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EMPLOYMENT DYNAMICS AND OPENNESS TO TRADE IN FINNISH MANUFACTURING**

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ABSTRACT: This paper examines internationalisation and employment dynamics in the Finnish manufacturing sector 1980–2001 using plant and industry-level data. According to the results, there is a large heterogeneity in the patterns of international trade and employment across industries and over time. In addition, the effect of macroeconomic fluctuations on employment dynamics is considerable. The results suggest that higher international openness stimulates labour demand during periods of recovery. Higher import competition in the industry has negative employment consequences, whereas higher export intensity increases net employment growth. However, plant efficiency is an important factor in adjusting to the effects of import competition. Unexpectedly, there is also some evidence that trade liberalisation reduces job turnover especially in import-intensive sectors.

Keywords: Job flows, worker flows, internationalisation, manufacturing

JEL-code: F16, J21, J23, L60

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TIIVISTELMÄ: Tässä tutkimuksessa analysoidaan kansainvälistymistä ja työllisyyskehitystä Suomen tehdasteollisuudessa ajanjaksolla 1980–2001 käyttäen toimipaikka- ja toimialatason aineistoja. Tulosten mukaan kaupan ja työllisyyden kehitys toimialojen välillä ja yli ajan on hyvin heterogeenista. Lisäksi suhdannevaihteluiden merkitys työllisyysdynamiikkaan on huomattava. Tulokset viittaavat siihen, että suurempi kansainvälinen avoimuus stimuloi työvoiman kysyntää lamasta elpymisen aikana. Suurempi tuontikilpailun aste toimialalla vaikuttaa työllisyyteen negatiivisesti, kun taas korkeampi vientiaste lisää nettotyöllisyyskasvua. Toimipaikan tehokkuus on kuitenkin tärkeä tekijä tuontikilpailun vaikutuksiin sopeutumisessa. Yllättäen, kaupan vapauttaminen näyttäisi vähentävän työpaikkojen vaihtuvuutta erityisesti tuonti-intensiivisillä toimialoilla.

Avainsanat: Työpaikkavirrat, työntekijävirrat, kansainvälistyminen, teollisuus

JEL-luokittelu: F16, J21, J23, L60

EI-TEKNINEN TIIVISTELMÄ

Tämän tutkimuksen tarkoituksena on kartoittaa kansainvälistymisen vaikutuksia teollisten toimipaikkojen ja toimialojen työllisyyskehitykseen ajanjaksolla 1980–2001. Tutkimusperiodille on ominaista kansainvälisen kaupan ja ulkomaalaisomistuksen vapauttaminen sekä poikkeuksellisen voimakkaat suhdannevaihtelut. Lisääntynyt kaupan avoimuus ja yritysten kansainvälistyminen voi johtaa voimakkaaseen työpaikkojen vaihtuvuuteen osana mikrotason rakennemuutosta. Työmarkkinoiden joustavuus on tärkeä edellytys resurssien tehokkaalle allokaatiolle ja sitä kautta talouden kasvulle. Toisaalta liiallinen työpaikkojen ja työvoiman vaihtuvuus aiheuttaa sopeutumiskustannuksia lisääntyneiden rekrytointien, irtisanomisten ja inhimillisen pääoman menetysten muodossa.

Toimipaikkatasolla keskitytään selittämään työllisyyden nettomuutosta. Tällöin erilaisten toimipaikkatason tekijöiden, kuten toimipaikan koon, tuottavuuden ja henkilöstön koulutusrakenteen, huomioiminen on erityisen tärkeää, sillä kansainvälistymisen vaikutukset eivät välttämättä kohdennu samalla tavalla kaikkiin toimipaikkoihin edes saman toimialan sisällä. Sen sijaan lisääntynyt altistuminen tuontikilpailulle voi heikentää joidenkin toimipaikkojen työllisyyskasvua enemmän kuin toisten. Toimialatasolla toimipaikkatason työllisyyden bruttomuutoksista laskettavat työpaikka- ja työntekijävirrat antavat työllisyyden nettomuutosta kattavamman kuvan taustalla olevasta työmarkkinoiden dynaamisuudesta.

Kuvaileva analyysi valottaa kansainvälisen kaupan ja työllisyyden kehitystä teollisuuden eri toimialoilla. Kaupan vapauttamisen vaikutukset työllisyyskehitykseen ovat jakautuneet hyvin epätasaisesti eri toimialojen välillä. Lisäksi tulosten mukaan suhdannevaihteluiden ja toimipaikan koon vaikutus työllisyysdynamiikkaan on huomattava. Tulokset viittaavat siihen, että suurempi kansainvälinen avoimuus stimuloi työvoiman kysyntää lamasta elpymisen aikana. Yksinkertaisen regressioanalyysin tulosten mukaan suurempi tuontikilpailun aste toimialalla vaikuttaa toimipaikan nettotyöllisyyskasvuun negatiivisesti, kun taas korkeampi vientiaste lisää työllisyyskasvua. Ulkomaalaisomistus puolestaan näyttäisi vähentävän työllisyyskasvua.

Toimipaikkakohtaiset erot tuontikilpailun lisääntymiseen sopeutumisessa ovat kuitenkin merkittäviä. Erityisesti toimipaikan tehokkuus mitattuna työn tuottavuudella on tärkeä tekijä työllisyyskasvun kannalta. Korkeamman tehokkuuden toimipaikat näyttäisivät menettävän suhteellisesti vähemmän työpaikkoja tuontikilpailun lisääntyessä. Näin ollen, kaupan vapauttaminen saattaa jopa stimuloida tuottavuutta edistävää rakennemuutosta toimipaikkatasolla. Tulosten mukaan kaupan vapauttaminen näyttäisi myös lisäävän työpaikkojen vaihtuvuutta vienti-intensiivisillä toimialoilla, kun taas, odotusten vastaisesti, lisääntynyt tuonti-intensiivisyys näyttäisi vähentävän työpaikkojen vaihtuvuutta. Teknologisen kehityksen vaikutusten erottaminen kansainvälistymisen vaikutuksista on kuitenkin vaikeaa. Lisäksi syy- ja seuraussuhteiden luotettavampi eritteleminen edellyttää syvällisempää jatkoanalyysiä.

1. Introduction

During the last two decades, there have been profound changes in the Finnish industrial structure and business environment. Finland experienced an exceptionally deep recession at the beginning of the 1990s followed by intense restructuring and record-high unemployment. In addition, during the 1980s and 1990s there has been a steady decline in the share of manufacturing sector employment, which is comparable to the development in various other highly-developed economies. At the same time, Finland's competitive environment has been changing rapidly due to an extensive regulatory reform concerning the financial markets and barriers to trade. During these 20 years, Finland has developed to an internationally respected open economy with a high level of competitiveness and productivity.

In recent years, there have been several studies on the impact of international liberalisation on job allocation in the domestic labour market using data on transition and newly-industrialised economies or the US (e.g., Konings, Kupets, & Lehmann, 2003; Levinsohn, 1999; Revenga, 1992, 1997). The exceptional Finnish experience allows us to study the employment responses to increased openness in a small highly-developed economy that has faced extensive restructuring and deregulation. Furthermore, according to recent heterogeneous firm trade models (e.g., Bernard, Redding, & Schott, 2004; Melitz, 2003), the effects of liberalisation on employment are not spread evenly among firms, but the exposure to trade may enhance the growth opportunities of some firms, while simultaneously contributing to the downsizing of other firms in the same industry. Differences in the firms' reactions may be explained by the differences in the underlying characteristics of the firms. The heterogeneous employment responses of firms to trade liberalisation have not received much attention in the empirical trade literature. However, this may be partly due to the difficulty of separating the effects of internationalisation from the effects of technological change, which may be more strongly reflected in the within-industry employment changes.

Industry-level net employment changes may hide a substantial reshuffling of jobs within an industry. Plant-level job and worker flows give a more complete picture of what has been happening behind the aggregate net employment change. Opening up to international competition may increase the reshuffling of jobs and workers in the economy leading to increased uncertainty about the persistence of jobs in the labour market. On the other hand, flexibility of the labour market is an important requisite for the efficient allocation of resources in the economy, and thus, rapid economic growth.

This paper investigates employment dynamics and globalisation in the Finnish manufacturing sector over the period 1980–2001. The focus on manufacturing is motivated by the manufacturing's high share of total trade and the availability of exceptionally rich data sets for this particular sector. Liberalisation of international trade and foreign ownership may lead to substantial job reallocation. Employment responses to increasing import competition may vary depending on the characteristics of the plant. Several studies for many countries have found that job and worker flows vary negatively with plant size, so it is expected that size plays an important role in employment dynamics. However, plant efficiency, capital intensity and the skill composition of workers may also have a crucial part in the adjustment process. In addition, the patterns of employment adjustment strongly depend on the business cycles.

Job flows are calculated using the LDPM (Longitudinal Data on Plants in Manufacturing) data set by Statistics Finland (Ilmakunnas, Maliranta, & Vainiomäki, 2001). Over the period examined, the data used covers all active plants with at least 20 employees. Unfortunately, smaller plants cannot be included due to an increase in the size threshold from 5 employees to

20 employees in 1995.[1] The data set used is an unbalanced panel, which allows the entries and exits of plants, covering approximately 2500–4000 plants every year. The advantage of the LDPM data is that it also includes information on various other plant-level variables, including value added, capital stock, exports and foreign ownership. Information on worker flows and work force skills is available from the linked plant-level employer-employee data sets constructed using the Employment Statistics and the Business Register of Statistics Finland over the period 1988–97 (Ilmakunnas et al., 2001). Industry-level information on exports, imports and production is obtained from the OECD STAN (the industrial STructural ANalysis) database covering the whole period under examination.

The structure of this paper is as follows. Section 2 gives a brief review of the theoretical and empirical background related to trade liberalisation and its employment consequences. Section 3 provides some information on the history of trade liberalisation in Finland. In addition, the patterns of internationalisation and employment in the Finnish manufacturing sector are described. In section 4, the relationships between job and worker flows and openness to trade are tested using a simple econometric framework both at the plant and industry level. Finally, the conclusions are given in section 5.

2. Literature on trade liberalisation and the labour market

Greater international involvement can bring about substantial economic benefits, especially for small economies with limited resources. Imports increase the availability of products and services and lower prices through increased competition in the domestic markets. Exporting creates higher growth opportunities and makes domestic firms less dependent on the demand disturbances in the domestic market. Furthermore, increased competitive pressure may affect employment growth and job turnover positively due to productivity gains, improvements in product quality and variety and expanding market shares. Increased foreign ownership may have favourable demand, competition and spillover effects on the domestic markets.

However, globalisation also increases the worries on the survival of domestic production and employment. Opening up to international markets increases the country's vulnerability. Domestic firms are affected by international business fluctuations, increased competition, changing rules in international trade and failures in monetary and currency systems. In addition, rapid growth of manufactured exports from low-wage, newly industrialized economies has been claimed to increase wage inequality and unemployment in developed countries.

International trade may create welfare gains through the reallocation of resources to their most productive uses. The effect of micro-level restructuring on productivity growth is emphasised in the recent literature on the phenomenon of creative destruction, where inefficient production units are replaced by more efficient ones (e.g., Caballero & Hammour, 1996; Maliranta, 2003). However, welfare gains are reduced by adjustment costs associated with factor reallocation. Most studies on the effects of trade on labor markets focus on net employment change. However, it is important to study the gross changes in employment in order

[1] Before 1995 plants with at least 5 employees are included, whereas since 1995 plants belonging to firms with at least 20 employees are included. However, before 1995 the patterns of job flows are very similar with size thresholds of 5 employees and 20 employees. In addition, in terms of employment, plants with less than 20 employees cover only a small fraction of manufacturing employment.

to evaluate the magnitude of these adjustment costs. The process of creative destruction often involves a high rate of job reallocation. However, excessively high job turnover or churning may create additional costs related to hiring, firing, job search, relocation, training and losses of specific human capital and earnings during unemployment. Import-intensive industries may exhibit greater gross job flows, because their workers may have relatively low levels of specific human capital. Thus, it is also important to control for the skill-level of the workers in the industry. However, it should be noted that skill-biased technological change that reduces the relative demand for less-skilled workers may also have played a major role in employment losses in low-skill manufacturing industries.[2]

Greater international openness also facilitates the transfer of certain types of jobs to foreign production sites. Thus, international exposure may reduce job security through higher job and worker reallocation and lower persistence of jobs created. From the welfare point of view, it may also be important whether a negative net employment change is a result of increased job destruction or decreased job creation. Furthermore, the negative net change may be due to a simultaneous decline in job creation and job destruction, called a `chill', or a simultaneous increase in job creation and destruction, a `shake-out', or opposite changes in gross flows (Gourinchas, 1999). Generally, periods of restructuring are characterised by a shake-out.

On theoretical grounds, the relationship between trade exposure and labour demand is somewhat controversial. There are some theoretical models related to the effects of trade on industry-level net employment change and the flexibility of wages (e.g., Fontagne & Mirza, 2003; Revenga, 1997). According to Fontagne & Mirza (2003), there are two effects of trade on employment. First, increased openness to imports has negative employment consequences in the industry through a substitution effect, i.e., imports replacing domestic production. On a symmetrical basis, exports should benefit domestic employment. Second, a pro-competitive effect has a positive impact on sectoral labour demand for both imports and exports. This is a result of a reduction in prices followed by an increase in total demand for the traded good. Thus, overall, we should see a positive effect of increased exports on net employment change, but the total effect of imports on employment is ambiguous.

Traditional trade theories do not make any assumptions about job and worker flows, which are considered to be irrelevant in the long-run equilibrium. In addition, the standard trade theory generally does not emphasise the costs associated with reallocating the factors of production. The reason is that the adjustment process is assumed to be transitory and the benefits of trade are assumed to far outweigh the adjustment costs (Klein, Schuh, & Triest, 2002). One problem in comparing these effects is that the costs may be revealed already in the short run, whereas the benefits may occur only gradually in the long run.

However, in recent years new literature adding firm heterogeneity to the models of international trade has started to develop. These models emphasise that the benefits and costs resulting from trade liberalisation are not distributed evenly among firms, but the benefits accrue to the most efficient firms within the industry. Melitz (2003) develops a dynamic industry model with heterogeneous firms and monopolistic competition. The model includes sunk costs related both to entering the industry and to entering the export market. Through higher profit opportunities and increased entry, exposure to trade increases the efficiency (or productivity) thresholds required for exporting and surviving, thus forcing the least efficient firms to exit. The export market selection effect and the domestic market selection effect both lead to the reallocation of market shares towards the more efficient firms increasing the average productivity in the industry.

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[2] There are several studies on the effects of trade and technological change on the demand for skilled and unskilled workers, e.g. Wood (1995), Sachs & Shatz (1994), Salvenes & Forre (2003) and, for Finland, Huttunen (2002).

The model by Bernard et al. (2004) also adds firm heterogeneity to a traditional model of international trade based on endowment-driven comparative advantage. The model shows that falling trade costs lead to increased entry and exit and larger increases in firm size in comparative advantage industries. Because firm entry and expansion are associated with job creation, and firm exit and decline with job destruction, these outcomes imply relatively greater job turnover in comparative advantage industries as a result of trade liberalisation. In addition, similarly to Melitz's model, trade liberalisation leads to the reallocation of economic activity towards higher-productivity firms. Albuquerque & Rebelo (2000) consider the reallocation of resources across industries as a result of international trade. According to their model, liberalisation results in workers moving from the import-competing sector to the export sector.

Based on these newer models, it can be hypothesised that plant characteristics, especially efficiency, play an important role in employment adjustment to trade liberalisation. In addition, trade can lead to increased job and worker turnover within and across industries. More precisely, job creation should be higher in export-oriented industries, whereas job destruction should be higher in import-competing industries after trade liberalisation. The main emphasis in this paper is on job flows because there is a clearer causality between trade liberalisation and the demand for labour, whereas worker flows, describing more the supply side of labour, are more indirectly affected by international factors.

Measures for job and worker flows are constructed following (Davis, Haltiwanger, & Schuh, 1996) and (Burgess, Lane, & Stevens, 2000). The plant-level employment change for plant i from period t–1 to period t is $\Delta E_i = E_{it} - E_{i,t-1}$. The rate of plant-level net employment change is $NETR_i = \Delta E_i / EA_i$, where plant size is measured with the two-period average $EA_i = \frac{1}{2}\left(E_{it} + E_{i,t-1}\right)$ in order to reduce the regression to the mean bias. As a consequence, the net change varies in the interval [-2,2]. A measure for plant-level job reallocation, $|NETR_i|$, is the absolute value of $NETR_i$.[3] Plant-level worker flow is the sum of hirings (inflow), H_i, and separations (outflow), S_i, so $WFR_i = (H_i + S_i)/EA_i$. Plant-level churning rate, $CFR_i = WFR_i - |NETR_i|$, describes worker turnover in excess of job turnover that is required for a given job turnover, i.e., separations and hirings in existing positions.

Aggregating employment changes across all plants within an industry s and dividing by the two-period average industry size EA_s gives the employment-weighted job and worker flow rates at the industry level. Plants are assigned to their t year industry S. The job creation rate in the industry is defined as $JCR_s = \sum_{i \in S} \Delta E_i^+ / EA_s$, where ΔE_i^+ is a positive employment change. Similarly, the rate of job destruction is defined as $JDR_s = \sum_{i \in S} \left|\Delta E_i^-\right| / EA_s$, where $\left|\Delta E_i^-\right|$ is the absolute value of a negative employment change. The job reallocation rate (or job turnover) is defined as $JRR_s = JCR_s + JDR_s$, the rate of net employment change as $NETR_s = JCR_s - JDR_s$, and the excess job reallocation rate as $EJR_s = JRR_s - |NETR_s|$. Job reallocation describes the reshuffling of employment opportunities across plants. Excess job reallocation is positive if job reallocation is larger than what is needed to accommodate the net employment change. Thus, excess job reallocation describes simultaneous job creation and job destruction, which is partly due to job flows between different sectors or the structural change in the econ-

[3] Ilmakunnas (2003) argues that it may be more appropriate to explain positive and negative employment changes separately using a two-stage approach. First, the ordered probit is used to determine the regime (positive, negative or zero employment change) and then equations for positive and negative changes are estimated separately.

omy. At the industry level, the worker flow rate (worker turnover) is $WFR_s = \sum_{i \in S}(H_i + S_i)/EA_s$ and the churning rate is $CFR_s = WFR_s - JRR_s$.

The empirical findings on the effects of increased international exposure on employment and wages have been somewhat conflicting (e.g., Currie & Harrison, 1997; Krugman, 1995; Revenga, 1992, 1997).[4] However, most empirical studies seem to find a negative effect of imports on employment suggesting that the substitution effect of trade has been stronger than the pro-competitive effect. When it comes to the heterogeneous firm effects, Bernard et al. (2003) find some evidence that higher plant capital intensity and productivity mitigates the negative employment effects of exposure to imports from low-wage countries. In addition, it is found that trade liberalisation results in considerable reallocation of jobs between sectors. Davis et al. (1996) were one of the first to study the relationship between plant-level gross job flows and international trade. However, they do not find any systematic relationship between the magnitude of gross job flows and exposure to international trade, except for a high rate of job destruction in industries with very high import penetration. However, these findings are based only on simple cross-tabulations using long-run averages.

Levinsohn (1999) concludes that it is difficult to separate the effects of macro shocks from the effects of trade on employment. In addition, firm size is found to play an important role. Konings et al. (2003) find that the relative openness of a sector is an important factor in firm-level employment adjustment. Higher imports or higher exports lead to a higher employment growth, but lower job reallocation. However, the destination of exports matters. Davidson & Matusz (2003) find a negative correlation of net exports with job destruction and worker separation rates. In Finland, the relationship between internationalisation and job allocation has not been studied much. Ilmakunnas & Maliranta (2000; 2003b; 2004) include some analysis on the relationship between international exposure and job and worker flows, whereas Maliranta (2003) studies the effect of international trade on productivity-enhancing restructuring within manufacturing industries.[5]

Closely related is literature on exchange rates and employment, because trade liberalisation is often accompanied by an exchange rate reform. According to these models, an exchange rate depreciation results in workers moving into the tradables sector, whereas an exchange rate appreciation results in job destruction in the tradables sector through a decreased demand. In addition, an exchange rate appreciation (depreciation) should decrease (increase) exports, and have opposite effects for imports. Klein et al. (2003) find that an exchange rate appreciation increases job destruction and decreases net employment change. Gourinchas (1999) finds a similar effect on net employment change. In addition, he finds that job destruction is much less responsive to real exchange rate fluctuations than job creation.

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[4] See also the literature review on the effects of international factors on net employment and job and worker flows by Klein et al. (2002).

[5] For example, Antelius & Lundberg (2003) and Andersson et al. (2000) have studied internationalisation and job turnover in Sweden.

3. The globalisation process and employment adjustment in Finland

3.1 Finnish regulatory reform and the process of internationalisation

Last 20 years have been a period of profound changes in the Finnish competitive environment.[6] Until the late 1980s, Finland's international trade was characterised by the exports of wood, paper and metal products. Bilateral trade with the Soviet Union was very important. However, the volume of Soviet trade was largely affected by the changes in oil prices, because Finland paid for its Soviet oil imports with an equal value of exports of, for example, construction projects, vessels, food products, textiles and transportation services. However, eastern trade suffered greatly when the Soviet Union collapsed in 1991.

The regulatory reform in Finland started in the mid 1980s. The aim was to promote market openness by liberalising foreign trade and capital markets, and thus, to increase business competitiveness. The most important initiatives to liberalising financial markets were the abolishment of currency and credit rationing in the mid 1980s, which led to the liberalisation of international capital movements.[7] The Finnish markets were opened up for competition by liberalising imports, abolishing licences and reforming technical standards. In addition, several initiatives focused on abolishing monopolies and restructuring state-owned enterprises. Extensive price regulation regime was dissolved in 1988. In 1993, laws restricting foreign ownership were abolished.

Barriers to foreign trade were gradually removed in many sectors. To give some examples, the import of crude oil products was liberalised in 1991 and the electricity markets opened up to competition in 1995. In the food industry imports were rationed and the markets were protected until the EU membership. However, the sugar import monopoly was removed already in 1992. The import and wholesale as well as the production of alcohol were partially liberalised in 1995. In 1995, Finland joined the European Union, which has resulted in a further opening of the markets to internationalisation. The EU membership did not change import tariffs policy considerably when considering the total manufacturing.[8] However, at the industry level, import tariffs decreased in textile, leather, rubber, non-metallic mineral products, metal products, machinery and electrical industries, but increased in wood, paper, chemical and basic metal industries. As a consequence of the EU membership, barriers to trade towards the non-EU countries have increased, especially Japan and the US.

The internationalisation of Finnish firms started rather late, but rationing has been removed faster than in many other EU countries. In particular, the deregulation of telecommunications in the late 1980s, implemented earlier and more extensively in Finland than elsewhere, has been an important factor in the growth of the Finnish communications sector into one of the most competitive and innovative businesses in the world. This sector also benefited from the national-level deregulation and the EU membership. Globalisation and increased competition have also had an effect on the Finnish forest industry. Firms have become more international in their operations and merged together in order to be more competitive. Basic metal industry, electronics and machinery have been successful in international markets. Chemical industry was dependent on imports for a long time, but nowadays it is a successful exporter.

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6 This section is largely based on OECD (2003) and Loikkanen et al. (1997, chapters 2 and 3).

7 For more information on the development of the Finnish financial markets, see e.g. Hyytinen et al. (2004).

8 The GATT (General Agreement on Tariffs and Trade) has had the largest effect on import tariffs in Finland. Finland joined the GATT already in 1950.

Today, the number of quantitative and indirect barriers to trade in Finland is very low when compared to other Nordic countries or the EU average. The share of trade of GDP has increased considerably during the last two decades. During the 1997–2001 the average share of exports and imports of GDP in Finland was 35%, which is quite high in comparison to the US (12%) or the European Union average (13%). However, Finland is still less integrated in foreign trade than many other small EU countries. Finland's most important trading partners have traditionally been Germany, Sweden, United Kingdom and Russia. In 2001 EU's share of imports was 55.6% and its share of exports was 53.8%. The import shares of Asia and North America were 12.7% and 7.4%, respectively. Developing countries represented 10.3% of total imports.

As a consequence of the liberalisation of international trade and capital markets, the number of multinational enterprises in Finland has increased rapidly. However, the share of foreign affiliates in manufacturing production is still the lowest among OECD countries, after Japan. In addition, the stock of inward FDI is less than half of outward FDI and cross-border venture capital and investment flows are relatively limited. These factors may be due to Finland's small market size, peripheral location or structural factors such as taxation.

According to the report by World Economic Forum (WEF, 2004), Finland is one of the most competitive countries in the world. It is obvious that deregulation has forced Finland to improve its competitiveness and productivity growth, which has speeded up structural change. According to OECD (2003), those Finnish markets that are open to international competition have had a high growth of labour productivity and lower prices when compared to the industries whose exposure to international competition is still low. As a next step, OECD emphasises the importance of the deregulation of the product and labour markets in increasing market openness. The flexibility of the labour markets is argued to be essential in lowering the rate of unemployment and increasing productivity.

In order to describe the competitiveness of Finland over the business cycles, Figure 1 graphs the real competitiveness indicator (source: Bank of Finland) and the real (external) terms of trade (source: Statistics Finland) over the period 1980–2001.[9] The right axis shows the change in the real GDP (source: Statistics Finland). Finland experienced an exceptionally deep recession at the beginning of the 1990s. After a period of overheating in the late 1980s, Finland's gross domestic product decreased by 6.4% in 1991 and the fall continued over the period 1992–93. At the same time the unemployment rate rose dramatically and reached a peak of 16.6% in 1994 (according to Statistics Finland) and persisted above 10% until year 2000.[10] If the competitiveness indicator decreases then the price competitiveness of the Finnish production improves. It can be seen that in the late 1980s Finland's international competitiveness decreased, whereas in the early 1990s and the late 1990s it was increasing. Similarly, if the ratio of export prices to import prices (external terms of trade) increases then the welfare of the country increases. Figure 1 shows that also the terms of trade has been following the business cycles quite closely.

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[9] For the compilation of the competitiveness indicator, see Kajanoja (2000).

[10] Finland's great depression is described in more detail in Honkapohja & Koskela (1999) and Kiander & Vartia (1996).

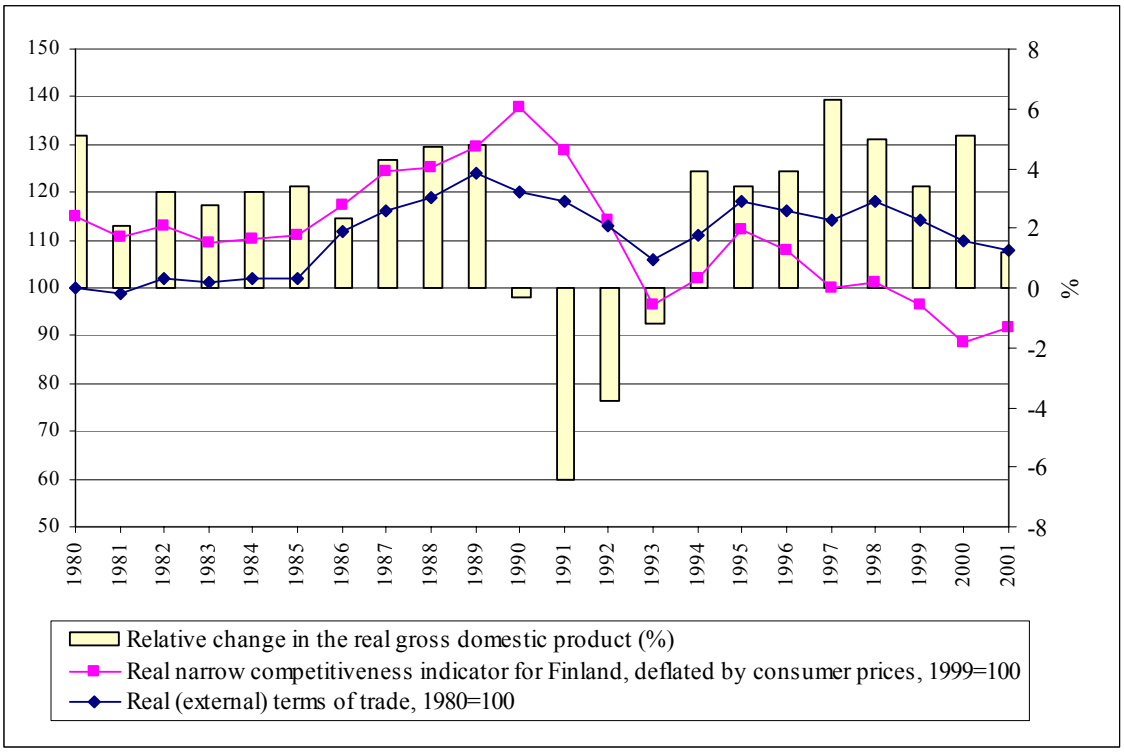

Figure 1. Finland's real competitiveness indicator, terms of trade and growth in real GDP 1980–2001

From the early 1980s until the mid 1990s, there was a strong declining trend in the employment share of the Finnish manufacturing sector. The number of manufacturing employees fell 38% from 1980 to 1994 and the average plant size decreased from 74.2 persons to 60.7 persons. The development of international trade and foreign ownership in manufacturing during the last two decades is described in Figure 2. Manufacturing export intensity, which is defined as the ratio of industry exports to gross output, grew very rapidly especially in the early 1990s, which was to a large extent due to devaluations in 1991 and 1992. In addition, the structural change in manufacturing and the failure of less efficient plants during the recession may have increased the exporting performance of plants in the 1990s. The growth of exports can also be seen in the export intensity figures of the LDPM data, where the share of exporting plants has steadily increased during the period examined. Exporters also account for a larger share of employment than in the early 1980s. However, the gap has become narrower which would indicate that the average size of exporters has decreased. In fact, the average (median) size of exporters has decreased from 170.5 (79) persons in 1980 to 141.8 (64) persons in 2001.

Import penetration, defined as the ratio of industry imports to total output for domestic markets (gross output minus exports plus imports), has remained quite stable over the years, when the total manufacturing is considered. However, according to Maliranta (2003), there are some sectors where the share of imports has increased considerably after the removal of barriers to trade. The number of foreign-owned firms has increased very rapidly as a result of the abolishment of laws restricting foreign ownership in 1993 and the internationalisation of Finnish firms. According to Figure 2, the employment share of foreign-owned plants (with at least 20% of foreign ownership) in manufacturing has increased from 4% to 24% during the period examined.[11]

[11] Until 1993 foreign ownership only includes direct ownership, whereas since 1994 information on both direct and indirect foreign ownership is available from the FATS (Foreign AffiliaTes Statistics) data.

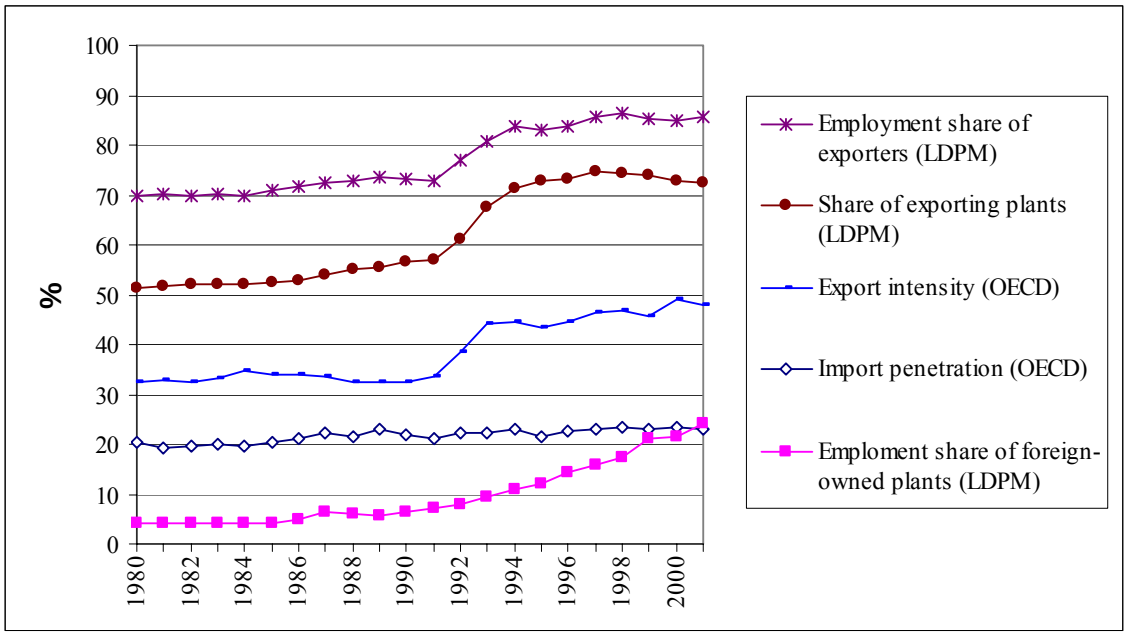

Figure 2. Patterns of globalisation in manufacturing 1980–2001

3.2 Dynamics of job flows and trade

In order to study the relationships between job flows and trade, manufacturing is divided into 27 sectors according to the OECD industry classification, which corresponds to the standard 2- or 3-digit industry classification in 1995. Table 1 shows some average characteristics of these industries over the period 1981–2001.[12] However, since this period includes strong cyclical fluctuations, the results in this table only give some indication of the inter-industry differences in the patterns of trade and employment. First, the figures show that the mean number of employees in exporting plants is clearly higher than the industry average plant size in most industries. Second, there are a few industries that account for a very high share of all manufacturing exports, namely wood, pulp and paper, machinery and equipment, and radio, television and communication equipment industries. Most of these industries also account for a high share of manufacturing employment.

Third, sectoral export intensity and import penetration ratios based on the OECD data reveal a large heterogeneity in trade orientation between industries. Finally, the export and import ratios can be compared to the average rates of job creation, job destruction and net employment change in each sector.[13] There does not seem to be any systematic pattern between job flows and trade orientation according to the long-run averages. However, this is as expected because the factors related to the long-run trade exposure across industries, such as resource endowments, are probably not correlated with the factors determining long-run employment changes, such as labour adjustment costs (Klein et al., 2003).

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[12] Figures are calculated as unweighted averages.

[13] The break in 1995 increases the rates of job creation and job destruction temporarily due to the increased number of plant entries and exits following the statistical reform. As a result, all job flow figures for 1995 are imputed as the average of 1994 and 1996. However, when only continuing plants are included, imputation is not necessary.

Figure 3 graphs trade ratios and employment allocation for a selected group of industries in order to reveal the industry-specific time patterns better. Regulatory reform increased the exposure to foreign trade especially in the manufacture of food products, textiles, wearing apparel and chemicals. The manufacture of food products and beverages has had an increasing import intensity, whereas the export intensity has been lower and declining in the late 1990s. It is evident that the effect of EU membership in 1995 shows up in the figures. Job reallocation rate clearly increases in the mid 1990s. However, the net employment change has remained close to zero except for the recession. So, it seems that increased competitive pressure has led to an extensive job reallocation as part of restructuring in this sector.

Textiles and wearing apparel industries have had a high share of trade over the entire period examined. However, it seems that in the manufacture of wearing apparel imports have partly replaced exports, whereas in the textiles industry exports have exceeded imports. These sectors were hit hard by the collapse in Soviet trade, which started to decline already in the mid 1980s. This can be seen in the clearly negative employment changes and high rates of job turnover. Chemicals industry has increased its importance as an exporter. However, the level of imports has also remained high, which may have slowed down employment growth in this sector.

Manufacture of non-metallic mineral products has had a clear increase in the share of trade after the recession. This seems to be preceded by a very high job turnover and restructuring during the recession. Fabricated metal products is an example of an industry that already had a considerable share of international involvement in the 1980s. However, the share of exports has replaced imports to some extent, which has partly lead to a positive employment growth in the late 1990s. Manufactures of electrical machinery and radio, television and communication equipment have been the most successful growers in the export markets. However, the graphs show that these sectors are characterised by rather different patterns of job reallocation and net employment change. Radio, television and communications industry has had a very high turnover and high employment growth in the recovery period, whereas growth in electrical industry has been more moderate. It is clear that the success of the telecommunications business has a large effect on these figures.

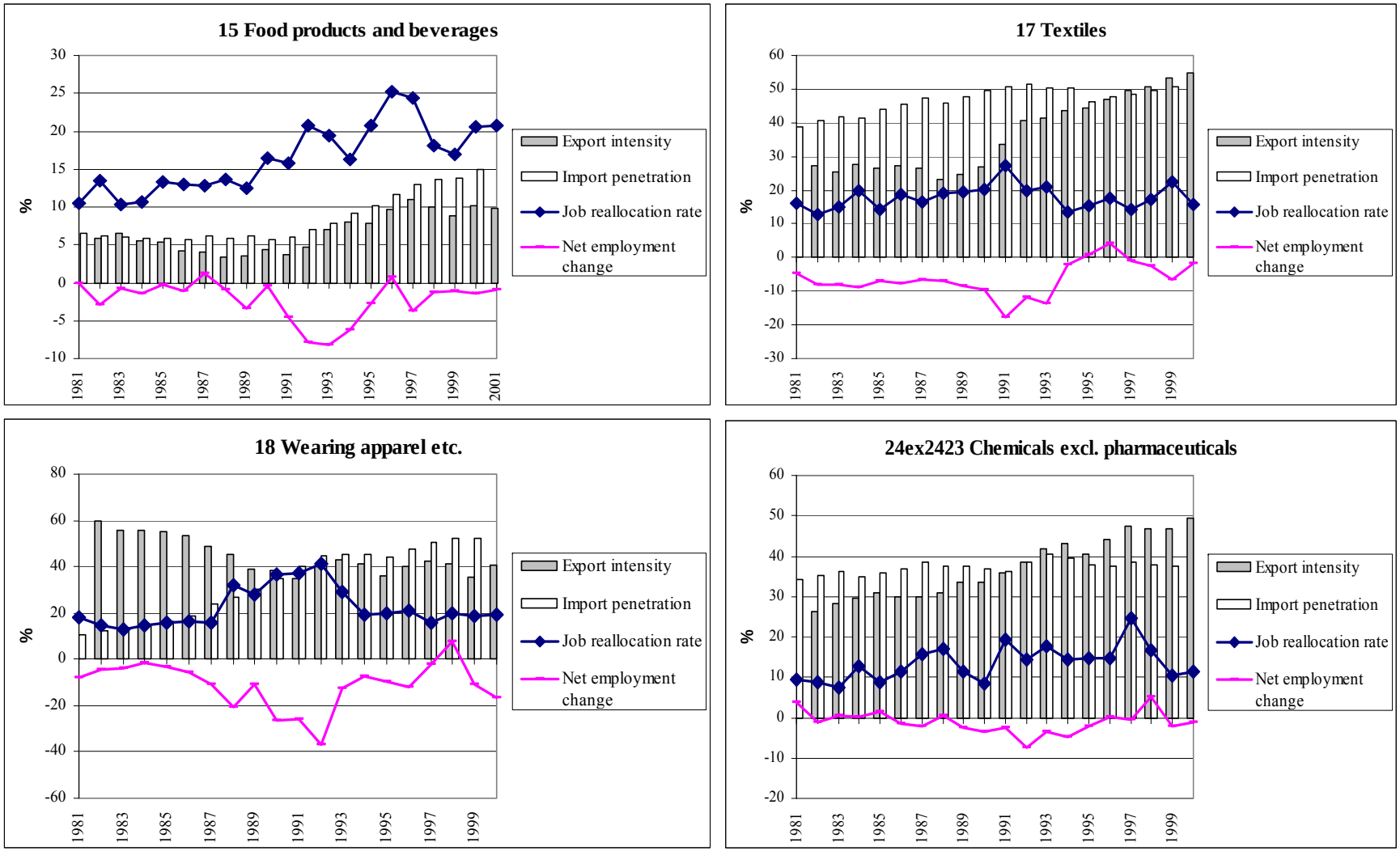
However, in addition to trade exposure there are also other dimensions that have to be taken into account when considering the employment response. Table 2 reports job and worker flow rates and employment shares across several plant characteristics, i.e., plant size, foreign ownership and export and import intensities. Results concerning the relationship between size and the gross flows confirm the earlier empirical evidence (e.g., Burgess et al., 2000; Davis et al., 1996). Both job reallocation rate (including job creation and job destruction) and worker flow rate decrease as plant size increases. As a result, also excess job reallocation and churning decrease with plant size. It seems that the net employment change has been more negative in smaller plants, which corresponds to the earlier findings on Finnish manufacturing using similar measures for size and growth, but a lower size threshold of 5 employees over the period 1980–1994 (Hohti, 2000). However, the most common finding in recent empirical studies using more sophisticated methods is that the relationship between plant size and its relative growth is negative, i.e., Gibrat's law of proportionate effect does not hold (for a review, see Goddard, Wilson, & Blandon, 2002; for Finland, Nurmi, 2004).

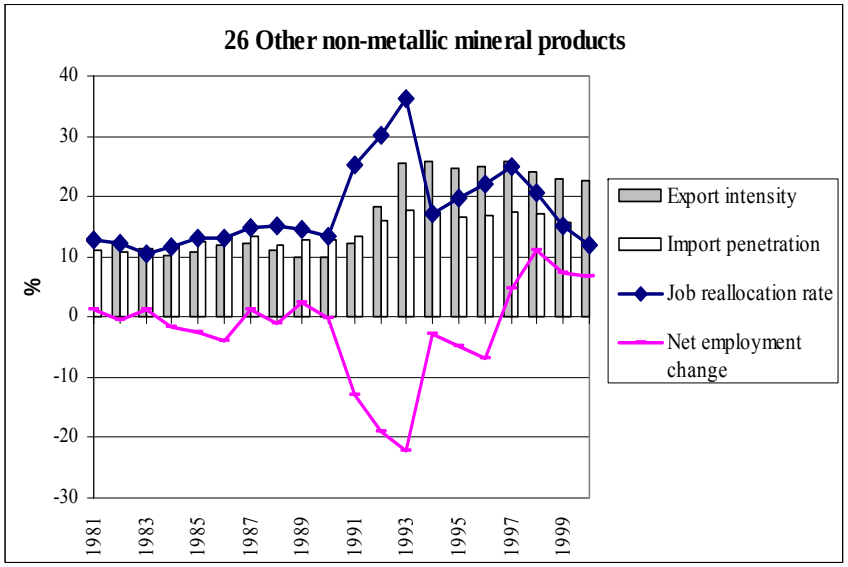
Relationships with the share of foreign ownership are less clear. It seems that job creation is lower in foreign-owned plants, but job destruction is higher in plants with a high share of foreign ownership. There is no clear relationship of ownership with the net employment change. However, worker flows and churning are clearly decreasing with foreign ownership. It should be noted that the employment share of foreign-owned plants is quite low, 9.4% in the total sample. Ilmakunnas & Maliranta (2002) have studied the relationship between for

Table 1. Trade orientation and job flows by industry 1981–2001

SIC	Industry	Average N of plants	Average plant size	Average exporter size	Share of manuf. exports	Export intensity	Import penetra-tion	Job creation rate	Job de-struction rate	Net em-ployment change	Share of manufacturing employment
15	Food products and beverages	449.7	96.7	156.8	2.5	6.7	9.2	7.4	9.6	-2.3	11.0
16	Tobacco products	3.5	270.3	284.0	0.1	13.3	14.0	5.1	11.4	-6.3	0.2
17	Textiles	114.5	88.7	102.2	1.2	36.4	58.3	6.0	12.6	-6.6	2.7
18	Wearing apparel etc.	174.9	84.7	98.5	2.3	46.2	46.8	5.7	16.4	-10.7	4.0
19	Leather and footwear	63.6	79.1	85.5	0.7	41.7	53.2	7.4	14.5	-7.2	1.3
20	Wood	290.5	94.1	106.2	7.7	47.7	7.0	7.5	10.8	-3.3	7.0
21	Pulp and paper	139.8	283.6	320.0	28.1	64.1	8.1	5.4	7.1	-1.7	10.2
22	Printing and publishing	288.5	98.8	113.9	0.9	6.3	6.2	7.4	9.1	-1.7	7.4
23	Coke, petroleum products and nuclear fuel	10.5	270.0	401.7	2.9	25.1	29.3	7.0	6.1	0.9	0.7
24ex2423	Chemicals excl. pharmaceuticals	16.0	234.9	297.6	0.7	41.7	60.1	5.6	3.9	1.7	1.0
2423	Pharmaceuticals	111.2	129.7	143.4	5.0	36.9	48.7	6.3	7.2	-0.9	3.7
25	Rubber and plastics	132.1	101.5	111.8	2.0	31.8	36.6	7.5	8.2	-0.6	3.4
26	Other non-metallic mineral products	178.4	83.3	123.4	1.2	17.1	17.0	7.9	10.0	-2.1	3.9
271etc	Iron and steel	44.7	272.2	263.0	4.9	39.4	29.1	3.9	5.2	-1.3	3.1
272etc	Non-ferrous metals	23.9	208.7	219.1	3.1	52.6	40.6	5.8	6.3	-0.6	1.2
28	Fabricated metal products	298.0	70.2	90.8	2.6	23.0	20.8	11.8	12.0	-0.2	5.4
29	Machinery and equipment	422.5	118.1	156.3	11.1	43.4	43.0	8.6	9.4	-0.8	12.8
30	Office, accounting and computing machinery	17.5	157.9	220.2	1.5	84.4	86.7	16.9	23.0	-6.1	0.7
31	Electrical machinery and apparatus	101.8	158.0	212.0	4.0	55.6	54.5	9.4	10.2	-0.8	4.1
32	Radio, television and communication equip.	59.4	259.0	302.4	7.4	54.6	52.5	16.8	10.4	6.4	4.1
33	Medical, precision and optical instruments	51.1	112.2	132.5	1.8	62.7	68.7	11.2	8.4	2.8	1.5
34	Motor vehicles, trailers and semi-trailers	62.8	121.3	148.0	3.4	103.6	103.0	6.9	7.3	-0.4	1.9
351	Other transport equipment	46.7	278.8	409.9	4.4	69.3	24.4	6.5	9.5	-2.9	3.4
352–359	Aircraft and spacecraft	19.7	196.4	153.7	0.3	20.5	32.5	5.3	10.0	-4.7	1.0
353	Railroad and transport equipment	4.9	571.3	845.0	0.2	30.3	73.8	4.0	2.5	1.6	0.7
36	Other manufacturing	181.4	72.7	81.4	0.0	0.0	0.0	8.4	11.2	-2.8	3.4
37	Recycling	1.4	40.5	52.6	0.0	0.0	0.0	79.4	42.7	36.7	0.0

Figure 3. Annual job flows and trade intensities for selected industries 1981–2001




26 Other non-metallic mineral products
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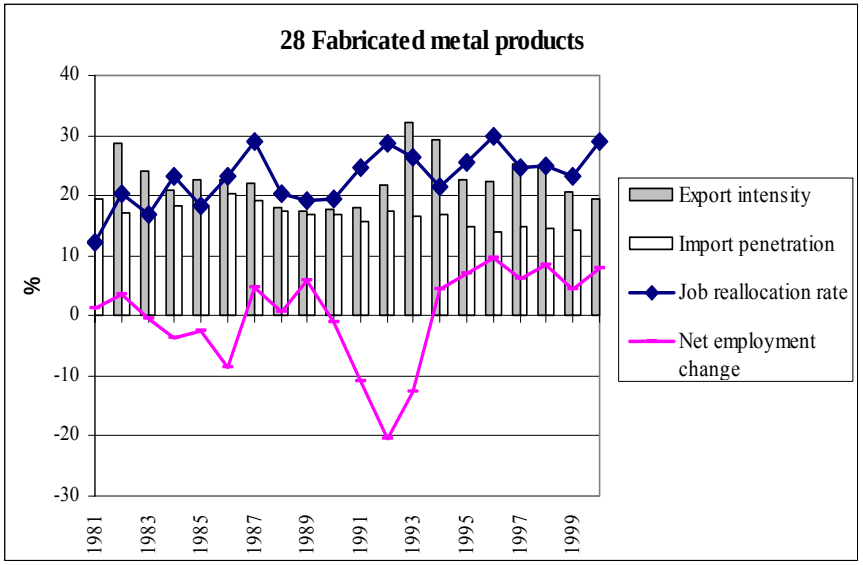
Export intensity
Import penetration
Job reallocation rate
Net employment change


28 Fabricated metal products
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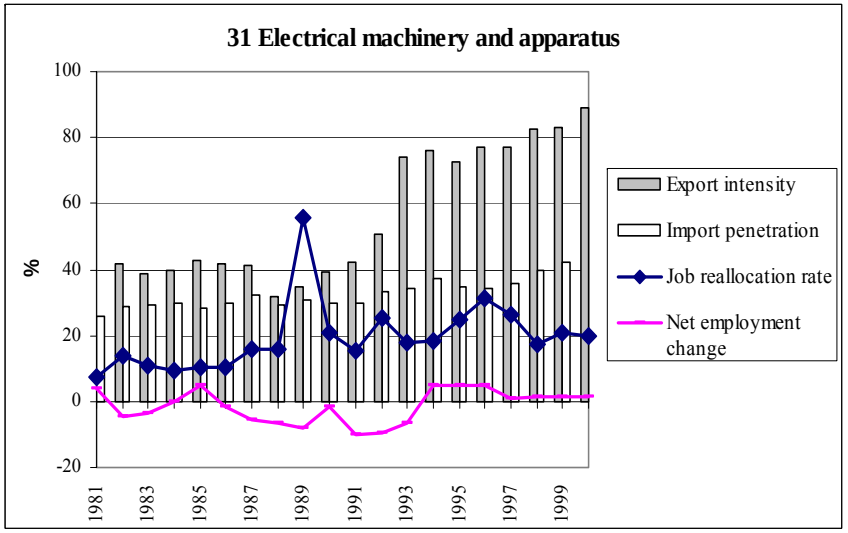
Job reallocation rate
Net employment change


31 Electrical machinery and apparatus
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Export intensity
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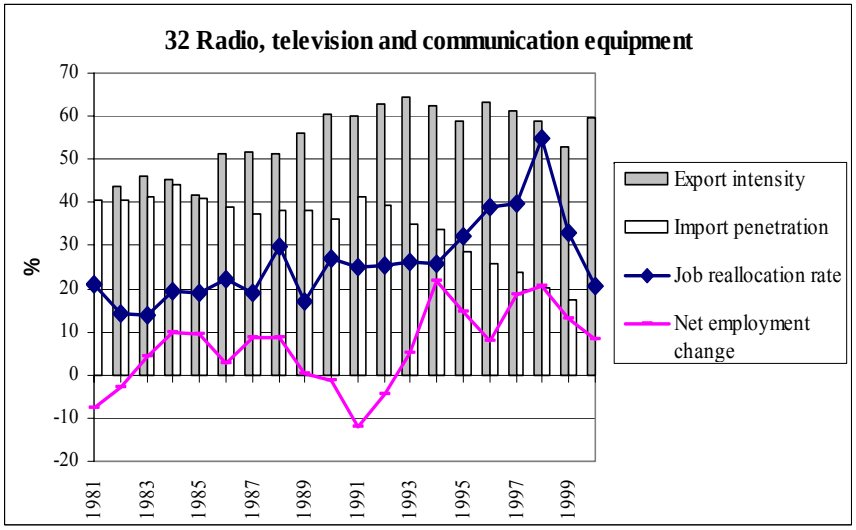
Net employment change


32 Radio, television and communication equipment
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Export intensity
Import penetration
Job reallocation rate
Net employment change

eign ownership and job and worker flows over shorter periods of the business cycle. It seems that the relationships vary notably from a boom to a recession period. However, they also find lower churning rates for foreign-owned plants in all periods. In addition, Ilmakunnas & Maliranta (2004) find that foreign acquisitions increase the worker outflow to unemployment.

Quartiles of export intensity and import penetration are based on the pooled industry-year data. Industries are classified on an annual basis. There is no clear relationship between export intensity and job or worker flows. However, net employment change seems to be less negative and excess job reallocation smaller for plants in export-intensive industries. When it comes to the industry import penetration, it seems that job turnover is increasing and the net employment change is less negative for higher quartiles of import penetration. However, there is no clear relationship between worker flows and imports. Ilmakunnas & Maliranta (2000) do not find any systematic relationship between openness to imports and job or worker flows.

Table 2. Job flows and worker flows by plant size, foreign ownership and quartiles of trade exposure

Size category	JCR	JDR	JRR	NETR	ERR	WFR	CFR	SHARE
20–49	11.9	14.1	26.0	-2.3	21.8	44.3	20.9	12.3
50–99	8.5	10.6	19.2	-2.1	15.4	42.0	19.3	13.7
100–249	6.8	8.0	14.9	-1.2	12.2	40.5	18.6	24.3
250–499	5.1	6.7	11.9	-1.6	9.1	37.7	19.3	19.2
500–999	4.1	5.8	9.9	-1.7	6.9	33.5	17.4	15.1
1000–	4.7	4.8	9.5	0.0	5.6	27.3	15.6	13.9
Share of foreign ownership	JCR	JDR	JRR	NETR	ERR	WFR	CFR	SHARE
less than 20%	8.1	9.4	17.5	-1.4	14.4	39.3	19.0	90.6
20%–50%	6.6	6.0	12.5	0.6	8.0	37.9	17.7	1.4
over 50%	7.4	10.7	18.1	-3.3	13.4	35.7	15.5	8.0
Quartile of export intensity	JCR	JDR	JRR	NETR	ERR	WFR	CFR	SHARE
0–0.20	7.5	9.7	17.1	-2.2	14.1	39.9	20.4	27.2
0.20–0.39	8.3	10.5	18.8	-2.2	13.9	36.7	17.6	21.2
0.39–0.52	7.8	9.7	17.6	-1.9	13.5	37.7	17.8	25.1
0.52–	8.1	8.9	17.0	-0.9	13.4	41.8	19.2	26.5
Quartile of import penetration	JCR	JDR	JRR	NETR	ERR	WFR	CFR	SHARE
0–0.14	6.8	8.9	15.7	-2.0	13.0	39.6	19.5	39.1
0.14–0.37	8.1	9.5	17.6	-1.4	13.8	34.4	17.4	21.6
0.37–0.57	8.8	10.2	19.0	-1.5	14.1	40.3	18.2	29.2
0.57–	9.1	9.0	18.0	0.1	14.9	37.8	18.5	10.0

Table 3 aims at separating the effects of exporting and foreign ownership on net employment growth by controlling for plant size category. In this analysis only continuing plants are included. It is noteworthy that when plant entries and exits are dropped out, the relationship between size and growth changes being more negative for larger plants, except for the largest size category. It seems that for plants that do not export, foreign ownership (at least 20%) increases net employment growth, whereas for exporters, the effect is ambiguous. Similarly, for plants with no or little foreign ownership, exporting increases employment growth, while for foreign-owned plants the effect is less clear. However, it seems that for larger plants also these ambiguous effects are mostly positive. Ilmakunnas & Maliranta (2000) find that having a high share of exports increases net employment growth. This corresponds to several earlier findings on a positive relationship between exporting and plant performance (e.g., Bernard & Jensen, 1999).

Figure 4. Annual job flows 1981–2001 for industries with different trade characteristics

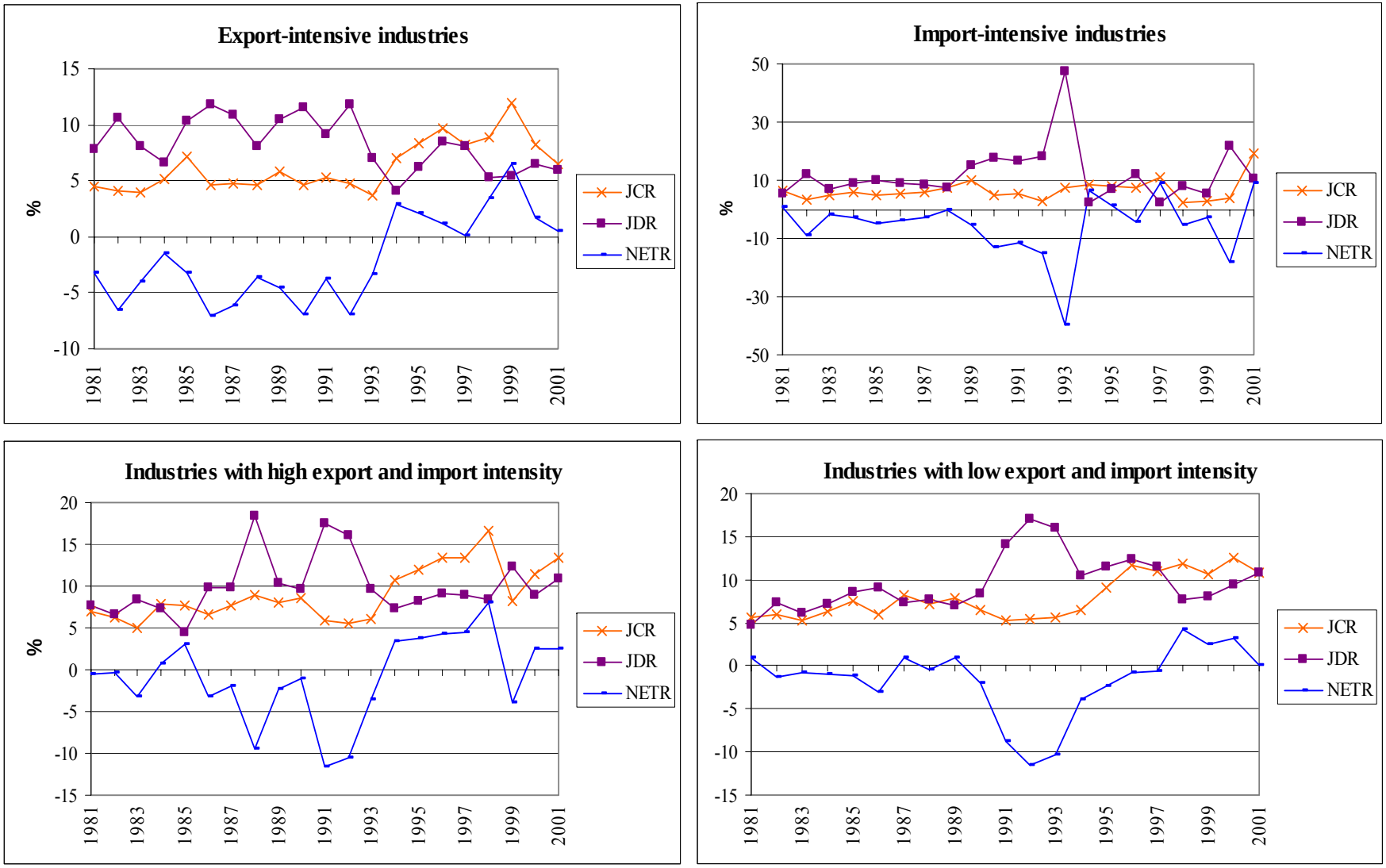

Table 3. Net employment growth and number of plants by plant size and the degree of globalisation

Size category	Plant does not export		Plant is an exporter		Total
	Foreign ownership <20%	Foreign ownership ≥20%	Foreign ownership <20%	Foreign ownership ≥20%	
20–49	-0.5	0.0	0.2	-0.7	-0.2
	14732	502	13705	975	29914
50–99	-1.7	1.2	-0.5	-1.2	-0.9
	5259	319	8731	1141	15450
100–249	-2.7	0.9	-1.3	-0.8	-1.5
	2869	211	8386	1096	12562
250–499	-3.7	-3.6	-1.5	-1.4	-1.8
	693	21	3427	442	4583
500–999	-0.6	1.0	-1.8	1.5	-1.4
	215	7	1434	148	1804
1000–	-1.5		0.5	-3.1	0.0
	54		551	62	667
Mean net growth	-1.9	0.9	-0.9	-0.7	-1.1
Total N of plants	23822	1060	36234	3864	64980

It is very likely that inter-temporal variation in employment flows is greater than the variation by trade orientation, so period averages may give a misleading picture and hide interesting features of the data. In order to examine the relationship between job flows and the degree of openness over time, the dynamics of annual job flows for industries with different trade characteristics are presented in Figure 4. The graphs reveal the effects of recession, which can be seen in the high rates of job destruction and negative net employment growth at the beginning of the 1990s.[14] In export-intensive industries with export intensity above the manufacturing median and import penetration below the median, net employment change is rather negative until the recession. However, the recovery starts very rapidly after the recession and the net employment growth remains positive due to an increased job creation and decreased job destruction. In import-intensive industries with import penetration above the median and export intensity below the median, the net employment change is highly negative during the recession. The recovery is rapid but there is some fluctuation in the net employment change in the late 1990s. Industries with both export and import ratios above the median experience rather rapid and steady employment growth after the recession. In contrast, industries with low openness (both export and import ratios below the median) are hit hard by the recession and the recovery is quite slow due to job destruction rates that remain high even after the recession. So, it seems that openness has speeded up the recovery especially in those sectors that have a high degree of openness.[15] The strong positive effect of exports on employment during recovery is also reported in various other studies (e.g., Ilmakunnas & Maliranta, 2000). However, it seems that the role of imports and international competition in improving the net employment growth during recovery is also important.

[14] Ilmakunnas & Maliranta (2003a) have studied the cyclicality of job and worker flows in the Finnish business sector.

[15] Similar results were found when annual job flows were graphed for different quartiles of an openness index, defined as the ratio of total trade to total output and imports.

Overall, the findings would indicate that plants in sectors with higher international exposure have performed better in net employment terms. In addition, it is clear from these figures that the response of total employment significantly understates the full magnitude of labor reallocation. However, due to several simultaneous influences, including business cycles, technological change and plant and industry-specific characteristics, more sophisticated methods are needed in order to reveal the impact of trade exposure on plant and industry-level employment adjustment.

4. Econometric results

A simple econometric framework is used to test the relationship between the degree of international exposure and employment flows. Both plant- and industry-level estimations are used because the factors influencing plant-level employment dynamics will most likely be important in shaping industry-level patterns of employment. At the plant level, the dependent variables are the rate of net employment change (*NETR*), the modulus of net employment change (|*NETR*|), the worker flow rate (*WFR*) and the churning rate (*CFR*) defined earlier. The main variables of interest, industry-level import penetration and export intensity, are measured as in the descriptive analysis using the OECD classification. It may be important to control for plant-level exports because all plants in the exporting sector may not face similar competitive pressure. In addition, it is likely that plants' exposure to international markets varies widely, even within narrowly defined industries. As a consequence, an interaction term of industry export intensity and plant's exporter status (plant has positive exports) is included. In order to study the effects of foreign ownership on growth, we have classified plants into four groups based on annual changes in foreign ownership: plants that stay domestically-owned (the reference group), plants that change from domestic to foreign ownership in excess of 20%, plants that change from foreign to domestic ownership, and finally, plants that stay in foreign ownership.

We control for some plant-specific characteristics, like belonging to a multiplant firm, plant size, measured as the logarithm of the two-period average employment, plant capital intensity (the logarithm of capital stock/hours worked) and labour productivity (the logarithm of real value added/hours worked). These variables may capture some of the effects of technological change. Furthermore, linked plant-level employer-employee data sets allow us to control for variables related to the work force composition in each plant, including the share of highly-educated employees (having more than comprehensive school and vocational school education) and the share of women. In order to control for macroeconomic shocks, such as cyclical fluctuations in demand and changes in exchange rates, year dummies are included in all estimations. The plant-level OLS estimations also include 3-digit industry dummies.[16]

Using simple OLS framework has several drawbacks, but it allows us to estimate the impact of trade shares on net employment growth conditional on macroeconomic influences and other control variables. However, within plants estimation method is also used in order to take into account the panel nature of the data, which makes the disturbance term correlated within plants and over time. In order to reduce the possible simultaneity biases, the explanatory vari-

[16] As a consequence, the industry-level trade shares should be interpreted as describing changes within each industry over time.

ables are measured in *t*–1 period.[17] It is also likely that increasing openness has an effect on employment dynamics only with a lag. Only continuing plants, i.e., plants that are present both in period *t* and *t*–1, are included in the regressions. At the plant-level, it is necessary to take into account the fact that there may be many zero observations in the flow rates. Ordinary Tobit model can be used to deal with the high concentration of zeros. However, Ilmakunnas & Maliranta (2003b) find that the employment-weighted OLS results (using the two-year average) are fairly close to the Tobit estimates. Weighted estimation gives lower weight to smaller plants who are more likely to have zero flows. Subsequently, we use the weighting approach in the models for plant-level worker flow and churning. Unweighted OLS results for net employment growth are also compared to the weighted results.

Table 4. OLS estimation results for plant-level employment flows

PLANT-LEVEL	LDPM data			Linked data		
	(1) NETR	(2) NETR, weighted	(3) |NETR|	(4) NETR	(5) WFR, weighted	(6) CFR, weighted
Import penetration	-0.044 (0.014)***	-0.035 (0.021)*	0.010 (0.011)	-0.005 (0.074)	0.112 (0.090)	0.041 (0.054)
Export intensity	0.014 (0.013)	-0.000 (0.020)	0.012 (0.010)	0.128 (0.063)**	0.028 (0.091)	0.012 (0.051)
Exporter*export intensity	0.017 (0.006)***	-0.005 (0.009)	-0.008 (0.005)*	0.011 (0.023)	-0.087 (0.033)***	-0.052 (0.024)**
Domestic-foreign ownership change	0.001 (0.010)	0.009 (0.012)	0.009 (0.008)	0.021 (0.021)	-0.026 (0.027)	0.004 (0.019)
Foreign-domestic ownership change	-0.010 (0.014)	0.004 (0.019)	0.005 (0.010)	0.044 (0.044)	0.102 (0.117)	-0.038 (0.012)***
Stays in foreign ownership	-0.009 (0.003)***	-0.002 (0.006)	-0.002 (0.003)	-0.040 (0.011)***	-0.008 (0.015)	-0.019 (0.008)**
Multiplant	-0.003 (0.002)	0.003 (0.003)	0.014 (0.002)***	-0.009 (0.006)	0.046 (0.009)***	0.017 (0.006)***
Plant size	-0.026 (0.001)***	-0.020 (0.002)***	0.003 (0.001)***	-0.019 (0.004)***	-0.023 (0.005)***	-0.012 (0.003)***
Capital intensity	0.007 (0.001)***	0.006 (0.002)***	0.000 (0.001)	-0.000 (0.003)	-0.009 (0.006)	-0.010 (0.004)***
Labour productivity	0.027 (0.002)***	0.035 (0.004)***	-0.011 (0.001)***	0.035 (0.006)***	-0.025 (0.012)**	-0.008 (0.010)
Share of highly educated				0.147 (0.037)***	0.328 (0.059)***	0.128 (0.037)***
Share of women				-0.004 (0.023)	0.077 (0.042)*	0.010 (0.020)
Constant	0.032 (0.008)***	0.013 (0.014)	0.100 (0.006)***	-0.073 (0.031)**	0.748 (0.053)***	0.401 (0.028)***
Observations	45836	45836	45836	16177	16177	16177
R-squared	0.06	0.07	0.03	0.06	0.12	0.13

All estimations include year and industry dummies. Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4 reports the plant-level OLS results and robust standard errors. According to the basic model (1), the effect of import penetration on net employment growth is negative, whereas the effect of industry export intensity is positive but turns insignificant when an interaction

[17] When measument is based on *t*–2 values, the main results remain rather similar.

term with plant's export status is included.[18] Hence, the positive effects of exporting seem to accrue to exporters, whereas the indirect effects of industry export intensity on the growth of non-exporters are rare.[19] This result corresponds to earlier empirical findings on the positive relationship between exporting and growth. Including an interaction of imports and plant's exporter status shows that the negative effect of imports on employment growth is reduced for exporters (not reported). Thus, plants oriented only towards the home market suffer more from increasing import competition.[20]

Somewhat surprisingly, the effect of staying in foreign ownership on employment growth is more negative than the effect of staying domestically owned.[21] In contrast, changes in foreign ownership do not seem to have any considerable effect on employment growth. It can be further studied whether different kinds of changes in domestic ownership have a differing effect on employment growth.[22] Table A.1 in the appendix shows the results corresponding to the models in Table 4 when three different cases of domestic ownership change are identified in addition to foreign ownership changes. The comparison group is plants that have stayed domestically-owned. In case A) the code of the domestic firm owning the plant has changed, in case B) the firm code has changed but also the old owner still continues (otherwise the observation is excluded from the analysis), and in case C) the firm code has changed but the new owner has been in operation already in the previous year (otherwise the observation is excluded from the analysis). The results regarding the trade variables (not reported) and foreign ownership changes do not change much, except for the increased positive effect of changing from domestic to foreign ownership on employment according to the employment-weighted regression. In addition, domestic ownership changes seem to increase worker turnover especially in cases A) and C).

Plant size has a negative effect on employment growth, which corresponds to the previous empirical literature.[23] Both capital intensity and labour productivity have a positive relationship with employment growth. In order to study the combination of international trade liberalisation and the business cycles, we also estimated model (1) with the trade variables interacted with year dummies (not reported). The effect of export intensity remained positive in all years, whereas the effect of imports on net growth was mostly negative over the period. The effect of imports became stronger during the late 1980s and the early 1990s. Thus, it seems that before and during the recession increased international competition had more detrimental effects on domestic employment. During recovery, the negative effect of imports became weaker and the positive effect of exports increased.

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18 Excluding industry dummies leads to a positive coefficient for imports. However, in this case the trade variables may capture some other industry effects.

19 If the exporter dummy is added, it turns out to have a very small and statistically insignificant coefficient.

20 Due to the high correlation between industry import penetration and export intensity, plant-level export intensity could be used instead of industry-level exports. However, the results do not change much.

21 When the foreign ownership dummy is instead included, the effect is still negative and statistically significant (not reported).

22 I am grateful to Jyrki Ali-Yrkkö and Mika Maliranta for their suggestions regarding changes in domestic ownership.

23 The sample selection bias, i.e. bias due to the higher probability of exit of slowly-growing small plants from the sample, is not taken into account. However, several studies have found that the results do not change even if plant survival is controlled for (e.g., Evans, 1987).

Table 5. Within estimation results for plant-level employment flows

PLANT-LEVEL	LDPM data		Linked data		
	(1) NETR	(2) |NETR|	(3) NETR	(4) WFR	(5) CFR
Import penetration	-0.056 (0.011)***	0.029 (0.009)***	-0.111 (0.073)	0.149 (0.061)**	0.076 (0.035)**
Export intensity	0.029 (0.012)**	-0.016 (0.010)	0.175 (0.067)***	-0.142 (0.057)**	-0.061 (0.032)*
Exporter*export intensity	0.016 (0.008)*	-0.007 (0.007)	0.006 (0.031)	-0.020 (0.026)	-0.014 (0.015)
Domestic-foreign ownership change	-0.006 (0.009)	0.004 (0.007)	0.038 (0.030)	-0.028 (0.025)	0.013 (0.014)
Foreign-domestic ownership change	-0.017 (0.014)	0.004 (0.012)	0.051 (0.049)	0.007 (0.042)	-0.014 (0.024)
Stays in foreign ownership	-0.024 (0.006)***	-0.000 (0.005)	-0.048 (0.026)*	-0.005 (0.022)	-0.019 (0.012)
Multiplant	0.016 (0.003)***	0.004 (0.003)	0.003 (0.014)	0.026 (0.011)**	-0.007 (0.007)
Plant size	-0.160 (0.003)***	0.009 (0.003)***	-0.210 (0.015)***	0.001 (0.013)	0.004 (0.007)
Capital intensity	0.017 (0.002)***	-0.001 (0.001)	-0.002 (0.009)	0.002 (0.007)	0.013 (0.004)***
Labour productivity	0.024 (0.002)***	-0.013 (0.001)***	0.020 (0.007)***	-0.033 (0.006)***	-0.006 (0.003)*
Share of highly educated			0.401 (0.038)***	0.361 (0.032)***	0.033 (0.018)*
Share of women			-0.200 (0.048)***	0.053 (0.041)	-0.009 (0.023)
Constant	0.608 (0.016)***	0.073 (0.013)***	0.840 (0.084)***	0.498 (0.071)***	0.276 (0.041)***
Observations	45836	45836	16177	16177	16177
N of plants	4899	4899	0.06	0.04	0.10
R-squared	0.10	0.02	2951	2951	2951

All estimations include year dummies. Standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

In the model (2) with employment-weights (the two-year average), the magnitude of the import penetration coefficient reduces slightly and the effect of exports turns negative and insignificant. The third model has a measure for plant-level reallocation as a dependent variable. Industry-level export intensity seems to be positively related to the employment changes, whereas the interaction with plant exports is negative. Models (4), (5) and (6) are based on the linked data sets, which allow the simultaneous calculation of job and worker flows and the inclusion of human capital variables. Findings on the net rate give somewhat different results from model (1) and the share of highly educated turns out to be positive and highly significant. The higher share of educated workers also seems to increase plant-level worker flow and churning. However, trade does not have any clear effects on worker flow and churning except for the negative effect through the plant's exporter status. The effect of staying foreign-owned on churning seems to be negative, whereas the change to domestic ownership also decreases churning. Table 5 reports the within estimates with plant fixed effects and year dummies. Findings for the model (1) correspond to the OLS results and the significance of the trade variables increases. The results for worker flows contradict the pooled OLS results when it comes to the trade variables suggesting that the effect of imports on worker turnover and

churning is positive, whereas the effect of exports is negative. However, the positive effect of education on employment growth and worker turnover gets further support.[24]

Based on the heterogeneous firm trade models, import competition may have differing growth effects on different kinds of plants depending, for example, on their size, efficiency, capital intensity or work force skills. It is likely that more efficient plants, measured with labour productivity, are better prepared to face new competitive challenges and are thus less vulnerable in employment terms. It may also be the case that capital- and skill-intensive plants, i.e. plants that are more likely to be operating according to Finland's comparative advantage, are more likely to grow relative to labor-intensive plants. Furthermore, small and large plants may not respond similarly to increased international exposure.

Table 6. Competition effects on the growth of different plant groups

Plants classified by (group 1 is the ref.)	Size	Labour productivity	Capital intensity	Share of highly educated
Import penetration	-0.032	-0.057	-0.056	0.026
	(0.015)**	(0.016)***	(0.014)***	(0.079)
Group 2	-0.021	0.021	0.014	-0.049
	(0.010)**	(0.010)**	(0.010)	(0.038)
Group 3	-0.011	0.019	0.015	0.005
	(0.011)	(0.011)*	(0.010)	(0.037)
Group 4	-0.006	0.027	0.029	-0.069
	(0.011)	(0.012)**	(0.014)**	(0.048)
Level				
Group 2	-0.026	0.011	0.003	-0.023
	(0.003)***	(0.003)***	(0.004)	(0.011)**
Group 3	-0.045	0.025	0.016	-0.031
	(0.003)***	(0.004)***	(0.004)***	(0.012)**
Group 4	-0.068	0.041	0.023	0.021
	(0.004)***	(0.004)***	(0.005)***	(0.018)
Observations	45836	46667	47610	16177
R-squared	0.06	0.06	0.05	0.06

Robust standard errors in parentheses.* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 6 shows the coefficients for different plant groups and their interaction terms with import penetration using Models (1) and (4) from Table 4.[25] Groups are based on annual quartiles of plant size, labour productivity, capital intensity and the share of highly educated. The results suggest that the negative effect of import penetration on employment growth is highest for plants just below the median size. These plants may face a cost disadvantage resulting from operating below the optimal size in the industry. More importantly, increased plant efficiency makes the plant less sensitive to foreign competition. The plants in the lowest efficiency group seem to face the most negative effects of import competition, whereas the negative effect is somewhat smaller for plants with higher labour productivity.[26] Consistently with

[24] Using 2-stage Tobit estimation, Ilmakunnas & Maliranta (2003b) have found that foreign-owned plants have somewhat lower churning rates than domestically-owned plants. When it comes to human capital effects, they find that the relationship between churning and educational level of employees is not linear. In addition, the share of women is found to have opposite effects on worker inflow and outflow.

[25] The number of observations may differ due to measuring percentiles before logarithmisation.

[26] When it was tested whether the employment effect turns positive for the highest efficiency plants operating above the 90th percentile, this was not the case.

the findings by Bernard et al. (2003), high capital intensity seems to mitigate the negative employment effects of exposure to import competition. However, the effect of imports does not vary significantly for plants with different proportions of highly-educated workers.

Table 7. OLS estimation results for industry-level employment flows

INDUSTRY-LEVEL	(1) JCR	(2) JDR	(3) NETR	(4) JRR	(5) EJR	(6) WFR[1]	(7) CFR[1]
Import penetration	-0.016 (0.011)	0.009 (0.014)	-0.025 (0.016)	-0.008 (0.018)	-0.042 (0.014)***	-0.052 (0.050)	-0.038 (0.031)
Export intensity	0.023 (0.010)**	0.000 (0.012)	0.023 (0.015)	0.023 (0.017)	0.028 (0.013)**	0.065 (0.040)	0.016 (0.018)
Labour share of foreign-owned	0.008 (0.014)	-0.020 (0.017)	0.028 (0.018)	-0.012 (0.025)	-0.007 (0.019)	-0.139 (0.038)***	-0.044 (0.016)***
Labour share of multiplants	-0.014 (0.009)	-0.017 (0.012)	0.003 (0.014)	-0.032 (0.016)*	-0.025 (0.012)**	-0.041 (0.041)	0.025 (0.021)
Average size	-0.074 (0.020)***	-0.115 (0.026)***	0.041 (0.028)	-0.190 (0.037)***	-0.122 (0.024)***	-0.263 (0.103)**	-0.132 (0.042)***
Capital intensity	-0.278 (0.125)**	0.254 (0.146)*	-0.531 (0.175)***	-0.024 (0.208)	-0.180 (0.138)	1.378 (0.893)	0.761 (0.687)
Labour productivity	0.245 (0.255)	-1.315 (0.294)***	1.560 (0.323)***	-1.070 (0.445)**	-0.246 (0.318)	-2.930 (0.871)***	-1.092 (0.623)*
Share of highly educated						0.207 (0.075)***	0.198 (0.039)***
Share of women						0.178 (0.340)	-0.192 (0.171)
Constant	0.093 (0.006)***	0.092 (0.007)***	0.001 (0.010)	0.184 (0.010)***	0.128 (0.008)***	0.655 (0.030)***	0.256 (0.018)***
Observations	1694	1694	1694	1694	1694	677	677
R-squared	0.12	0.13	0.13	0.12	0.10	0.18	0.16

[1] Figures based on linked data. All estimations include year dummies. Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

At the industry level, it is possible to calculate all the flows, *JCR*, *JDR*, *NETR*, *JRR*, *EJR*, *WFR* and *CFR*, at the 3-digit industry level. Explanatory variables are the industry-level analogues of the plant-level variables.[27] Table 7 reports the industry-level OLS results. Import penetration has a negative effect on job creation, net employment growth and excess job reallocation. This is confirmed by the within estimates including 3-digit industry fixed effects and time fixed effects in Table 8. Export intensity has a positive effect on job creation, net employment change and excess job reallocation. However, the relationships of trade exposure with worker flow and churning are not clear. In contrast, education turns out to have a highly significant and positive effect on worker turnover.[28] At the industry level, the effect of industry size is negative and significant in all the models, except for the net employment change. The reason for this differing result may be that the entries and exits of plants are included in the industry-level estimations. It seems that when calculating growth at the [-2,2] interval, the effect of corner solutions is considerable. We also tried using industry median size, but the results did not change notably.

[27] It should be noted that at the industry level, worker flows are measured using also information on the smaller plants in the industry.

[28] Böckerman et al. (2004) do not find any large differences in regional job and worker flows across educational levels.

Table 8. Within estimation results for industry-level employment flows

INDUSTRY-LEVEL	(1) JCR	(2) JDR	(3) NETR	(4) JRR	(5) EJR	(6) WFR[1]	(7) CFR[1]
Import penetration	-0.053 (0.026)**	0.066 (0.031)**	-0.119 (0.040)***	0.012 (0.041)	-0.067 (0.032)**	0.358 (0.163)**	-0.020 (0.100)
Export intensity	0.027 (0.021)	-0.043 (0.026)*	0.071 (0.033)**	-0.016 (0.034)	0.027 (0.026)	-0.330 (0.122)***	0.031 (0.075)
Labour share of foreign-owned	0.029 (0.015)*	-0.020 (0.018)	0.049 (0.023)**	0.008 (0.024)	-0.007 (0.018)	-0.114 (0.058)*	-0.013 (0.036)
Labour share of multiplants	0.006 (0.012)	-0.012 (0.015)	0.018 (0.019)	-0.006 (0.020)	-0.005 (0.015)	-0.056 (0.054)	0.020 (0.033)
Average size	-0.043 (0.030)	0.004 (0.037)	-0.048 (0.046)	-0.039 (0.048)	-0.087 (0.037)**	0.433 (0.139)***	0.003 (0.086)
Capital intensity	0.315 (0.152)**	0.249 (0.186)	0.066 (0.236)	0.564 (0.244)**	0.268 (0.189)	0.559 (0.666)	-0.891 (0.409)**
Labour productivity	0.051 (0.222)	-1.013 (0.272)***	1.064 (0.346)***	-0.961 (0.356)***	-0.220 (0.276)	-6.874 (0.772)***	-4.458 (0.474)***
Share of highly educated						0.383 (0.213)*	0.317 (0.119)***
Share of women						4.427 (1.723)**	0.384 (0.959)
Constant	0.135 (0.014)***	0.065 (0.016)***	0.070 (0.020)***	0.200 (0.021)***	0.147 (0.017)***	0.692 (0.063)***	0.396 (0.039)***
Observations	1694	1694	1694	1694	1694	677	677
N of industries	96	96	96	96	96	94	94
R-squared	0.11	0.10	0.13	0.08	0.06	0.33	0.29

[1] Figures based on linked data. All estimations include year dummies. Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Summarising the plant-level and industry-level results, there seems to be some evidence that the substitution effect of imports exceeds the pro-competitive effect leading to a negative employment response in net terms. The positive effect of exports on job creation and net employment change also corresponds to the theoretical predictions. Somewhat surprisingly, it seems that increased import penetration decreases excess job reallocation, whereas increased export intensity increases job turnover.[29] However, imports seem to increase worker turnover at the plant level. These results correspond to some extent to the findings by Konings et al. (2003). However, according to their results, the origin of imports and destiny of exports matter. To conclude, it seems that increased openness to imports has not resulted in very much excessive job turnover, but the employment restructuring has been more concentrated in the export-oriented industries. This is possibly due to other factors related to technological change and the business cycles, including the collapse of Soviet trade and the rapid growth of the ICT (information and communication technologies) sector. However, plant-level heterogeneity turns out to be important in adjusting to import competition, in particular when it comes to differences in labour productivity.

It is possible that the variables describing industry trade should be measured at a more disaggregated level in order to control for the within-industry heterogeneity better. However, according to Klein et al. (2003), it appears that moving to the 2-digit level of aggregation does not significantly reduce the extent of heterogeneity in openness compared to the 4-digit level. Unfortunately, at the moment more detailed data on trade covering the whole period is not available.

[29] Traditionally, the share of intra-industry trade has been relatively low in Finland, which may decrease the effects of imports on job reallocation if it is assumed that intra-industry trade has larger effects on job turnover than inter-industry trade.

5. Conclusions

In this paper, the employment patterns of Finnish manufacturing sector plants were studied with special emphasis on the process of internationalisation. The descriptive analysis gives new empirical material on the heterogeneity of trade and employment dynamics across plants in different industries and over time. However, it was found that the job and worker flow rates vary much more across plant size categories than across industry trade classifications. In addition, the effect of macroeconomic fluctuations is considerable. The liberalisation of trade and capital movements has resulted in an increased share of exports and imports in several sectors of manufacturing. However, this has led to different patterns of job reallocation and employment growth in different industries. The results suggest that the recovery from the recession was easier in those sectors where the degree of international openness has been high. However, there are also other factors, including many plant-specific characteristics like efficiency, that need to be taken into account when considering the relationship between openness and employment.

A very simple regression analysis shows that increased competition through imports has a negative effect on net employment growth, whereas higher exports have a positive effect on employment especially in exporting plants. It seems that plants with higher efficiency can adapt more easily in employment terms to changes in the competitive environment resulting from the trade liberalisation. Thus, trade liberalisation may even stimulate productivity-enhancing restructuring at the plant level (see e.g., Maliranta, 2003). There is also some evidence that trade liberalisation creates more job turnover in the export-intensive industries, whereas import competition, surprisingly, reduces excess job reallocation. However, it is likely that the effect of technological change has been much stronger than the effect of international exposure.

It is possible to extend this analysis to take into account the dynamics of trade and job and worker flows by using for example the GMM methods. These techniques may enable us to separate the short-run and long-run effects of deregulation better and tackle with the endogeneity problems. The simultaneity problems related to the determination of labour demand and the demand for imported inputs as well as the positive relationship between firm performance and exporting also cause problems. In addition, imports and exports are highly correlated. It would be important to find suitable instruments to mitigate these problems. Availability of better data on industry-level trade or trade protection, including sectoral effective rates of protection or changes in tariffs, would probably improve the analysis.

In the further analysis, it is possible to use the new individual-level FLEED (Finnish Longitudinal Employer-Employee Data) data set to examine whether the increased international competition affects job and worker turnover of high-skilled and low-skilled workers differently. It is also interesting to see whether the employment adjustment has affected disproportionately workers of different educational background and working history.

Table A.1 The effect of domestic and foreign ownership changes

PLANT-LEVEL	LDPM data			Linked data		
OLS	(1) NETR	(2) NETR, weighted	(3) |NETR|	(4) NETR	(5) WFR, weighted	(6) CFR, weighted
CASE A						
Domestic-domestic	0.004	0.006	0.026	-0.013	0.051	-0.010
ownership change	(0.006)	(0.007)	(0.005)***	(0.015)	(0.020)***	(0.011)
Domestic-foreign	0.005	0.024	0.010	0.018	-0.028	0.001
ownership change	(0.010)	(0.012)**	(0.008)	(0.020)	(0.025)	(0.019)
Foreign-domestic	-0.011	0.008	0.004	0.061	0.097	-0.038
ownership change	(0.015)	(0.020)	(0.011)	(0.044)	(0.130)	(0.012)***
Stays in foreign	-0.012	-0.002	0.005	-0.030	-0.003	-0.016
ownership	(0.005)**	(0.008)	(0.004)	(0.011)***	(0.015)	(0.007)**
Observations	24048	24048	24048	14887	14887	14887
R-squared	0.08	0.10	0.03	0.06	0.12	0.12
CASE B						
Domestic-domestic	-0.002	0.011	0.029	-0.024	0.040	-0.029
ownership change	(0.012)	(0.010)	(0.010)***	(0.026)	(0.033)	(0.015)*
Domestic-foreign	0.007	0.026	0.011	0.018	-0.030	0.002
ownership change	(0.010)	(0.012)**	(0.008)	(0.020)	(0.026)	(0.019)
Foreign-domestic	-0.011	0.010	0.006	0.060	0.097	-0.038
ownership change	(0.016)	(0.020)	(0.012)	(0.044)	(0.129)	(0.012)***
Stays in foreign	-0.010	0.001	0.005	-0.029	-0.004	-0.016
ownership	(0.005)**	(0.007)	(0.004)	(0.011)***	(0.015)	(0.007)**
Observations	22522	22522	22522	14294	14294	14294
R-squared	0.08	0.10	0.03	0.06	0.12	0.12
CASE C						
Domestic-domestic	-0.012	-0.020	0.025	-0.057	0.102	0.014
ownership change	(0.012)	(0.013)	(0.010)**	(0.030)*	(0.051)**	(0.035)
Domestic-foreign	0.007	0.026	0.011	0.016	-0.027	-0.001
ownership change	(0.010)	(0.012)**	(0.008)	(0.020)	(0.025)	(0.019)
Foreign-domestic	-0.011	0.009	0.005	0.062	0.099	-0.040
ownership change	(0.016)	(0.019)	(0.012)	(0.044)	(0.125)	(0.012)***
Stays in foreign	-0.010	0.002	0.005	-0.030	-0.005	-0.016
ownership	(0.005)**	(0.007)	(0.004)	(0.011)***	(0.015)	(0.007)**
Observations	22480	22480	22480	14245	14245	14245
R-squared	0.08	0.10	0.03	0.07	0.12	0.13

Robust standard errors in parentheses.* significant at 10%; ** significant at 5%; *** significant at 1%.

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