Innovation, employment growth and foreign ownership of firms

A European Perspective

Bernhard Dachs[1] and Bettina Peters[2]

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Abstract:

This paper examines how foreign-owned and domestically owned firms transform innovation into employment growth. The empirical analysis based on the model of Harrison, Jaumandreu, Mairesse and Peters (2008) reveals important differences between the two groups: foreign-owned firms experience higher employment losses due to general productivity increases than domestically owned firms. These reductions, however, are overcompensated by the employment-creating effects of higher sales from old products and by the employment-creating effects of product innovation. Together, all three effects result in net employment growth in foreign-owned firms.

JEL classification: O310; O330; F230

Keywords: employment, foreign-owned firms, innovation, Community Innovation Survey, host country effects

[1] AIT Austrian Institute of Technology, Vienna, Austria. Email: bernhard.dachs@ait.ac.at

[2] Centre For European Economic Research (ZEW), Mannheim, Germany. Email: b.peters@zew.de

1. INTRODUCTION

Employment is a central issue in discussions about the effects of globalisation on various economies. Foreign-owned firms can be a source of employment growth in their host countries (Barba Navaretti, 2004; Bellak, 2004): their market entrance and subsequent growth creates new labour demand, and they bring in new technologies which diffuse to the economy and stimulate growth of domestically owned firms. But the presence of foreign-owned firms may also have negative consequences for employment growth; compared to domestically-owned firms, employment in foreign-owned firms may be more volatile due to competition within the multinational enterprise (MNE), and the threat of relocation to low-wage locations of MNE (Scheve and Slaughter, 2004; Buch and Lipponer, 2010).

This paper wants to contribute to this discussion. We investigate the linkage between employment growth and innovation in foreign-owned and domestically owned firms. Our paper distinguishes in three important points from other contributions: First, we employ an econometric model that links the effects of innovation, in particular output growth from innovation, to employment growth at the firm level and disentangles some of the effects at work. Hence, we establish a link between innovation and employment growth at the firm level, which allows us to observe innovation-related differences in employment creation between foreign-owned and domestically owned firms. Most studies on the effects of the presence of foreign-owned firms on host countries focus on indirect effects or spillovers (Keller, 2004, 2010). Second, in contrast to other studies on this topic, we investigate effects at the firm level with a large data set of observations from 19 European countries. Third, we provide a separate analysis for the service sector. The service sector is a major source of employment growth. Studies that investigate innovation as well as multinational activities, however, often neglect service industries.

We start from two basic assumptions discussed in more detail below. First, it is commonly acknowledged that innovation and technology are major drivers for employment growth of firms (Pianta, 2005; Harrison et al., 2008). Second, innovation and technology is a key dimension in which foreign-owned and domestically owned firms differ. There is ample evidence that MNEs possess superior intangible assets, operate more frequently in R&D-intensive sectors and employ

more highly-qualified staff than domestically owned firms (Barba Navaretti, 2004; Bellak, 2004). Both groups differ in the way they create new products, in the capabilities they employ for this task, and in the means to introduce new product to the market. These differences, in turn, may lead to differences in employment creation and destruction from innovation between the two groups.

The paper is organized as follows: Chapter 2 discusses the linkages between innovation and employment in foreign-owned and domestically owned firms and presents our hypotheses. Chapter 3 describes our data. Chapter 4 presents some descriptive statistics on employment growth and innovation from this data set. Chapter 5 introduces the econometric set-up of this study. Chapter 6 discusses the results and draws conclusions from the analysis.

2. BACKGROUND AND RESEARCH QUESTIONS

2.1. Innovation, job creation and job destruction

Innovation and employment are related through various channels, and different forms of innovation have different effects on employment growth (Garcia et al., 2002; Pianta, 2005; Hall et al., 2008; Harrison et al., 2008). We can distinguish between the labour-saving effect (displacement effect) of innovation which reduces employment, and the demand-creating effect of innovation (compensation effect), which will increase employment (see Table 1 below). For analysing employment effects of innovation, it is thus important to distinguish between product and process innovation.

Table 1: Effects of product and process innovation on employment

	Displacement effect	**Compensation effect**
Product innovation	New product requires different or less labour input	New products increase overall demand
Process innovation	Less labour input for a given output	Cost reduction passed on to price expands demand

Source: Harrison et al. (2008), p. 37

Product innovations spur employment growth mainly via demand expansion and the compensation effect. When a new product has successfully been introduced to the market, it creates new demand for the innovating firm. This compensation effect can either be the result of a overall market expansion or at the expense of the firm's competitors. The amount and degree of the compensation effect resulting from demand increases depends on the competition and the way and timing competitors react (see Garcia et al., 2002).

In addition to this direct effect, there are also indirect employment effects from product innovation. The direction of these indirect effects depends on the rate of substitution between the new and existing products. If the new product (partially or totally) replaces the old one, labour demand for the production of the old product will decrease, and the overall effect is again not clear for the innovating firm. However, in the case of complementary demand relationships, the innovation in question causes the demand for previously existing products to rise as well, and employment will increase.

Product innovations may also lead to displacement effects, even if they are not associated with simultaneous process innovations. The new or improved product may imply a change in production methods and input mix, which could either reduce or increase labour requirements (see Harrison et al., 2008). The extent and direction of the effect must be empirically determined.

Employment effects of *process innovations* are closely related to productivity changes. The introduction of new production processes leads to an increase in productivity. Process innovation allows firms to produce the same amount of output with less input and, ceteris paribus, lower unit costs. The extent of this negative displacement effect depends on the current production technology and, thus, the rate of substitution between input factors as well as on the direction of the technological change.

At the same time, the reduction in unit costs allows the innovative firm to lower the product price. This leads in a dynamic perspective to a higher demand for and output of the product. The magnitude of this compensation effect depends on the price reduction, the price elasticity of demand, the degree of competition as well as the behaviour and relative strength of different

agents within the firm (Garcia et al., 2002). The higher the market power of the innovating firm, for instance, the lower is the extent to which cost reductions are passed to product prices.

The majority of empirical studies have found a positive relationship between *product innovation* and employment growth in manufacturing (Entorf and Pohlmeier, 1990; König et al., 1995; Reenen, 1997; Blechinger et al., 1998; Rottmann and Ruschinski, 1998; Smolny, 1998; Greenan and Guellec, 2000; Garcia et al., 2002; 2002; Hall et al., 2008; Harrison et al., 2008). Empirical evidence on the employment effects of process innovations is less clear than for product innovation. In the studies of van Reenen (1997) and Entorf and Pohlmeier (1990), the impact of process innovations turned out to be small and not significant at all. König et al. (1995), Smolny and Schneeweis (1999), Smolny (2002), or Greenan and Guellec (2000), in contrast, report a significant positive effect of process innovations on employment growth. The latter study even found evidence that process innovation created more new employment at the firm level than product innovation. Contrarily, Blechinger and Pfeiffer (1999) found evidence of labour displacement by process innovation, the effect being more pronounced in larger firms.

2.2. Innovation, employment growth and foreign ownership

The mechanisms how innovation transforms into new jobs via displacement and compensation effects should be the same for foreign-owned and domestically owned firms. Both groups, however, may differ in the frequency and intensity they create product innovation, utilize new production processes, and in the capabilities they can employ for this task. These differences, in turn, may lead to differences in employment creation and destruction from innovation between the two groups.

A first important difference is that foreign-owned firms possess superior assets domestically owned firms may not have at their disposal (Dunning, 1981; Caves, 1996 (1974); Markusen, 2002; Helpman et al., 2004). This includes technologies, brands, but also organisational and management capabilities. These assets allow foreign-owned firms to enter foreign markets and compete with domestically-owned firms.

The existence of these assets implies, at first, that innovation in foreign-owned firms does not have to start from scratch. Foreign-owned firms can utilize existing products and technologies

available inside the MNE, and learn from the experiences of MNE subsidiaries in other countries. They may also employ more advanced management practices than domestically owned firms (Bloom and Van Reenen, 2010) which allows them to adopt new technologies more effectively. This may help foreign-owned firms to introduce new products more successfully into the market, and reap higher output growth from new products which may translate into a higher employment growth from product innovation. Various studies give evidence for an advantage of foreign-owned firms in innovation output (Ebersberger et al., 2005; Sadowski and Sadowski-Rasters, 2006; Dachs et al., 2008).

Second, empirical evidence suggests that foreign-owned firms are larger than domestically owned firms in many countries and sectors. Hence, the ability of foreign-owned firms to create employment from innovation is also related to the general advantages and disadvantages of large and small firms in the innovation process (Kleinknecht, 1989; Cohen, 1995, 2010). Large firms, in particular multinationals, can spread risks over a larger number of projects, have considerable internal funds for innovation, and may benefit from a higher degree of specialisation and a more elaborated division of labour in research, development and innovation, which is not feasible in smaller firms. In addition, foreign-owned firms as part of a multinational group are likely to possess larger market power which would allow them to withhold a larger proportion of the cost reduction. Hence, one might expect a stronger negative impact of process innovations in foreign-owned firms. As mentioned above, market power is also important for the size of the compensation effect. Being part of a multinational group might further enable MNE subsidiaries to speed up the time in which they can react to the introduction of product innovations by competitors, reducing potential employment gains of domestic competitors.

Various advantages may therefore allow foreign-owned firms to enjoy higher sales from product innovation as well as higher productivity gains from process innovation than the average domestically owned firm. This will lead to higher displacement and compensation effects. It is difficult to say if the compensation effect will be large enough to compensate the (presumably negative) displacement effect of process innovation. Evidence from previous studies (Hall et al., 2008; Harrison et al., 2008) suggests, however, that the compensation effect should be larger than the displacement effect leading to overall positive employment growth at foreign-owned firms.

H1: Foreign-owned firms exhibit a higher employment growth from the compensation effect, but also a larger employment reduction from the displacement effect than their domestic competitors.

The advantages of size, internationalisation and market power in the innovation process, are of course, not restricted to foreign multinational firms alone. Some of these advantages are also shared by domestically owned firms which are part of a (multinational) enterprise group. We can therefore assume that differences between foreign and domestically owned firms belonging to an enterprise group are smaller than between foreign-owned firms and non-affiliated firms.

H2: Differences between foreign-owned firms and domestically owned group firms are smaller than between foreign-owned firms and domestically owned unaffiliated firms.

There is also reason to assume that there are differences between foreign-owned firms of different home countries. First, because foreign-owned firms are embedded in the corporate culture and standards of their enterprise group, and activities abroad are shaped by these factors to a considerable degree. Second, because there are productivity differences between countries which may result in different endowments of foreign-owned firms with technology and management capabilities and different productivity levels between foreign-owned firms. Harris and Robinson (2003) examine employment growth in 20 UK manufacturing industries over the period 1974-1995. Their results indicate that US owned plants performed better than domestic ones in most industries. For six industries they found no significant differences in performance, while domestically owned firms performed better in two industries. EU owned plants outperformed domestically owned plants in only four industries. The evidence for other home countries (i.e. old commonwealth countries, South East Asian countries, and the rest of the world) was mixed, with foreign owned firms performing better in some industries, but worse in others.

H3: There are differences between foreign-owned firms in employment creation which are related to different home countries.

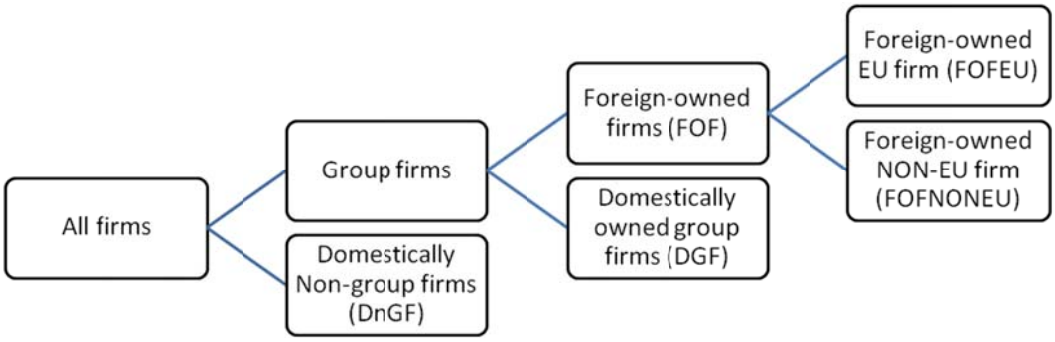
3. DATA SET

We employ data from the Community Innovation Survey (CIS) to estimate employment effects of innovation activities in foreign-owned and domestically owned firms. CIS is a survey based on a common questionnaire administered by Eurostat and national statistical offices or research institutes in all EU member states, Iceland and Norway. CIS aims at assessing various aspects of the innovative behaviour and performance of enterprises and follows the definitions laid down in the OECD Oslo Manual (OECD, 2005).

EUROSTAT provides access to CIS microdata at the firm level at their premises. We use a sample from CIS 4 which refers to the period 2002-2004. This sample includes more than 60,000 firms from 19 European countries (see Table 2 and 3 in the Annex).

CIS data contains information if the firm is part of an enterprise group. Additionally, the questionnaire asks for the country of origin of the parent company, i.e. the country where the parent's headquarter is located. Based on these two items we distinguish between the following types of foreign and domestic ownership (Figure 1):

Figure 1: Types of domestic and foreign ownership in the CIS data



Source: Own illustration

Domestically owned non-group firms (DnGF) are firms that do not belong to an enterprise group. They are domestically owned by definition. Domestically owned group firms (DGF) are firms that belong to a domestic enterprise group. Foreign-owned firms (FOF) are part of an enterprise group whose parent company is located abroad, e.g. a firm in France with a parent company in

Germany. There is evidence in the literature that DGF behave in many aspects different to DnGF, but are more similar to FOF (Frenz and Ietto-Gillies, 2007; Dachs et al., 2008).

We further distinguish between foreign-owned firms from different home countries: Foreign-owned European firms (FOF-EU) belong to an enterprise group whose parent company is located in another European country inside or outside the European Union. An example is a French firm whose parent company is located in Spain. Foreign-owned non-European firms (FOF-NONEU) are part of an enterprise group with a parent company located outside Europe (incl. Iceland and Norway). An example is a French firm with a parent company from US. FOF-NONEU can further be distinguished into Foreign-owned North American firms (FOF-NA) and Foreign-owned Non-European firms from the rest of the world (FOFROW).

In addition, we employ producer price index data provided by EUROSTAT (time series DS-074564-industry) at three-digit level for NACE 15.9, NACE 24.4, and NACE 36.12, and at two-digit level for all other industries. Where no producer price index was available (in particular SK; PT, MT, LU, LV, CY, EE), we use the average price movements at EU level measured by the producer price index. In the service sector, we employ the average producer price index for all sectors (NACE 10-40).

4. DESCRIPTIVE STATISTICS

A breakdown of the sample according to the ownership status of the firms reveals that the vast majority of the firms in the sample are DnGF, followed by DGF (Table 4 in the Annex). FOF are the exception. Their share is highest in small countries. The table also indicates that foreign-owned affiliates are more frequent among service firms (10.7%) than among manufacturing firms (5.2%). The share of foreign-owned affiliates from Europe exceeds that of foreign-owned Non-European firms in all countries [3].

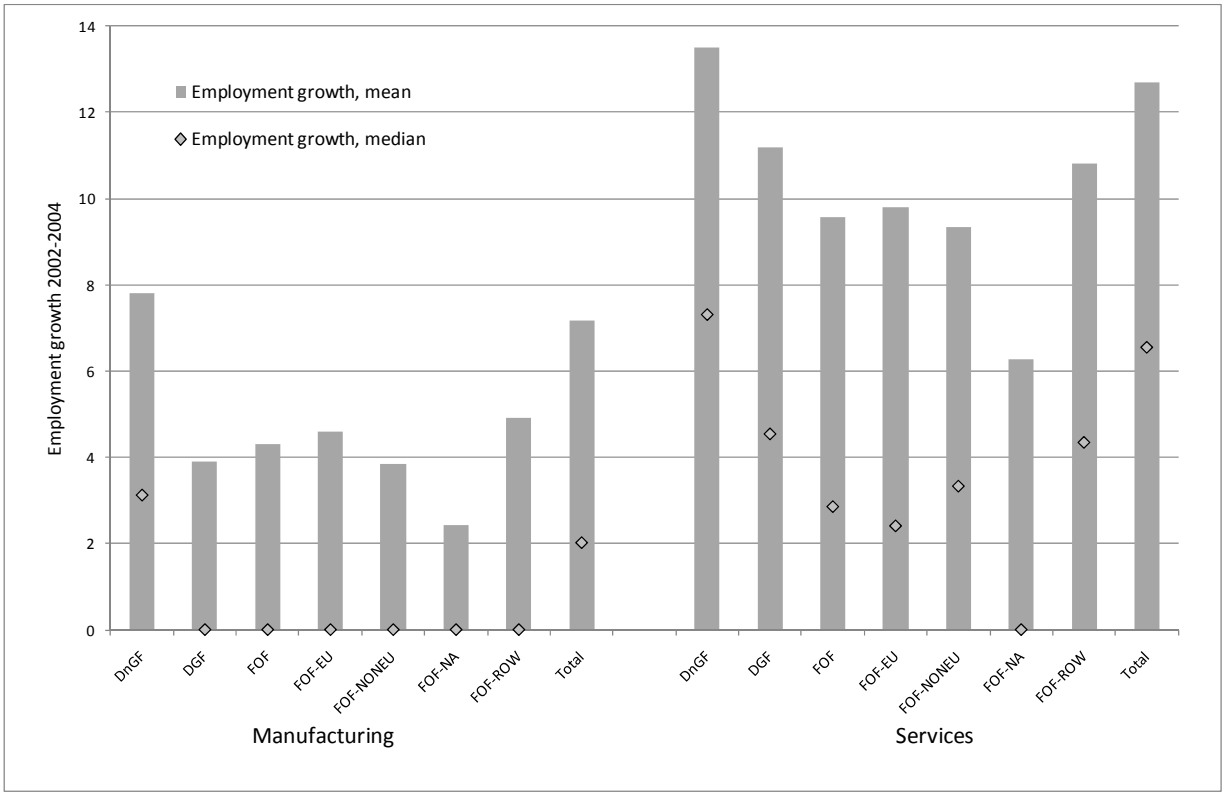
Employment growth is largest at DnGF and grows slower in FOF than in DnGF, but faster in FOF than in DGF (Figure 2). North-American firms have a considerably lower employment

[3] Norway, Greece and Iceland have no foreign-owned European firms the CIS 2004 data set.

growth than the other sub-groups of foreign-owned firms. The figure furthermore confirms the importance of service firms for creating employment: Employment growth is higher in services than in manufacturing. Foreign-owned service firms, however, generate lower employment growth than DnGF and DGF. Though not reported here, we see this pattern for all countries.

One should keep in mind, however, that these figures are higher than the growth rates published by official statistics due to the fact that (i) we can only observe surviving firms, (ii) we restricted the sample to firms with at least 10 employees and certain industries and (iii) we average the employment growth across firms instead of taking the ratio of the sum of changes in employment for all firms to the sum of employed personnel. Due to this method, average employment growth rates are more influenced by very fast growing firms. The median employment growth rate, i.e. the employment growth rate experienced by the least 50 percent of firms, is much lower - 2% in manufacturing and 6.6% in services.

Figure 2: Employment growth by ownership, manufacturing and services, 2002-2004



Source: CIS 4, Eurostat, own calculation, weighted figures.

5. ECONOMETRIC SET-UP

To investigate the employment effects of innovation we employ a model which was recently developed by Harrison, Jaumandreu, Mairesse and Peters (2008). This model has already been used to evaluate employment effects of innovation in a cross-country comparison for the UK, Spain, France and Germany (Harrison et al., 2008), Chile (Benavente and Lauterbach, 2007), and for Italy (Hall et al., 2008), as well as to study employment effects of different types of innovation (Peters, 2008) and in different stages of the business cycle (Rammer and Peters, 2010).

The model is based on a simple multi-product framework. The basic idea is that a firm can produce different products. It further assumes that one can observe a firm j at two points in time t (= 1, 2). In t=1 the firm produces one or more products which are aggregated to one product which is called the "old product" or "existing product". Between t=1 and t=2, the firm can decide to launch one or more new or significantly improved products. The new product can (partially or totally) replace the old one if they are substitutes or enhance the demand of the old product if complementarity exists. To produce the different outputs, it is assumed that firms use conventional inputs labour L and capital C (and that the production function is linear homogeneous in these inputs). Moreover, specific efficiencies for the production process of both goods and its evolution over time are driven by the knowledge capital of the firm (which is assumed to be a non-rival input).

Based on these basic assumptions, Harrison et al. (2008) derived the conditional labour demand functions for each product for each point in time and, as a result, the employment growth rate. Following the theoretical considerations above, employment growth in the model stems from three different sources: (i) from the efficiency increase in the production of the old product, which negatively affects labour demand; (ii) from the rate of change in the production of the old product (which is provoked by the new product to a certain degree, the induced change being negative for substitutes and positive for complements); and (iii) from starting production of the new product (positive sign). The employment effect of the latter depends on the efficiency ratio between both production technologies.

A main advantage of this model is that it allows to disentangle some of the theoretical employment effects mentioned above. Furthermore, it is well-suited for analysing firm-level employment impacts of innovation using the specific information provided by CIS data. In particular, it establishes a theoretical relationship between employment growth and results of innovation activities at the firm level. That is, it postulates a link between the employment growth rate and the innovation output in terms of sales growth due to new products. The latter can be directly calculated with CIS data.

Formally, Harrison et al. (2008) derive the following equation which describes the relationship between employment growth (in a three-year period), efficiency gains through process innovation (in that period) and the sales growth due to new products[4]:

$$l - \left(g_1 - \tilde{\pi}_1\right) = \alpha_0 + \alpha_1 pc + \beta g_2 + v \qquad (1)$$

With:

l	Employment growth rate between 2002-2004
α_0	Average efficiency gains in the production of the old product for non-process innovators between 2002-2004 (expected to be negative)
α_1	Average efficiency gains in the production of the old product through process innovations between 2002-2004
pc	Dummy variable for process innovations in the period 2002-2004
$g_1 = y_1 + \pi_1$	Nominal output growth (sales growth) due to old products in the period 2002-2004
$g_2 = y_2 + \pi_2 y_2$	Nominal output growth (sales growth) due to new products in the period 2002-2004
y_1, y_2	Real output growth due to old and new product between 2002-2004
π_1	Price growth rate of old products at the firm level between 2002-2004
$\tilde{\pi}_1$	Price growth rate of old products at the industry level between 2002-2004
π_2	Price difference between new and old product in relation to the price of the old product
$v = -E\left(\pi_1 - \tilde{\pi}_1\right) - \beta \pi_2 y_2 + u$	Error term

[4] For more details see Harrison et al. (2008) and Peters (2008). Note that the model can also be rewritten in terms of productivity growth as follows: $g_2 + \left(g_1 - \tilde{\pi}_1\right) - l = -\alpha_0 - \alpha_1 pc + (1-\beta) g_2 - v$ The left-hand side describes labour productivity which depends on process innovation and on sales growth due to new products. A further advantage of this model is that is allows to disentangle productivity and employment effects due to old and new products which give additional insight.

The sales growth rate from new products g_2 may be correlated with the error term v. An appropriate econometric method to deal with such an endogeneity problem is to use instrumental variable techniques where the instruments should be correlated with the innovation success but not correlated with the error term. We use three dummy variables as instruments: a dummy variable that indicates whether the firm does continuous R&D; a dummy variable that indicates whether the extension of the product range was a medium or highly important goal of the innovation process; and a dummy variable that indicates whether the firm has used patents to protect its knowledge. These instruments are similar to the ones proposed by Harrison et al. (2008). We have tested and proved their non-weakness and validity by checking the F-statistic from the first stage regression and by using the Sargan-Hansen test on overidentifying restrictions.

6. ECONOMETRIC RESULTS

6.1. Employment growth of foreign-owned and domestically owned firms

We first look at employment growth of FOF. We build on equation (1) and additionally control for country effects, industry effects and ownership.[5] The results for manufacturing and services are given in Table 5 in the Annex.

The econometric results reveal a significantly smaller employment growth rate for FOF and DGF compared to DnGF. This is in line with the descriptive results of Figure 2. FOF in manufacturing, but not in services, behave very much like DGF. FOF in services, in contrast, exhibit significant lower (i.e. a stronger negative effect) growth rates compared to DGF. Moreover, econometric results reveal that DGF create less employment growth than DnGF both in manufacturing and service industries.

Employment growth of FOF also depends on the home country. In manufacturing, we see that European FOF grow slower than North-American FOF. European FOF, however, tend to perform

[5] Note that the estimation equation is specified in growth rates, i.e. in first differences. This implies that time-invariant firm-specific (observable and unobservable) effects in the employment levels are already eliminated. However, the inclusion of industry, country and ownership dummies enlarge the flexibility of the specification by allowing for an unspecified form of heterogeneity in the growth rates between industries, countries and ownership types.

better than FOF from the rest of the world. In services, North-American FOF create significantly less employment than European FOF. Compared to FOF from the rest of the world, employment growth of European FOF is lower.

Based on the results we can further ascertain that successful product innovations are significantly related to employment growth. A higher sales growth rate due to product innovations (SGRPD) is associated with a higher employment growth rate. From the coefficient we can infer that an increase in sales growth due to new products of 1% leads to an increase in *gross* employment by 1% in manufacturing. This effect is smaller in services. At the same time, one must take into account that product innovations can displace existing products to a considerable extent; this leads to downsizing as well. An estimation of the net employment effect of product innovations will be undertaken below.

Process innovations (PC) are significantly associated with employment reduction in manufacturing, but not in the service sector. We can deduct from this result that the negative displacement effect of process innovations outweigh compensation effects in manufacturing, resulting in a negative employment effect. Conversely, the results suggest that service firms tend to pass on the productivity gains derived from innovations to a larger extent which may be a result of less market power of service firms on average. However, in part this result might also be driven by the fact that process innovations in services are more difficult to identify than in manufacturing. Services are often customised to specific demands so that a clearly structured production process is lacking in many cases.

6.2. Product, process innovation and employment growth

How are the observed differences in employment creation between foreign-owned and domestically owned firms related to differences in process and product innovation? We will examine this question in detail by running separate regressions for each type of ownership (Table 6).

The results corroborate a positive impact of sales growth due to new products (SGRPD) on gross employment (compensation effect) for DnGF, DGF and FOF. Readers should remember that the

coefficient measures the relative efficiency in production between the old and the new product. If new products are produced more efficiently than the old ones, this ratio is less than unity.

FOF were able to produce their new products with a higher efficiency than domestically owned firms, implying less employment growth. The period 2002-2004 was characterized by a recession in many countries; one reason for this result could be that globally active multinational firms are exposed to a higher cost pressure in recession periods so that they target efficient production of new products more heavily.

The effect of process innovation (PC) on employment, in contrast, varies with ownership type. Process innovations are responsible for a significant labour reduction only in DnGF and in non-European FOF. Though both effects are statistically not significant, the direction is surprising as one might have expected that FOF - as part of a multinational group - possess more market power and would thus hesitate to lower prices which stimulate employment.

Table 7 analyzes innovation and employment growth in the same way for service firms. Product innovations spur employment creation in all types of service firms. Like in manufacturing, we find that the coefficients for FOF are much smaller than for DnGF and DGF. This indicates that in the recession FOF were able to offer their new services with a much higher efficiency than their old ones. Process innovations do not significantly matter for employment growth in all types of firms.

6.3. Disentangling general productivity trends, demand effects, process and product innovation

Harrison et al. (2008) suggest an alternative way of presenting these results which allows to separate the effects of product and process innovations from effects arising from general demand and productivity trends. They propose to decompose the average employment growth in the following way:

$$l = \underbrace{\hat{\alpha}_0}_{1} + \underbrace{\hat{\alpha}_1 pc}_{2} + \underbrace{\left[1 - I\left(g_2 > 0\right)\right]\left(g_1 - \tilde{\pi}_1\right)}_{3} + \underbrace{I\left(g_2 > 0\right)\left(g_1 - \tilde{\pi}_1 + \hat{\beta} g_2\right)}_{4} + \hat{v} \qquad (2)$$

I(·) is a so-called indicator function. It is 1 if the condition in brackets is fulfilled and 0 otherwise. Thus, employment growth can be decomposed into four terms:

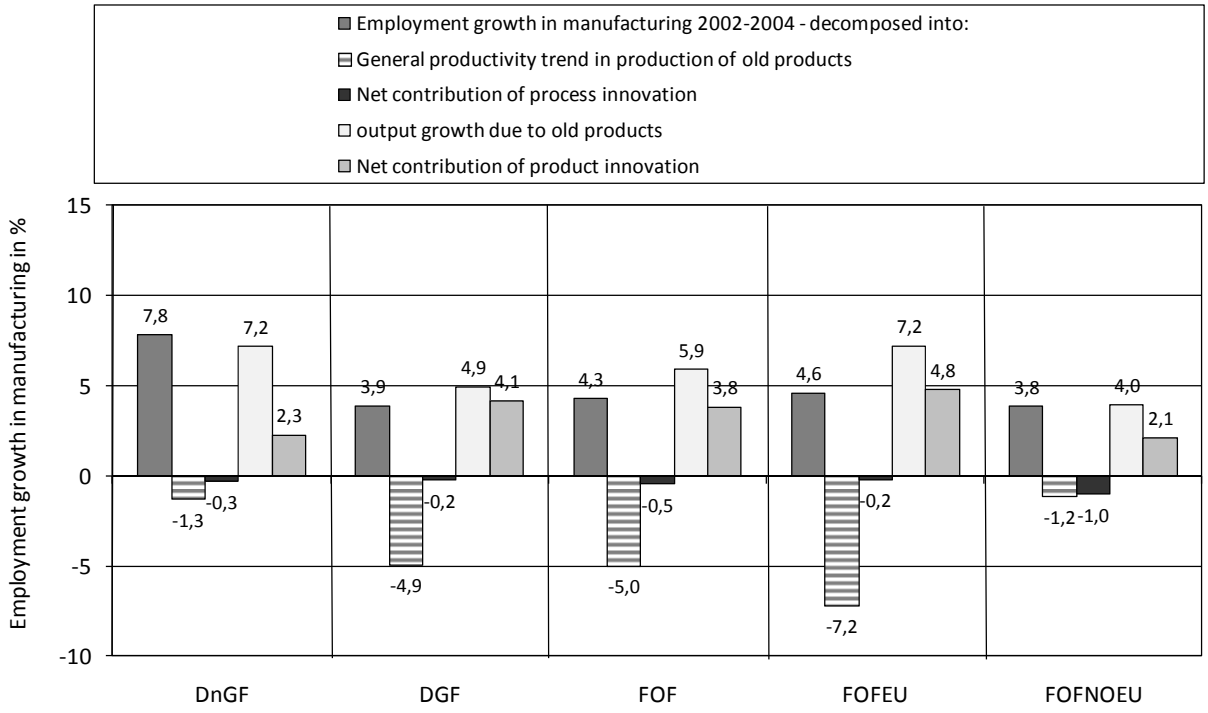
1. The first term measures the change in employment due to *general industry and country specific productivity trends* in the production of old products. Here, general means that these effects are not attributable to process or product innovation. They rather reflect the effects of organisational change, corporate restructuring, acquisitions of firms, changes in human capital endowment, training, productivity effects from spillovers etc.
2. The second term presents the net employment contribution made by *process innovations* related to the production of old products. Here, net contribution is understood as the result of displacement effects brought about by process innovations and the compensation demand effects owing to cost and price reductions.
3. The third term captures the employment change associated with *output growth of old products* for firms that do not introduce new products. That is, the third component accounts for changes in employment growth due to shifting demand for the existing product. This shift in demand can be the result of cyclical impacts, rivals' product innovations, changes in consumers' preferences etc.
4. The fourth term summarises the net contribution of *product innovation* to employment for product innovators. In this case, this effect results from increases in the demand for the new product and possible shifts in demand for the old one.

The final term is the residual term which is zero by definition. A dissection of the average employment growth can be obtained by inserting the average shares of innovators from the sample, the average price growth rates, and the estimated coefficients into the equation.

Figure 3 depict the decomposition of employment growth in manufacturing by type of ownership. The general productivity trend exerts a considerable negative influence on employment. Both, DGF and FOF experience a much higher general productivity increase than DnGF which leads to

a decrease in employment by roughly 5%. Another small negative effect on employment comes from process innovations.

Figure 3: Decomposition of employment growth by ownership, manufacturing, 2002-2004



Source: CIS4, Eurostat, own calculation.

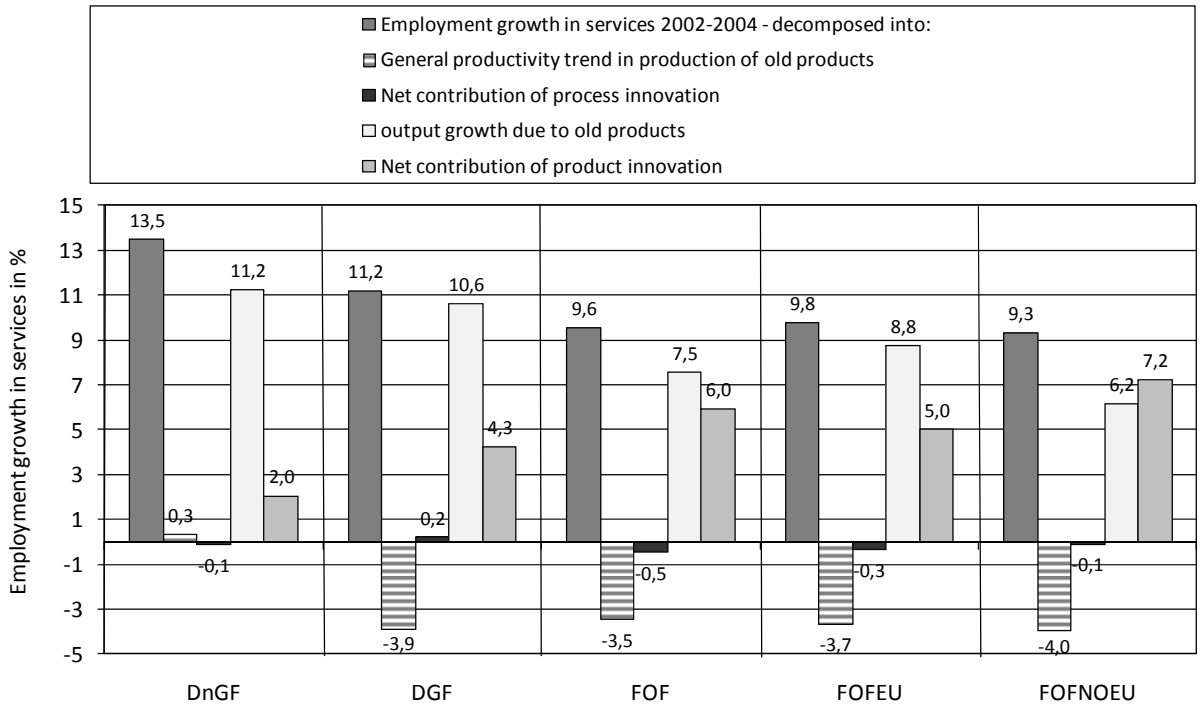
The effects of general productivity trends and process innovation on employment, however, are outweighed in each sub-sample by the compensation effect – the employment-creating effects of growth in demand for old and new products. Output growth of old products contributes more to employment than product innovation in all sub-samples. A similar result was found by Harrison et al. (2008) for Spain and the UK, whereas product innovation contributed more to employment in Germany and France. Employment creation due to demand for old products is highest for European FOFs, but closely followed by DnGF.

The main difference between FOF, DnGF and DGF can be found in the contribution of product innovation to employment growth. In FOF-EU, new products contribute more to employment

growth than in DGF and GnGF. This indicates that European foreign-owned firms generate more employment growth than domestically owned firms with product innovation. Their contribution, however, is smaller in absolute terms than the contribution of old products.

Figure 4 depicts the results of the decomposition of employment growth for service industries. The general pattern is the same in manufacturing and services: There is employment growth in all sub-samples of foreign-owned and domestically owned firms, because employment losses by general productivity increases are overcompensated by the effects from output growth for old products and by the contribution of product innovation. Process innovation, in contrast to manufacturing, contributes only little to employment changes in services. This result is the same in all types of ownership.

Figure 4: Decomposition of employment growth by ownership, services, 2002-2004



Source: CIS4, Eurostat, own calculation.

Like in manufacturing, FOF benefit much more from general productivity gains (due to organisational changes, training, externalities, etc.) than DnGF. General productivity gains (and

thus labour savings from general productivity gains), however, are smaller than in manufacturing. In contrast to manufacturing, non-European FOF exhibit stronger general productivity gains in services than European FOF. Moreover, the importance of demand growth for old products in employment creation is lower for FOF than for DnFG and DGF in services. New products have an even higher absolute and relative contribution to employment growth for both Non-European and European FOF.

To sum up, the analysis supports hypothesis 1 that foreign-owned firms experience a higher employment growth from innovation, but also a larger employment reduction from innovation than domestically owned firms. Foreign subsidiaries in manufacturing behave very much like domestically owned firms belonging to an enterprise group. We find significant lower growth rates for foreign-owned firms in services compared to both types of domestically owned firms. This supports hypothesis 2 for manufacturing, but not for services. The country of origin of the foreign-owned firm matters for employment growth. In manufacturing, we see European foreign-owned firms grow slower than firms from North-America. In turn, subsidiaries of European MNEs tend to perform better than subsidiaries of MNEs from the rest of the world. In services, there is not such a clear pattern. We therefore find support for hypothesis 3 only for services.

7. DISCUSSION AND CONCLUSIONS

Understanding how foreign-owned and domestically owned firms transform innovation into employment is essential for an evidence-based discussion of the effects of globalisation. We have demonstrated that foreign-owned firms experience higher employment losses than domestically owned firms due to general productivity increases. This observation, at first sight, supports the opinion that employment at foreign-owned firms is more volatile, and foreign activity may have negative consequences for host country labour markets. Our analysis, however, also clearly demonstrates that these reductions are overcompensated by the employment-creating effects of product innovation and higher sales from old products. Foreign-owned firms create a higher employment growth with product innovations than domestically owned firms. The displacement and the compensation effect is stronger in foreign-owned than in domestically owned firms. In total, all three effects result in net employment growth in foreign-owned firms.

From a policy perspective the results confirm the importance of foreign direct investment for aggregate growth. The effects of foreign presence on growth may be even higher if we consider that foreign-owned firms are also an important source of spillovers and technology diffusion to firms in the host country. Innovation of foreign-owned firms has positive effects in the service sector in particular. This gives support to a further liberalisation of FDI in services.

In addition, the results point to the need to support innovation capabilities of both, foreign-owned and domestically owned firms. Given that product innovation generates employment at foreign-owned firms, it would be irrational to exclude foreign-owned firms from innovation funding. Non-discrimination is indeed the guiding principle in the treatment of foreign-owned firms in the OECD member states (OECD, 2008; Schwaag Serger and Wise, 2010).

The result that foreign-owned firms of different home countries perform differently in employment creation may tempt to suppose a sort of discrimination and the promotion of certain types of firms. However, one should also carefully consider the limitations of the analysis: First, we did not take employment growth in non-innovating firms into account, which may give the results a certain bias; second, the firm-level analysis cannot consider the 'business stealing effect' when employment growth in one group of firms is at the expense of employment losses of another group of firms. Competitors which cannot keep pace with technological change may lose market share or even disappear, leading to employment destruction in these firms. However, we also exclude possible spillovers from foreign-owned to domestically owned firms which may increase productivity and spur product innovation. Third, it does not account for additional employment effects that may occur in upstream or downstream firms. If the innovative firm is able to increase its output, all its suppliers benefit and this may stimulate their labour demand as well. Suppliers may also benefit from innovation expenditure of innovative firms. Forth, the results only take employment changes into consideration which happen in the same period as the innovation. Additional effects of new products and processes that occur in later periods are excluded.

Future research should therefore focus on the long-term effects of foreign innovation activity on employment. These long-term view is particularly important for fundamental innovations new to

the market, which may unfold their economic potential only after years. A second promising line of research could be to investigate whether the differences observed between foreign-owned firms of different home countries are persistent over time and countries and find explanations for this phenomenon.

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ANNEX

Table 2: Distribution of CIS4 sample by country

		CIS 4: 2002-2004			
		Manufacturing		Services	
Country	**Abb.**	**Number**	**in %**	**Number**	**in %**
Bulgaria	BG	4,162	10.02	2,730	12.06
Czech Republic	CZ	2,611	6.29	1,076	4.75
Denmark	DK	504	1.21	469	2.07
Estonia	EE	839	2.02	422	1.86
Greece	EL	227	0.55	161	0.71
Spain	ES	8,046	19.37	2,601	11.49
France	FR	6,350	15.29	4,442	19.63
Hungary	HU	1,714	4.13	744	3.29
Iceland	IS	74	0.18	31	0.14
Italy	IT	6,745	16.24	3,638	16.07
Lithuania	LT	553	1.33	300	1.33
Luxembourg	LU	165	0.4	279	1.23
Latvia	LV	761	1.83	419	1.85
Norway	NO	1,467	3.53	932	4.12
Portugal	PT	2,052	4.94	1,111	4.91
Romania	RO	3,259	7.85	2,352	10.39
Slovakia	SE	296	0.71	192	0.85
Slovenia	SI	717	1.73	292	1.29
Sweden	SK	992	2.39	442	1.95
Total		41,534	100	22,633	100

Source: CIS 4, Eurostat, own calculation, unweighted figures.

Table 3: Distribution of CIS4 samples by industry

		CIS 4: 2002-2004	
Industry	**NACE**	**Number**	**in %**
Manufacturing			
Food / beverages / tobacco	15-16	5,611	8.74
Textile / leather	17-19	6,210	9.68
Wood / paper / printing	20-22	5,256	8.19
Chemicals	23-24	2,442	3.81
Plastic / rubber	25	2,047	3.19
Non-metallic	26	2,439	3.80
Basis metals	27-28	5,311	8.28
Machinery	29	3,367	5.25
Electrical	30-33	3,843	5.99
Vehicles	34-35	2,268	3.53
Nec	36	2,740	4.27
Services			
Wholesale	51	9,491	14.79
Transport / storage / post	60-63	6,310	9.83
Telecommunication	64	721	1.12
Banks / insurances	65-67	2,507	3.91
Computer and related activities	72	2,306	3.59
Research and development	73	619	0.96
Technical services	74.2 +74.3	679	1.06
Total		64,167	100

Source: CIS 4, Eurostat, own calculation, unweighted figures.

Table 4: Distribution of CIS4 sample by ownership

	CIS 4: 2002-2004				
Country	**DnGF**	**DGF**	**FOF**	**FOFEU**	**FOF NON-EU**
Manufacturing					
BG	92.9	3.2	3.9	2.9	1.1
CZ	81.3	6.9	11.8	9.5	2.3
DK	54.8	35.2	10.0	5.3	4.6
EE	72.4	15.3	12.3	6.3	6.0
ES	89.0	7.7	3.3	2.3	1.0
FR	66.1	24.9	9.0	5.3	3.7
GR	90.1	0.0	9.9	0.0	9.9
HU	84.8	5.1	10.0	7.3	2.7
IS	81.7	15.7	2.7	0.0	2.7
IT	88.5	9.1	2.4	1.4	1.0
LT	81.6	12.5	5.9	3.8	2.1
LU	57.9	18.0	24.1	15.8	8.2
LV	94.5	2.3	3.1	2.2	0.9
NO	57.6	34.4	8.1	0.0	8.1
PT	88.2	7.6	4.2	2.9	1.3
SE	100.0	0.0	0.0	0.0	0.0
SI	66.8	27.2	6.0	5.3	0.7
SK	78.1	7.3	14.7	13.1	1.5
Total	*82.9*	*11.9*	*5.2*	*3.2*	*2.1*
Services					
BG	92.3	2.7	5.0	3.8	1.1
CZ	73.7	9.8	16.5	12.3	4.3
DK	45.0	32.0	23.1	11.6	11.4
EE	65.0	19.8	15.2	7.1	8.1
ES	83.2	10.0	6.8	4.0	2.8
FR	59.6	28.4	12.0	6.9	5.1
GR	71.2	0.0	28.8	0.0	28.8
HU	80.0	6.2	13.8	9.0	4.8
IS	46.1	52.4	1.5	0.0	1.5
IT	80.4	13.1	6.5	3.5	3.0
LT	74.4	14.8	10.8	9.0	1.9
LU	37.7	16.6	45.7	32.1	13.6
LV	82.4	2.5	15.1	11.5	3.6
NO	48.4	31.4	20.2	0.0	20.2
PT	77.1	14.9	8.0	5.8	2.2
SE	100.0	0.0	0.0	0.0	0.0
SI	70.8	18.3	10.9	6.4	4.5
SK	70.9	8.2	20.9	18.2	2.7
Total	*73.0*	*16.4*	*10.7*	*5.6*	*5.0*

Source: CIS 4, Eurostat, own calculation, weighted figures.

Table 5: Effect of foreign ownership on employment growth, 2002-2004

	Manufacturing			Services		
	(1)	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
Const.	-14.139***	-14.116***	-14.117***	-9.891***	-10.023***	-10.004***
	(1.498)	(1.498)	(1.498)	(2.079)	(2.098)	(2.098)
Innovation						
SGRPD	1.001***	1.000***	1.000***	0.841***	0.840***	0.836***
	(0.040)	(0.040)	(0.040)	(0.079)	(0.079)	(0.079)
PC	-2.270***	-2.270***	-2.270***	-0.779	-0.776	-0.823
	(0.868)	(0.868)	(0.868)	(1.290)	(1.290)	(1.290)
Ownership						
DGF	-3.459***	-3.457***	-3.454***	-2.859**	-2.859**	-2.887**
	(0.761)	(0.761)	(0.762)	(1.211)	(1.211)	(1.211)
FOF	-3.391***	-	-	-5.315***	-	-
	(0.764)			(1.621)		
FOFEU	-	-3.585***	-3.580***	-	-4.493**	-4.538**
		(0.823)	(0.823)		(2.216)	(2.217)
FOFNONEU	-	-3.096**	-	-	-6.273***	-
		(1.249)			(2.187)	
FOFNA	-	-	-2.321*	-	-	-11.763***
			(1.260)			(4.516)
FOFROW	-	-	-3.697*	-	-	-3.344
			(1.895)			(2.194)
Country dummies						
BG	1.585	1.566	1.569	-0.697	-0.588	-0.569
	(1.298)	(1.298)	(1.298)	(2.201)	(2.213)	(2.212)
CZ	8.861***	-	-	8.598***	8.664***	8.703***
	(1.297)			(2.194)	(2.199)	(2.199)
DK	27.505***	8.851***	8.857***	19.573***	19.714***	19.760***
	(1.835)	(1.297)	(1.297)	(2.462)	(2.476)	(2.475)
EE	3.644**	27.480***	27.474***	2.128	2.276	2.158
	(1.778)	(1.837)	(1.837)	(2.945)	(2.957)	(2.957)
EL	8.892***	3.618**	3.648**	8.860***	8.983***	9.024***
	(1.247)	(1.780)	(1.781)	(2.296)	(2.316)	(2.316)
ES	Reference country			Reference country		
FI	12.699***	12.676***	12.671***	9.764***	9.883***	9.979***
	(1.465)	(1.466)	(1.466)	(2.194)	(2.203)	(2.199)
FR	12.191***	12.142***	12.205***	11.311***	11.717***	10.926***
	(2.424)	(2.420)	(2.418)	(3.041)	(3.092)	(3.087)
HU	14.412***	14.397***	14.402***	10.257***	10.355***	10.386***
	(1.429)	(1.429)	(1.429)	(2.538)	(2.547)	(2.547)
IT	10.744***	10.715***	10.732***	13.930**	14.065**	14.024**
	(3.003)	(3.003)	(3.003)	(6.478)	(6.482)	(6.480)
LT	19.495***	19.473***	19.475***	17.093***	17.219***	17.243***
	(1.236)	(1.237)	(1.237)	(2.156)	(2.171)	(2.171)
LU	2.736	2.717	2.726	0.366	0.439	0.456
	(2.349)	(2.349)	(2.348)	(4.582)	(4.582)	(4.580)
LV	16.203***	16.189***	16.174***	22.169***	22.162***	22.271***
	(2.136)	(2.137)	(2.137)	(2.981)	(2.982)	(2.990)
PT	-1.276	.	-	7.586*	7.6539*	7.706*
	(2.211)			(4.063)	(4.067)	(4.071)
RO	21.563***	-1.296	-1.290	18.526***	18.846***	18.272***
	(1.405)	(2.211)	(2.211)	(2.399)	(2.466)	(2.471)
SE	11.468***	21.518***	21.569***	10.536***	10.638***	10.684***
	(1.364)	(1.411)	(1.416)	(2.478)	(2.483)	(2.482)
SK	14.042***	11.449***	11.451***	13.471***	13.599***	13.608***
	(1.919)	(1.365)	(1.365)	(3.204)	(3.214)	(3.214)

NO	4.415***	14.020***	14.023***	7.0637**	7.1809**	7.132**
	(2.022)	(1.919)	(1.920)	(3.502)	(3.514)	(3.504)
Industry dummies	0.000***	4.402**	4.407**	0.000***	0.000***	0.000***
		(2.022)	(2.022)			
Obs	38274	38274	38274	20281	20281	20281
R2adj	0.259	0.259	0.259	0.191	0.191	0.192
J-Test	0.970	0.951	0.939	0.654	0.661	0.673
First stage statistics:						
F overall	83.14***	80.73***	78.78***	32.71***	32.15***	31.45***
R2adj	0.179	0.178	0.179	0.197	0.197	0.197
Partial R2	0.146	0.146	0.146	0.158	0.158	0.158
F excl.	282.60***	281.95***	282.31***	86.110***	86.436***	86.410***

Note: Estimates are based on a pooled data. Estimation method: instrumental variables. Instruments for the sales growth due to new products: increased product range (1 if this goal was of high-to medium importance, 0 else), dummy for continuous R&D activity and patenting. J-Test reports the p-value of the Sargan-Hansen test on overidentifying restrictions (H0: instruments are valid). F excl. reports the test statistic of an F-Test on the joint significance of the instruments in the first stage regression. Partial R2 measures the explanatory power of the instruments (it is the R2 of the first stage regression where other explanatory variables have been partialled out).

Source: CIS 4, Eurostat, own calculation.

Table 6: Effect of innovation on employment growth by ownership, manufacturing, 2002-2004

	DnGF	DGF	FOF	FOFEU	FOFNONEU
Const.	-13.356***	-17.736***	-17.868***	-17.994***	-19.552***
	(1.699)	(4.204)	(3.382)	(3.481)	(6.932)
Innovation					
SGRPD	1.000***	1.051***	0.792***	0.944***	0.582***
	(0.045)	(0.115)	(0.111)	(0.118)	(0.193)
PC	-2.319**	-1.503	-3.288	-1.482	-7.550**
	(0.990)	(2.154)	(2.143)	(2.208)	(3.740)
Ownership					
FOFNONEU	-	-	1.006	-	-
			(1.178)		
Country dummies					
BG	0.742	5.846	2.237	1.266	7.844
	(1.469)	(4.792)	(3.786)	(4.199)	(8.457)
CY	-	-	-	-	-
CZ	7.400***	10.459**	16.738***	18.684***	12.589*
	(1.492)	(4.415)	(3.211)	(3.484)	(7.283)
DK	29.753***	24.819***	23.694 ***	18.083***	33.561***
	(2.407)	(4.570)	(3.801)	(4.860)	(6.795)
EE	2.786	3.694	9.0812**	7.083	14.400*
	(2.160)	(4.874)	(3.897)	(5.135)	(7.423)
EL	7.888***	8.708**	16.289 ***	16.001***	19.866***
	(1.427)	(4.318)	(2.993)	(3.278)	(6.356)
ES	Reference country				
FI	10.945***	14.654***	17.458 ***	18.061***	19.881***
	(1.838)	(4.041)	(2.922)	(3.136)	(6.226)
FR	11.395***	-	16.932 **	-	22.464**
	(2.596)		(7.640)		(9.216)
HU	14.068***	12.681**	15.368***	12.649***	24.076***
	(1.634)	(5.259)	(3.372)	(3.633)	(7.494)
IT	8.033**	18.848***	22.318**	-	22.501*
	(3.571)	(4.927)	(9.553)		(11.569)
LT	18.892***	16.534***	23.975 ***	25.835***	23.764***
	(1.419)	(4.203)	(3.346)	(3.963)	(6.412)
LU	1.018	8.403	5.914	8.192	6.201
	(2.697)	(6.263)	(7.326)	(6.539)	(15.813)
LV	14.868***	18.283***	20.155 ***	21.122***	21.992***
	(2.880)	(5.854)	(3.880)	(4.764)	(7.491)
MT	-	.	-	-	-
PT	-2.011	-5.914	-2.069 (6.458)	-6.156	10.442
	(2.382)	(6.250)		(8.026)	(9.848)
RO	21.167***	21.731***	21.879 ***	-	24.572***
	(1.744)	(4.138)	(3.564)		(6.430)
SE	10.653***	12.603***	11.569***	10.154**	18.972**
	(1.553)	(4.455)	(3.928)	(4.659)	(7.602)
SK	13.131***	-	-	-	-
	(2.024)				
NO	5.259**	1.223	3.228	4.957	1.177
	(2.658)	(4.467)	(4.030)	(4.368)	(11.626)
Industry dummies	0.000***	0.000***	0.002***	0.000***	0.357
Obs	26514	7215	4545	2755	1790
R2adj	0.250	0.316	0.309	0.305	0.301
J-Test	0.365	0.457	0.560	0.136	0.114
First stage statistics:					
F overall	52.92***	22.23***	20.62***	14.69***	10.20***
R2adj	0.188	0.146	0.180	0.167	0.198
Partial R2	0.161	0.094	0.126	0.134	0.114
F excl.	185.08***	86.64***	141.45***	93.72***	53.96***

Notes: see Table 4

Source: CIS 4, Eurostat, own calculation.

Table 7: Effect of innovation on employment growth by ownership, services, 2002-2004

	DnGF	**DGF**	**FOF**	**FOFEU**	**FOFNONEU**
Const.	-8.216***	-16.419***	-18.063***	-26.137***	11.608
	(2.364)	(6.596)	(5.339)	(6.256)	(9.690)
Innovation					
SGRPD	0.828***	1.027***	0.667***	0.688**	0.677***
	(0.100)	(0.135)	(0.252)	(0.349)	(0.242)
PC	-1.042	1.291	-3.559	-2.668	-0.666
	(1.648)	(2.241)	(3.164)	(4.197)	(4.332)
Ownership					
FOFNONEU			-2.440		
			(3.013)		
Country dummies					
BG	-1.876	-2.860	-0.379	2.461	-21.612*
	(2.489)	(8.795)	(6.277)	(7.152)	(12.418)
CY					
CZ	6.699***	8.866	15.408***	21.058***	-15.028
	(2.557)	(7.517)	(5.180)	(5.810)	(10.292)
DK	19.435***	18.836***	27.337***	32.934***	-2.057
	(2.904)	(7.175)	(5.942)	(7.098)	(10.498)
EE	0.241	4.984	8.030	9.068	-17.991*
	(3.741)	(7.885)	(5.837)	(7.340)	(10.366)
EL	7.864***	10.222	9.835	5.232	-6.098
	(2.614)	(7.361)	(6.937)	(8.051)	(10.157)
ES					
FI	7.329***	14.376**	13.859**	22.907***	-18.952
	(2.565)	(6.718)	(5.758)	(6.362)	(10.680)*
FR	8.360**		21.696***		-8.433
	(3.496)		(7.136)		(11.449)
HU	8.891***	12.832	13.159**	14.014**	-10.515
	(2.934)	(9.648)	(5.931)	(6.912)	(10.307)
IT	7.007	21.584**	5.111		-27.000***
	(12.214)	(8.331)	(6.296)		(9.690)
LT	16.107***	18.429***	18.645**	30.984***	-21.115*
	(2.456)	(6.730)	(7.376)	(8.940)	(10.849)
LU	-0.985	-7.828	19.369**	20.504**	21.937*
	(4.991)	(16.625)	(8.509)	(9.939)	(12.954)
LV	19.304***	17.127**	29.137***	32.005***	3.170
	(3.851)	(8.694)	(5.906)	(6.686)	(11.848)
MT					
PT	5.702	25.274**	11.923	15.287	-6.176
	(4.706)	(10.099)	(8.580)	(9.949)	(13.444)
RO	17.597***	19.912***	24.862***		-5.817
	(3.031)	(6.912)	(6.525)		(9.897)
SE	9.565***	14.019**	9.011	16.558***	-24.600
	(2.933)	(6.932)	(6.253)	(6.336)	(15.5454)
SK	12.146***				
	(3.391)				
NO	6.391	11.639	2.201	-3.519	-13.083
	(4.189)	(8.370)	(10.691)	(11.529)	(18.036)
Industry dummies	0.000***	0.009***	0.040**	0.036**	
Obs	12743	4747	2791	1578	1213
R2adj	0.183	0.195	0.186	0.328	0.204
J-Test	0.813	0.171	0.034**	0.000***	0.680
First stage statistics:					
F overall	19.13	11.20	11.64	5.40	7.27
R2adj	0.1903	0.1920	0.2385	0.2118	0.3223
Partial R2	0.1615	0.1506	0.1476	0.1302	0.1849
F excl.	48.9251	54.9171	16.0746	7.94528	17.1273

Notes: see Table 4

Source: CIS4, Eurostat, own calculation.

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