment more competitive in those industries and regions where competition is still lacking. These questions are dealt with in a related study by Maliranta and Nurmi (2004). They find that the presence of the FOCs decreases the survival probability of inefficient local entrepreneurs but increases the survival probability of the efficient ones. The finding suggests that the FOCs do contribute to productivity-enhancing restructuring indirectly. Various indirect effects on industry deserve more attention in the future research.

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Figure 1. Illustration of various mechanisms by which foreign-owned firms (F) may contribute aggregate productivity change

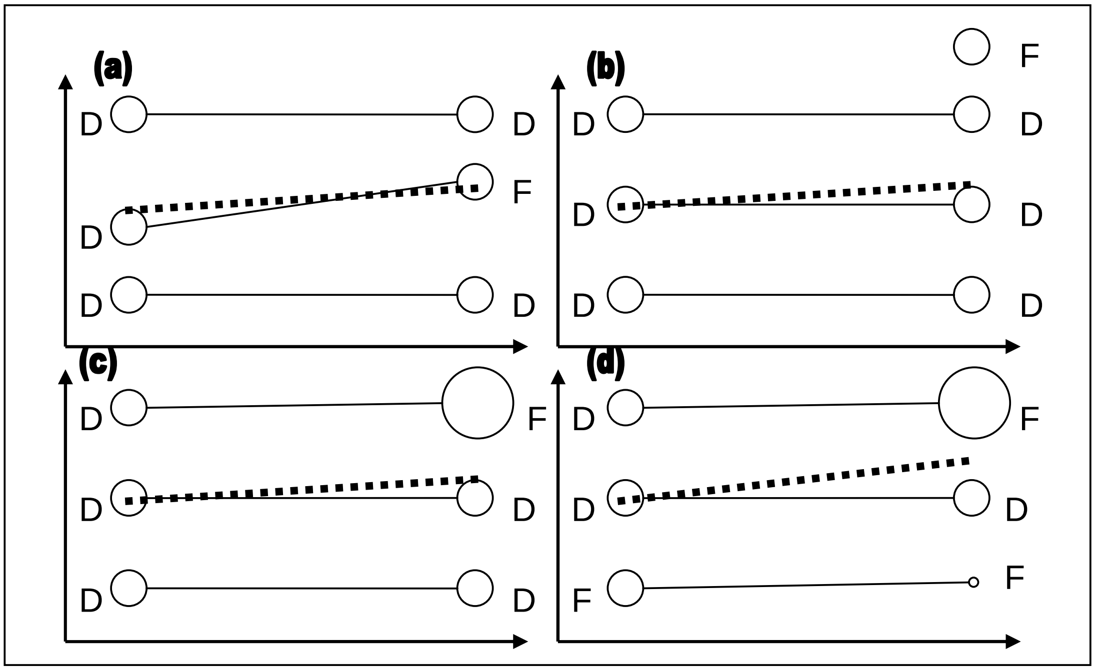
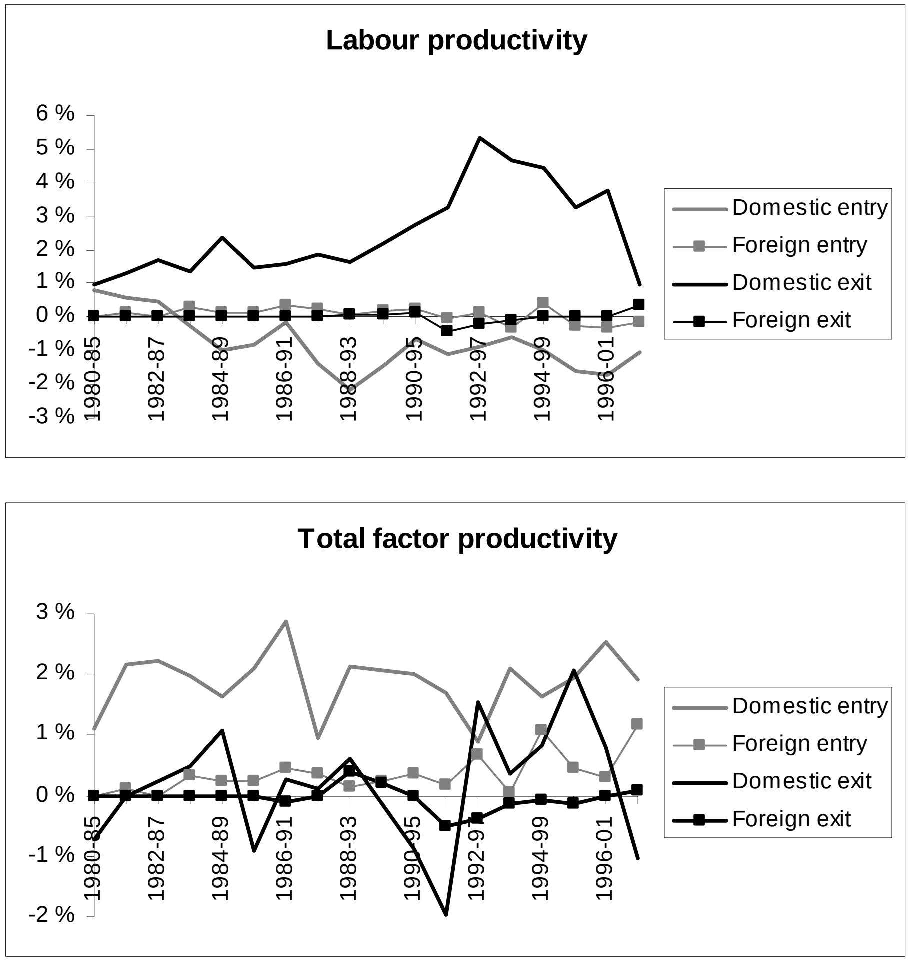
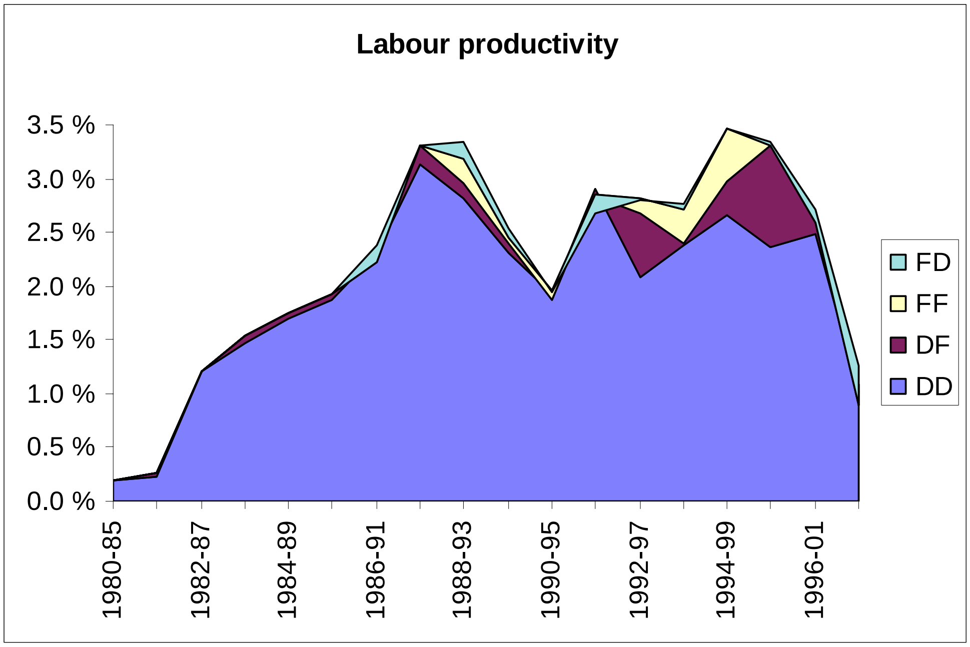


Figure 2. Entry and exit components of productivity growth by groups



Note: Decompositions are made at 2-digit industry level (21 manufacturing industries) and the results are aggregated to the level of total manufacturing by using employment shares as weights.

Figure 3. Between component of productivity growth by groups, Griliches-Regev -method



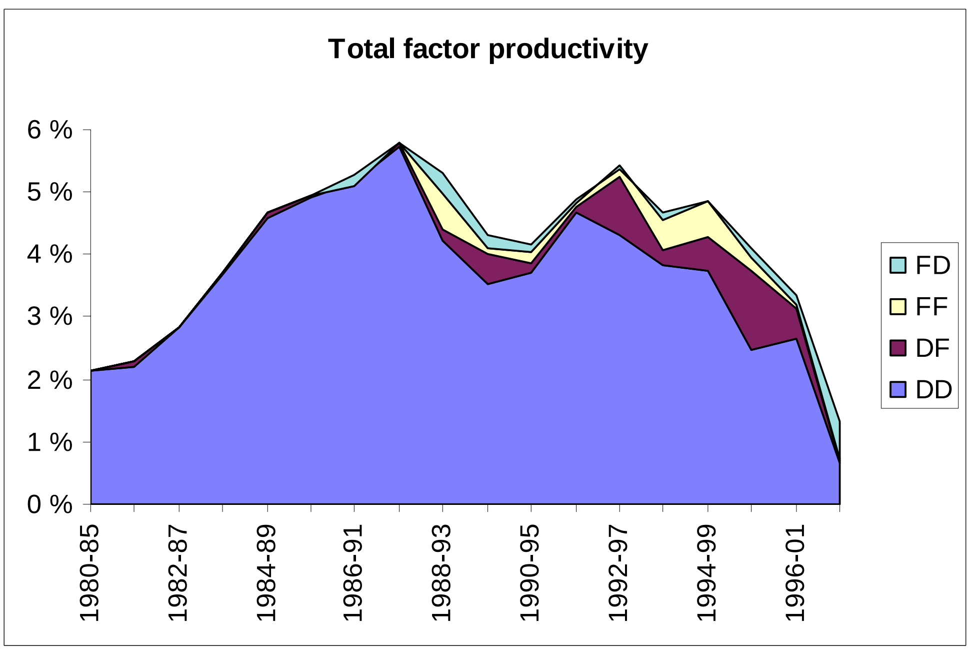


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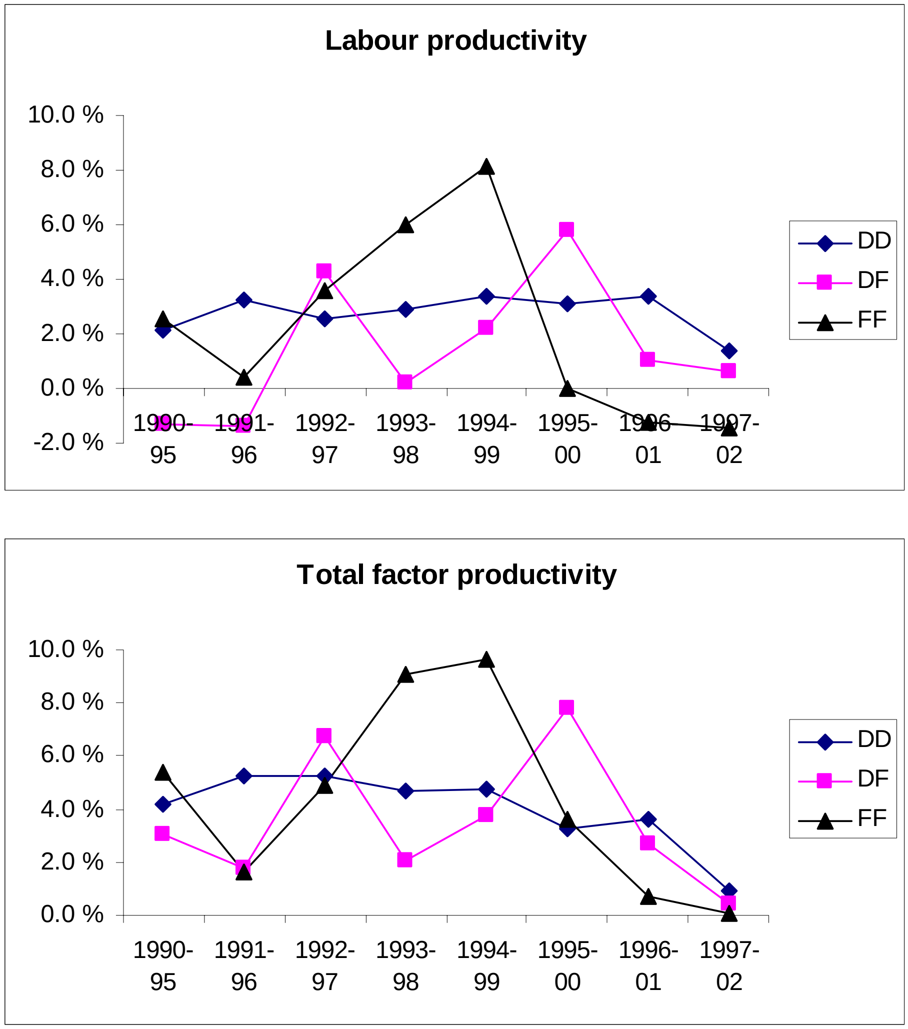
Figure 4. The between components of productivity growth normalized by the labor share of group



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