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## International Trade and Worker Turnover – Empirical Evidence for Germany

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Daniel Baumgarten

## **International Trade and Worker Turnover**

Empirical Evidence for Germany

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**Empirical Evidence for Germany**



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Daniel Baumgarten<sup>1</sup>

# International Trade and Worker Turnover – Empirical Evidence for Germany

## Abstract

*Using a linked employer-employee data set for Germany, this paper studies how worker turnover is related to establishments' international trade involvement. The descriptive analysis shows that trading establishments have lower worker turnover rates than non-traders, suggesting a higher degree of employment stability. Conditional on an extensive set of control variables, exporting is further associated with a higher net job flow rate, which is almost entirely due to a lower separation rate (particularly for high-skilled workers and transitions into non-employment). In contrast, an increase in import intensity is associated with a lower accession rate (particularly for low-skilled workers and their accessions out of non-employment). These results are more pronounced for smaller establishments, and they partly lose statistical significance once unobservable establishment characteristics are taken into account.*

*JEL Classification: F16, J21, J23, J63*

*Keywords: International trade; worker turnover; job turnover; linked employer-employee data*

*November 2010*

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# 1 Introduction

In recent decades, global trade flows have soared and increased at a much faster pace than output. In Germany, one of the largest trading nations of the world, the exports-to-GDP ratio (imports-to-GDP ratio) rose from 22.2 (21.5) percent in 1991 to 39.7 (31.7) percent in 2007.<sup>1</sup> Against this backdrop, fears of massive labour market adjustment needs have also been on the rise. Indeed, the link between trade integration and labour reallocation is at the core of international trade theories.<sup>2</sup> While academics point out that this reshuffling of jobs leads to important gains from trade since resources are brought to their most productive uses, the affected firms and workers have more cause for concern. This is due to potentially important adjustment costs arising in this process. For example, firms might incur firing, hiring, and (re-)training costs, while workers may lose specific human capital and, potentially, experience periods of frictional non-employment. Thus, obtaining a proper understanding of labour market adjustment dynamics in response to increased exposure to international trade is not only of academic interest, it also addresses growing public concerns in industrialized countries about the costs and benefits associated with an accelerated globalization.<sup>3</sup>

Previous empirical work (see below) has shown that – consistent with heterogeneous-firm trade theory – net job flows are indeed associated with the export and import activities of the firm, thus suggesting that international trade may be an important factor behind the simultaneous occurrence of job creation and job destruction that Davis and Haltiwanger (1992) documented even for narrowly defined industries.

However, net job flows provide only very limited insight into the adjustment dynamics. In particular, they do not contain information on how the employment change is brought about and how many and in what way both workers of the existing workforce and job seekers are affected. Do firms grow faster because they separate

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<sup>1</sup>Source: German Federal Statistical Office (<https://www-genesis.destatis.de/genesis/online>).

<sup>2</sup>Whereas classic (Ricardian and Heckscher-Ohlin type) trade theory predicts that workers move across sectors according to comparative advantage, the so-called new new (heterogeneous-firm) trade theory, pioneered by Melitz (2003) and Bernard et al. (2003), emphasizes the reallocation of resources within industries from purely domestic firms towards more productive exporters.

<sup>3</sup>Indeed, public support of globalization is far from unanimous. According to a survey conducted by the German Marshall Fund of the United States, 53 percent of the German respondents in 2007 had a favourable but 42 percent an unfavourable opinion of globalization. Similar figures were obtained for other European countries and the US (German Marshall Fund of the United States, 2007).

from less or because they hire more workers? Do these transitions mainly include job-to-job movements or do they primarily affect movements in and out of non-employment? Moreover, international trade may affect worker turnover even if it is not associated with net employment changes.<sup>4</sup> For instance, adjustments to new production patterns may induce a change in the required qualification set of the workers, leading to a (partial) replacement of the existing workforce. Also, worker turnover can be affected if a firm's engagement in international trade leads to a change in the volatility of labour demand (Rodrik, 1997).<sup>5</sup> A deeper understanding of these adjustment patterns helps to quantify the adjustment costs and is important for policy makers who would like to know, e.g., whether labour markets are flexible enough to accommodate for change, whether special compensation packages for trade-displaced workers are called for, or whether the focus should be on more efficient placement services for the unemployed.

This paper takes these issues seriously and examines in detail the trade-induced employment adjustment process in Germany. For this purpose, it makes use of a rich linked employer-employee data set that follows both establishments and individual workers over time. In addition to net job flows, it quantifies accessions, separations, and churning flows at the establishment level and relates them to the establishments' exporting and importing activities. It moreover examines whether occupations characterized by different skill levels are affected differently in this respect and makes further distinctions concerning the origin states of the accessions and the destination states of the separations. The empirical analysis covers the years 1999 to 2003 and restricts attention to the manufacturing sector.

The main findings are the following. Trading plants have lower worker turnover rates than non-traders, suggesting a higher degree of employment stability. The multivariate regression analysis further reveals a statistically significant and positive association between the export status and the net job flow rate, which is primarily driven by a lower separation rate. The latter is mainly due to less separations of high-skilled workers and into non-employment. In contrast, an increase in import in-

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<sup>4</sup>Worker flows that are not associated with net employment changes are called excess worker or churning flows in the literature. They account for a considerable fraction of all worker flows (e.g., Abowd et al., 1999; Burgess et al., 2000, 2001; Davis and Haltiwanger, 1999).

<sup>5</sup>A priori, this effect could go into both directions, however. On the one hand, trading establishments are more exposed and vulnerable to global shocks, but on the other hand, they are better able to diversify demand risks over different destination markets. Indeed, in a recent study using German firm-level data, Buch et al. (2009) find that increased export openness actually lowers firm-level output volatility.



tensity is associated with a lower accession rate, particularly for low-skilled workers and their accessions out of non-employment. These results, however, are predominantly driven by small establishments, and they partly lose statistical significance once unobservable establishment characteristics are taken into account.

The explicit focus on the link between worker turnover and international trade at the establishment level is largely absent in the existing empirical literature. The two only (and closely interrelated) other studies I am aware of that also use linked employer-employee data and focus on worker reallocation are Muendler (2008) and Menezes Filho and Muendler (2007). Using data for Brazil for the time period 1986 to 2001, they unexpectedly find that there are significantly fewer accessions and more displacements – thus, lower job growth – in comparative-advantaged industries and at exporters, although product-market shares are reallocated in the opposite direction. The authors suggest that this result can arise in a setting where factor productivity grows faster than output. This paper complements the analysis of Muendler (2008) and Menezes Filho and Muendler (2007) not only by providing evidence on Germany, a case quite different from Brazil, as it is an industrialized country, abundant in skilled labour and capital. In addition, it also uses (qualitative) information on the import behaviour of establishments, next to exports.

In a related strand of the literature, there are several studies that have analysed the connection between exporting at the firm or establishment level and (net) job growth in industrialized countries (cf. for example Bernard and Jensen, 1999; Wagner, 2002; Bernard et al., 2009).<sup>6</sup> Most of them yield conclusions that are quite different from the ones reported for Brazil. In general, exporters are found to be larger than non-exporters and also to experience faster employment growth.

On the other hand, evidence on the connection between importing and employment is less conclusive.<sup>7</sup> Biscourp and Kramarz (2007) use data on the French manu-

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<sup>6</sup>In addition, studies in the line of Davis et al. (1996) analyse how sector-level job creation, job destruction and churning vary with the exposure to international trade, again measured at the sectoral level. They do not detect clear effects in this respect. However, note that in these studies, only the between-sector variation of trade exposure and job flows is used, whereas the recent theoretical literature stresses the importance of the within-industry and between-firm reallocation. Yet another route is the one taken by Gourinchas (1999) with data on France and Klein et al. (2003) with data on the US. They relate job flows to movements in the real exchange rate. Interestingly, these studies do find significant effects. More recently, Moser et al. (2010) follow this strand of the literature with German establishment-level data. They find that employment responds to movements in the real exchange rate mainly through the job creation rate.

<sup>7</sup>The diverging empirical results on the connection between imports and employment are mirrored by a lack of clear theoretical predictions in this respect. On the one hand, imports may

facturing sector for the years 1986 to 1992 and analyse how employment growth and skill structure correlate with imports and exports of goods. They find a strong correlation between imports (particularly imports of finished goods) and job destruction, primarily the destruction of production jobs. In contrast, Bernard et al. (2009) for the US, Pisu (2008) for Belgium, and Ibsen et al. (2009) for Denmark find a positive association between importing (or starting to import) and job growth. Similarly, Moser et al. (2009), using the same German establishment information as in the present study, also conclude that an increase in the use of imported intermediates leads to positive job growth as long as it is not connected to a major restructuring such as the closure or spin-off of a plant. They do not try to disentangle importing from exporting effects, however.<sup>8</sup>

The plan of this paper is as follows. Section 2 describes the linked employer-employee data set used for the analysis. Section 3 contains details on the methodology and the empirical strategy. A first descriptive inspection of the data is undertaken in Section 4, whereas regression results are presented in Section 5. Section 6 extends the analysis by distinguishing different worker categories as well as different origin and destination states, respectively. Finally, Section 7 summarizes the main findings and concludes.

## 2 Data

The data set used for the analysis is the German LIAB, the linked employer-employee data set provided by the Institute for Employment Research (IAB).<sup>9</sup> It combines the Employment Statistics with the IAB Establishment Panel. Alda et al. (2005) give a detailed description of the data set.

The Employment Statistics are administrative social security records, which are

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replace domestic jobs, reflecting outsourcing strategies (as discussed in, e.g., Feenstra and Hanson, 1996). On the other hand, access to possibly cheaper or higher-quality inputs from abroad may enhance productivity and lead to higher sales and job growth (e.g., Kasahara and Lapham, 2008).

<sup>8</sup>All of the aforementioned studies (predominantly) deal with the import and export of goods. In complementary work, Hijzen et al. (2007) relate net job growth, job creation, and job destruction to the import and export of producer services. Using data on the UK for the years 1997 to 2004, the authors do not find negative effects of service imports on employment growth. In fact, firms that start to import services experience faster employment growth than comparable firms that do not.

<sup>9</sup>The LIAB data are confidential but not exclusive. They are available for non-commercial research by visiting the research data centre of the German Federal Employment Agency at the IAB in Nuremberg, Germany. See <http://fdz.iab.de/en.aspx> for further information.

based on notifications made by employers on behalf of their employees to the social security authorities at the beginning and end of each employment spell. Moreover, employers send an updating report at the end of each calendar year. Hence, only workers covered by social security are included in the Employment Statistics, whereas civil servants and the self-employed are not. This covers roughly 80 per cent of all employees in Germany and even a considerably larger share when it comes to private-sector employment in the manufacturing sector, which is the focus of the subsequent analysis. Among the information given in the Employment Statistics are certain demographic characteristics of the individual (year of birth, gender, nationality, level of education/training), the occupation, the (top-coded) wage, the industry, an establishment identifier and the region of the workplace.

The employer side of the data set is given by the IAB Establishment Panel, a random sample of establishments drawn from a stratified sample of all the establishments included in the Employment Statistics. Strata are defined over industries and size classes, with larger establishments being oversampled. The IAB Establishment Panel started in 1993 with 4,265 plants in West Germany. East German establishments were included in the Establishment Panel from 1996 onwards. After taking in several waves of additional establishments, the sample size increased to about 16,000 in 2007. Although participation is voluntary, the response rate of repeatedly interviewed establishments is quite high, amounting to about 80 percent. The IAB Establishment Panel and the Employment Statistics can be merged via a common establishment identifier. I keep the worker information for the 30th of June of each year, the date of reference for the Establishment Panel, and focus on year-to-year changes in the empirical analysis. In an extension, I make additional use of the workers' complete employment history in order to identify the origin state of new hires (accessions) and the destination state of separations. Attention is restricted to full-time workers in regular employment, that is, I discard apprentices, trainees, marginal and part-time employed workers, individuals older than 65 as well as workers who are currently on leave due to military service, child-bearing, etc.

There are two variables in the establishment data that contain information on international trade. The share of exports in total sales in the previous year is directly asked for and surveyed in every year. In contrast, the available information on imports is less explicit. It can, however, be derived from the following question: "Where did you purchase raw materials, commodities, and supplies in the previous year? For each region on the list (western Germany; eastern Germany; European

Monetary Union countries; other foreign countries), please tell me whether you have purchased most of, some of, or none of your materials from there.”<sup>10</sup> I define importing as sourcing at least some of the materials from the two latter regions. Unfortunately, this information is only available for the years 1999, 2001, and 2003. Hence, in the analysis, I focus on this time span. In particular, I determine for the two time intervals 1999–2001 and 2001–2003, respectively, the import and export status at the beginning of the period as well as the evolution of the trade intensity over the two years, that is, whether import and export intensity increase, decrease, or stay constant.<sup>11</sup>

This implies that only those establishments that participated in the survey at the beginning and the end of at least one interval are included in the estimation sample. Thus, the analysis is confined to continuing establishments, although this does not rule out that some of them may have zero full-time employees at the beginning or the end of the interval. Furthermore, attention is restricted to establishments in the manufacturing sector (NACE two-digit codes 15–37) for several reasons. First, information on imports and exports is more patchy for other sectors. Second, the question on imports mainly refers to material inputs, being thus of highest relevance for manufacturing establishments. Third, the results become more comparable to other studies in the related literature (e.g., Biscourp and Kramarz, 2007), which adopt the same sample restriction.

## 3 Methodology

### 3.1 Gross job and worker flows

To capture employment dynamics, I closely follow the literature on gross job and worker flows (surveyed in Davis and Haltiwanger, 1999). In particular, I calcu-

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<sup>10</sup>Translation adopted from the English version of the questionnaire. Moser et al. (2009) use the same question to define offshoring activities of the establishment.

<sup>11</sup>A change from “none” to “some” or from “some” to “most” is defined as a (qualitative) increase in import intensity. Moreover, to make the import and export variables comparable to each other, I rely on qualitative information not only for imports but also for exports. Note that intensity of exports is measured with respect to sales, whereas intensity of imports is measured with respect to all intermediate (material) inputs. This could impede comparability of both variables if, say, the share of imports in total inputs increases, but at the same time, the share of total inputs in sales is reduced. To investigate this possibility, I related the change in import intensity to the change in the input share. There is no indication that an increase (decrease) in import intensity is associated with a significant decrease (increase) in the input share.

late net job flow rates, accession rates, separation rates, and churning rates at the establishment level. Since the trading status of establishments as well as the evolution of the trade intensity are determined for the two-year intervals 1999–2001 and 2001–2003, the job and worker flow rates refer to the same time periods. In detail, I adopt the following procedure. I first measure year-to-year accessions,  $A_{et}$ , as the number of (full-time) workers that are employed at establishment  $e$  on the 30th of June of year  $t$  but not on the 30th of June of year  $t - 1$ . Correspondingly, separations  $S_{et}$  are counted as the number of workers whose employment relationship at an establishment is observed at  $t - 1$  but not anymore at  $t$ . Denoting the first year of the relevant time interval (1999 and 2001, respectively) with  $t = 0$  and the last (2001 and 2003, respectively) with  $t = 2$ , the formulae for the interval job and worker flows are:

- Accessions:  $A_{e\tau} = \sum_{t=1}^2 A_{et}$
- Separations:  $S_{e\tau} = \sum_{t=1}^2 S_{et}$
- Net job flows:  $JF_{e\tau} = A_{e\tau} - S_{e\tau} = E_{e\tau,t=2} - E_{e\tau,t=0}$
- Churning flows:  $CF_{e\tau} = A_{e\tau} + S_{e\tau} - |JF_{e\tau}|$

where  $\tau \in \{1 = 99-01, 2 = 01-03\}$  identifies the respective interval and  $E_{et}$  denotes employment at establishment  $e$  in interval  $\tau$  and year  $t$ . Hence, year-to-year accessions and separations are cumulated over the two-year window, whereas net job flows are obtained as the difference between the two. Finally, churning flows denote those worker flows (accessions and separations) that would not have been necessary to achieve the observed employment adjustment. Instead, they arise when new hires replace workers who have left the establishment in the same time interval. Following Davis and Haltiwanger (1999), I divide the flows by the average of total employment at the beginning and the end of the interval,  $\bar{E}_{e\tau} = 1/2 * (E_{e\tau,t=0} + E_{e\tau,t=2})$ , to obtain the corresponding rates ( $AR_{e\tau}$ ,  $SR_{e\tau}$ ,  $JFR_{e\tau}$ , and  $CR_{e\tau}$ ). Calculating the respective job and worker flow rates for a particular sector or a group of establishments works analogously. For this purpose, the flows are summed over all establishments within the sector and then divided by total sector size. Accordingly, sector-specific job and worker flow rates are size-weighted averages of the underlying establishment-specific rates.

### 3.2 Empirical strategy

To explore the link between international trade and job and worker turnover at the establishment level, I estimate the following linear regression model, which is based on the model used by Biscourp and Kramarz (2007) and was later also adopted by, e.g., Hijzen et al. (2007):

$$Y_{e\tau} = \beta_0 + \beta_M M_{e\tau 0} + \Delta \mathbf{M}_{e\tau}' \beta_{\Delta M} + \beta_X X_{e\tau 0} + \Delta \mathbf{X}_{e\tau}' \beta_{\Delta X} \quad (1) \\ + \beta_{\Delta S} \Delta S_{e\tau} + \mathbf{Z}_{e\tau 0}' \beta_{\mathbf{Z}} + \alpha_\tau + u_{e\tau},$$

where  $Y_{e\tau}$  denotes the respective job and worker flow rates ( $JFR_{e\tau}$ ,  $AR_{e\tau}$ ,  $SR_{e\tau}$ , and  $CR_{e\tau}$ ) of establishment  $e$  in the two-year time interval  $\tau$ . The main variables of interest are indicators for the initial import and export status ( $M_{e\tau 0}$  and  $X_{e\tau 0}$ , respectively) as well as the change in import and export intensity over the same two-year time interval ( $\Delta \mathbf{M}_{e\tau}$  and  $\Delta \mathbf{X}_{e\tau}$ ).<sup>12</sup> To control for contemporaneous shocks that may affect the establishment, I again follow Biscourp and Kramarz (2007) and include sales growth  $\Delta S_{e\tau}$  among the regressors. Moreover, the vector  $\mathbf{Z}_{e\tau 0}$  contains other variables capturing observable differences between trading and non-trading establishments, in particular a set of dummy variables (6 categories) for initial establishment size, initial log sales, a dummy variable indicating whether the establishment's (self-assessed) initial technology status is above average compared to other plants in the same industry, and federal state and two-digit industry dummies. Thus, I make sure that the results are not driven by differences with respect to industry characteristics. Finally, the time dummy variable  $\alpha_\tau$  captures differences between the two time intervals under consideration with respect to general macroeconomic conditions and the business cycle. Summary statistics of these variables are displayed in Table A1 in the Appendix.

Although I control for many potentially confounding factors, attaching causality to the estimated coefficients would require very strong assumptions. In particular, establishments would need to decide on their trade involvement *before* they decide on labour turnover, which may be rationalized on the basis of sunk costs (e.g., search

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<sup>12</sup>To be precise, both  $\Delta \mathbf{M}_{e\tau}$  and  $\Delta \mathbf{X}_{e\tau}$  are in fact vectors consisting of two dummy variables: the first one takes on the value of 1 if trade intensity increases, whereas the second one denotes a decreasing trade intensity. Thus, the reference group are those establishments that did not change their trade intensity. I restrict myself to this categorical definition of the variables since the information available on the importing behaviour of establishments is only qualitative in nature (see Section 2).

costs) or fixed coordination costs associated with these activities.<sup>13</sup> Still, in the absence of a truly exogenous variation in the exporting and importing behaviour, one should be cautious and interpret the estimated coefficients as informative partial correlations.

However, in order to assess the robustness of the results, I also estimate several model variants where the potential endogeneity problems are further reduced. First, I make use of the fact that I observe some of the establishments in both time intervals under consideration (1999–2001 and 2001–2003) and estimate a fixed-effects regression model. This approach controls for any (time-constant) unobservable differences between establishments that might otherwise drive the results. However, it also reduces the variation in the explanatory variables of main interest considerably since parameters are only identified through changes within establishments over time. Second, I vary the specification of Equation (1). In particular, in one regression, I only include initial trade status variables, which are based on information for the preceding year and, hence, more likely to be indeed exogenous with respect to future labour turnover. Another specification controls for all the variables specified above and in addition, for several potential confounding factors: investments in technology, organizational change, and a stronger reliance on external suppliers. With the latter variable, I aim to capture general outsourcing strategies.

## 4 Descriptives

Table 1 contains descriptive statistics on the link between job and worker turnover and international trade in the German manufacturing sector. Largely following Biscourp and Kramarz (2007), establishments are grouped into six different categories characterizing their export (first panel) and import (second panel) activities over the two-year time intervals. Within each panel, each row is mutually exclusive. Specifically, I distinguish establishments that do not trade at all in the time intervals, the ones that continuously trade, new exporters/importers, and the ones that exit international markets. Among the continuous traders, I make a further distinction depending on whether the trade intensity increases, decreases, or remains constant over the two-year period.

A glance at the columns number 3 and 4, which display the groups' shares in the

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<sup>13</sup>Indeed, evidence on the existence of such costs has been widely documented (e.g., Das et al., 2007). They are also a central feature in the model of Melitz (2003).

number of establishments and in total (full-time) employment, respectively, confirms previous results according to which trading establishments are much larger than non-traders. The latter's share in the number of establishments is about three times higher than the share in employment. Moreover, continuous traders are also larger than establishments that enter or exit international markets. Both the exporting and the importing panel yield the same results in this respect.

The picture is more nuanced, however, when examining the job flow rates. A first point to note is that the whole manufacturing sector (and at least on average, establishments in every trade category) experienced a pronounced decline in employment during the period of analysis.<sup>14</sup> Interestingly, at least according to these unconditional figures, the group of establishments that did not export/import at all was as a whole less severely hit than the average, which is in contrast to prior expectations and theoretical predictions. It becomes apparent, however, that establishments with a decreasing participation in international markets did worse than the ones that expanded their exporting and importing activities.

Looking in more detail at the corresponding worker flows reveals an intriguing pattern. In particular, whereas non-trading establishments display net job flow rates that are similar to or even less negative than the ones of trading establishments, their worker turnover rates are much higher. They have higher accession rates, higher separation rates, and consequently, higher churning rates. Thus, worker flows that simply arise due to the replacement of workers who have left the establishment – thus possibly also indicating some form of turbulence – are less frequently encountered at establishments that are active in international markets. Furthermore, establishments that start or cease to trade have higher worker turnover rates than continuous traders.

Summing up, according to the descriptive analysis, both exporting and importing were not related to net job growth in a clear-cut way during the period of analysis. However, both activities can be associated with lower worker flow rates, and thus, with higher employment stability.

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<sup>14</sup>This reflects both the (structural) shift towards service activities and the adverse business cycle conditions in the interval 2001 to 2003 when real GDP growth in Germany was negative.



## 5 Baseline estimation results

In the following, I turn to the multivariate regression analysis described in Section 3.2. OLS regression results for the four job and worker flow rates are given in Table 2. Not surprisingly, the strongest predictor for the job flow rate, the accession rate, and the separation rate is sales growth.<sup>15</sup> The latter variable is not significantly correlated with the churning rate, however.

Whereas the contemporaneous development of export intensity over the two-year interval is not related in a statistically significant way to any of the outcome variables, the initial export status is significantly and positively correlated with the net job flow rate, which is almost entirely due to a lower separation rate. With a point estimate of about five percentage points, the correlation is economically sizeable. Hence, the positive link between exporting and job growth seems to come with a lag, or alternatively, to be of a more persistent nature.<sup>16</sup> One explanation for the lower separation rate may be that exporters are better able to distribute demand risks over different markets and thus, can stabilize employment more easily, which would be in line with the findings of Buch et al. (2009). They suggest that increased export openness is associated with lower output volatility. Alternatively, given that exporters are known to pay higher wages (e.g., Schank et al., 2007), it may also be the case that employees working for exporters are less likely to quit. I will explore these issues in more detail in the next section. The finding of a greater employment stability at trading establishments is further corroborated by the significant and negative association between the export dummy and the churning rate.

Among the other variables of main interest, only the dummy variable for increasing import intensity exhibits statistically significant (and again negative) correlations with both the accession and the churning rate. Thus, increasing imports are associated with a lower hiring activity, which, however, is partly offset by a lower separation rate so that overall job growth is not negatively affected. One possible interpretation is that these establishments relocate some of their production processes abroad, hire less workers in turn<sup>17</sup>, but gain from productivity improvements

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<sup>15</sup>Given that sales growth is expressed as  $\Delta \log \text{sales}$ , the coefficient of 32 in the job flow rate regression implies that a change in sales growth by one percent is associated with an increase in the job flow rate by approximately 0.32 percentage points.

<sup>16</sup>Certainly, it might also be driven by unobserved factors, e.g., a better management. This possibility will be explored in the fixed-effects regressions.

<sup>17</sup>Germany's rigid labour market laws may prevent firms from firing personnel in the short run so that they may resort to less hirings instead (also cf. Moser et al., 2010).

(Kasahara and Lapham, 2008) that help to stabilize the employment of the existing workforce.

The negative correlation between international trade and worker turnover is perfectly in line with the descriptive analysis in the previous section. However, why did the positive association between the initial export status and the net job flow rate not show up to the same extent in the descriptives? One explanation is that the analysis has moved from a univariate to a multivariate setting, thereby taking, e.g., differences in industry or regional characteristics into account. Alternatively, however, the differences might be caused by the fact that the aggregate job and worker flow rates displayed in Table 1 are size-weighted averages of the underlying establishment-level rates, whereas the regressions leading to the results displayed in Table 2 are not size-weighted. To explore the relevance of the latter point, I rerun the regressions weighting observations by total employment (cf. Table 3). It becomes apparent that most coefficients that were statistically significant before still point into the same direction but drop in magnitude and lose statistical significance.<sup>18</sup> Hence, the correlations between international trade and job and worker turnover are indeed mainly driven by small establishments. However, note that the positive coefficient of the export dummy in the job flow rate regression remains weakly significant. Thus, once covariates are taken into account, existing exporters do grow faster than non-exporters, irrespective of the weighting scheme.

In a next step, to explore the importance of unobserved time-constant establishment characteristics, I restrict attention to those establishments that were surveyed (and active) during the two time intervals under consideration and estimate a fixed-effects regression model. Table 4 contains the results.

It turns out that most of the results reported before lose their statistical significance. This is particularly true for the dummy variable capturing the initial export status. These findings allow for different interpretations. On the one hand, the superior performance of exporters with respect to employment growth and employment stability could mainly be driven by unobservable characteristics, e.g., management quality. On the other hand, the loss of estimation efficiency caused by less observations in the regression sample and less variation in the explanatory variables also plays a role since, for example, the size of the coefficient of the export dummy in the job flow rate regression even increases, but so does the standard error, too.<sup>19</sup>

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<sup>18</sup>The negative coefficient on the dummy variable for increasing import intensity becomes zero.

<sup>19</sup>The fact that only 85 establishments changed their export status from one interval to the next

The results for the dummy variable indicating increasing imports remain stable, however. Thus, the case made for increasing imports being associated with fewer new accessions is strengthened. Interestingly, and at first sight in contradiction to the previous result, decreasing imports also go along with a lower accession rate. In fact, different driving forces may be at work since imports can have two effects. On the one hand, they might substitute for in-house production, but on the other hand, they may be associated with gains in competitiveness due to the availability of cheaper or higher-quality inputs from abroad (Kasahara and Lapham, 2008). Accordingly, lower hirings in response to increasing imports may reflect the substitution of foreign for domestic labour, whereas lower hirings in response to decreasing imports could denote a loss in competitiveness and market share. If this is indeed the case, it might also mean that the reduction in hirings relates to different worker groups, a possibility that will be explored in the next section.

At the end of this section, I briefly discuss the results of two alternative specifications to check for the robustness of the findings (cf. Table 5).<sup>20</sup> The specification in Column (2) excludes the variables capturing contemporaneous changes in export and import intensity, thus mitigating to some extent the endogeneity concerns. In contrast, the specification in Column (3) has a more extensive set of control variables and adds to the variables of the baseline specification information on investments in technology as well as on organizational change and whether the establishment has reported to rely more heavily on external suppliers. For comparison, the results of the baseline model are redisplayed in Column (1). It becomes apparent that the results are fairly robust to these amendments. In particular, there is no evidence that the superior job growth of exporters is in fact driven by technology differences. Instead, the coefficient of the dummy variable capturing the initial export status even becomes statistically significant in the fixed-effects regression of this model variant.

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makes it difficult to obtain more precise estimates.

<sup>20</sup>For the sake of space, attention is restricted to the job flow rate regression.

## 6 Extensions

### 6.1 Job and worker flows by skill

Up to now, I have implicitly assumed a homogeneous workforce and not distinguished workers according to their skill level or the characteristics of their occupation. However, one central aspect in the debate on the labour market consequences of international trade is its effect on the relative demand for different worker types. In the case of an industrialized country, low-skilled workers are expected to be particularly vulnerable towards foreign competition (from low-wage countries), whereas high-skilled workers are in the best position to gain from new market opportunities abroad, a prediction that is also in accordance with Heckscher-Ohlin type trade theory.<sup>21</sup>

To identify possibly heterogeneous effects for different skill groups, I recalculate all the job and worker flow rates ( $JFR_{i\epsilon\tau}$ ,  $AR_{i\epsilon\tau}$ ,  $SR_{i\epsilon\tau}$ , and  $CR_{i\epsilon\tau}$ ) at the skill level  $i$  (cf. Bauer and Bender, 2004, for an application with the same data set) and redo the analysis. I distinguish two skill groups, following a scheme proposed by Blossfeld (1985) that relies on the detailed occupation of the workers as given in the Employment Statistics.<sup>22</sup> Note that, if calculated at the skill level, accessions and separations can occur both outside and inside the establishment. In the latter case, workers change the occupational grouping from one year to the next, which may be due to a promotion or demotion.

Table 6 contains the regression results for the job flow rate. Again, estimation results of both OLS and fixed-effects regressions are displayed. It can be seen from the OLS regression that exporters experience faster job growth of high-skilled workers but not of low-skilled workers. Hence, international trade seems indeed to be skill-biased. However, this finding primarily holds in the cross-section. In the fixed-

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<sup>21</sup>In contrast, the early heterogeneous-firm trade models (cf. Melitz, 2003) abstract from different factors of production but assume homogeneous labour. Thus, there is no relative demand that could in any way be affected. However, more recently, Bernard et al. (2007) incorporate heterogeneous firms in a model featuring endowment-based comparative advantage. In their model, trade liberalization leads to both within- and between-sector reallocation and also affects the relative demand for different factors of production.

<sup>22</sup>Bauer and Bender (2004) rely on the same scheme but distinguish three worker groups: unskilled, skilled, and professionals and engineers. In this paper, I have merged the two latter groups in order to reduce the number of establishments having zero employees in one of the categories. Bauer and Bender (2004) also document that the occupation-based skill classification is highly correlated with the level of education and training.

effects regression, which relies on export switchers to identify the parameters, the export coefficient is larger and of similar size for both skill groups but insignificant.

Table 7 displays the corresponding regression results for the accession rate and the separation rate, respectively.<sup>23</sup> According to both the OLS and the fixed-effects regressions, a decrease in import intensity is associated with a significantly lower accession rate of high-skilled workers. In contrast, the dummy for increasing import intensity is not related to the accession rate in a statistically significant way in either of the two OLS regressions but turns significantly negative in the fixed-effects regression of the low-skilled. Thus, there is some indication that although both increasing and decreasing imports are associated with less hirings, different mechanisms may be at work since different worker groups are predominantly affected. A reduction in import intensity tends to go along with less high-skilled hirings, being consistent with the hypothesis of a diminished degree of competitiveness. On the other hand, increasing imports seem to substitute primarily for low-skilled workers, being more in line with the notion that the low-skill-intensive parts of the production are relocated to a low-wage country.

There is also some evidence – but only according to the fixed-effects regression – that exporting is associated with more low-skilled accessions. It could be the case that a switch from non-exporting to exporting induces the demand for (new) low-skill-intensive production and distribution tasks. However, recall that the correlation between exporting and the job flow rate of low-skilled workers is not statistically significant since the positive export coefficient with respect to the accession rate is partly offset by the positive export coefficient with respect to the separation rate.

Regarding the skill-specific separation rates, most of the main variables of interest are insignificant on statistical grounds. However, it can be seen that the negative association between the initial export status and the separation rate mainly holds for the high-skilled. Hence, high-skilled incumbent workers at exporters seem to be the main beneficiaries of increased opportunities for international production sharing in the German manufacturing sector.

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<sup>23</sup>Regression results for the churning rate are not displayed in order to save space. However, they are available upon request.

## 6.2 Origin of accessions and destination of separations

To obtain a better sense of the nature of the reallocations, in this section, accessions are differentiated by their origin state and separations by their destination state. In particular, a distinction is made between flows that directly lead from one (full-time) employment relationship to another and the ones that do not.<sup>24</sup> Arguably, the latter are more likely to be associated with higher costs and more likely to occur involuntarily. Table 8 documents the descriptive evidence, applying the same partitioning of establishments as before, that is, according to their importing and exporting behaviour over the two-year interval. It can be seen that the transitions between employment and non-employment and *vice versa* account for the largest share of worker flows and also for the largest part of the differences between trading and non-trading establishments in their total accession and separation rates. Thus, a first conclusion to draw from these figures is that reallocation tends to be a rather disruptive (non-smooth) process.<sup>25</sup>

OLS and fixed-effects regression results for the two categories of accession and separation rates – and again differentiated by skill – are displayed in Table 9. For the sake of space, I highlight only those results that directly relate to the main findings concerning the skill-specific total accession and separation rates (cf. Section 6.1). The following points stand out.

First, there is no clear-cut pattern regarding the negative association between the decrease in import intensity and the high-skilled accession rate. Whereas the OLS regression results suggest that employment-to-employment (EE) flows are the main reason, the fixed-effects regression points to hirings from non-employment (NE).

Second, the negative correlation between increasing imports and the low-skilled accession rate in the fixed-effects regression is also primarily due to NE flows. Thus, it is non-employed job seekers that are mainly affected.

Third, the positive association between the initial export status and the low-skilled hiring rate in the fixed-effects regression cannot be related to one particular

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<sup>24</sup>Transitions have been characterized as direct if they occurred within 60 days and the respective individual did not draw unemployment benefits or engage in some form of marginal or part-time employment in the meantime. Since only full-time employees are considered, transitions into part-time or marginal employment also count as transitions into non-employment. Note that they constitute only a very low fraction of all transitions in the manufacturing sector.

<sup>25</sup>The observation that periods of negative net job growth, as experienced over the sample period, tend to go along with a low number of direct job-to-job transitions is in accordance with the business-cycle literature (cf. Shimer, 2005, for the US or Bachmann, 2005, for Germany.)

flow. The coefficient is positive but insignificant for both NE and EE flows.

Fourth and now turning to separations, the negative correlation between the initial export status and the high-skilled separation rate is driven by less flows into non-employment. This does not lend support to the hypothesis that employment stability at exporters is higher due to a lower number of quits since in this case, there should be less EE flows. Instead, exporters seem indeed to be better able to shield their high-skilled (and to some extent also low-skilled) employees from unemployment risks.

## 7 Summary and concluding remarks

Using a linked employer-employee data set for the German manufacturing sector that follows both establishments and individual workers over time, this paper has studied how worker turnover is related to establishments' international trade involvement. While empirical evidence on the association between net job growth and international trade at the firm or establishment level has lately been increasing, only the explicit focus on worker flows allows us to obtain a complete picture of trade-related adjustment dynamics.

The study has shown that according to unconditional figures, the group of trading establishments did not experience a higher net employment growth rate than the group of non-trading establishments over the period of analysis (1999 to 2003). However, trading plants were characterized by smaller worker flow rates and less churning, which suggests that employment relationships are more stable at establishments which are active in international markets, possibly reflecting their superior capacity in balancing demand risks.

Accounting for an extensive set of control variables in a multivariate regression model, the coefficient of the export status of the establishment becomes positive and statistically significant with respect to the job growth rate and confirms the negative correlation with the separation and churning rates. However, these results vanish or cannot be estimated with sufficient precision once unobservable next to observable characteristics are controlled for in a fixed-effects regression framework. Moreover, they are more pronounced for smaller establishments.

Further results of the analysis indicate that the lower separation rates at exporters mainly relate to high-skilled workers and transitions into non-employment,

arguably the most costly separations from the perspective of the affected workers. In contrast, the only result that is supportive of the worries generally expressed with respect to rising globalization and domestic employment is the negative association between increased importing and the accession rate. A closer look further reveals that this finding mainly holds for low-skilled workers and their accessions out of non-employment so that the employment prospects of low-skilled, unemployed job seekers may be negatively affected. However, a decrease in import intensity is also associated with less hirings according to the fixed-effects regressions, although this result is mainly due to less accessions of high-skilled workers.

On balance, there is no evidence that the establishments' international trade activities lead to lower job growth or higher labour market turbulence.<sup>26</sup> What seems to be the case, however, is that mainly incumbent workers – and particularly the high-skilled ones – benefit from more stable employment relationships, whereas job seekers tend to face a more difficult environment. Accordingly, policy should focus on improved placement services for the unemployed.

Preferably, these findings should be scrutinized in future research using data for a larger sample of establishments and a longer time horizon, for three main reasons. First, the precision of the estimates would increase. Second, it would be interesting to see whether the results on the separation and accession rates obtained in this study are robust to the phase of the business cycle. For example, it could be that in a period of positive employment growth, the difference between exporters and non-exporters is due to differences in hirings as opposed to separations. Third, fluctuations in the real exchange rate may give some exogenous variation in the establishments' incentives to import and export, which could be exploited in an instrumental-variables framework to establish causality in a clear-cut way.

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<sup>26</sup>This is in line with the claim by Blanchard (2006). He made the point that although everybody assumed globalization to cause higher economic and labour market turbulence, the latter did not show up in the data.



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# Tables

Table 1: Mean job and worker flows per 100 workers by international trade involvement of establishments

	Obs <sup>*</sup>	Est. share	Empl. share	JFR	AR	SR	CR
All	2,629	100.00	100.00	−4.91	24.64	29.56	36.63
<i>By export activity</i>							
Never exports	1,205	73.27	25.16	−4.39	32.72	37.11	48.19
Increasing exports	541	6.87	30.59	−3.43	21.29	24.72	32.09
Decreasing exports	362	6.49	21.50	−6.79	23.17	29.96	34.09
Constant exports	255	4.20	13.46	−7.62	19.58	27.20	30.60
Stops exporting	124	5.51	5.01	−4.72	24.50	29.22	36.18
Starts exporting	142	3.66	4.28	−0.84	24.65	25.49	33.30
<i>By import activity</i>							
Never imports	983	60.12	19.56	−3.28	30.91	34.19	44.58
Increasing imports	204	4.17	9.79	−3.15	21.44	24.59	30.61
Decreasing imports	214	3.09	10.93	−6.65	21.12	27.77	31.93
Constant imports	755	14.32	42.36	−5.81	21.72	27.53	33.15
Stops importing	229	9.85	8.38	−4.70	26.16	30.86	37.77
Starts importing	244	8.46	8.99	−4.22	31.15	35.38	46.92

<sup>\*</sup> Unweighted number of observations.

Note: Est. share: Share in the number of establishments; Empl. share: Share in total employment; JFR: (net) job flow rate; AR: Accession rate; SR: separation rate; CR: churning rate. Author's calculation based on the LIAB. Figures (except for the number of observations) employ sampling weights. Furthermore, group-specific job and worker flow rates are size-weighted averages of the underlying establishment-level rates as described in Section 3.1. Observations are pooled over the two time intervals under consideration, that is 1999 to 2001 and 2001 to 2003. Categories are mutually exclusive within but not across panels.

Table 2: OLS: international trade and worker turnover

	JFR	AR	SR	CR
Initially importing	−2.602 (2.940)	−0.048 (1.702)	2.553 (2.798)	−1.779 (2.454)
Increasing imports t0–t2	−0.491 (2.569)	−2.149* (1.304)	−1.657 (2.313)	−3.294* (1.846)
Decreasing imports t0–t2	−1.626 (2.618)	−1.920 (1.429)	−0.294 (2.536)	−0.572 (2.106)
Initially exporting	5.167* (2.824)	0.119 (1.542)	−5.048* (2.615)	−4.819** (1.991)
Increasing exports t0–t2	0.275 (2.585)	0.250 (1.270)	−0.025 (2.310)	−1.588 (1.535)
Decreasing exports t0–t2	2.540 (3.023)	1.646 (1.497)	−0.893 (2.667)	0.060 (1.833)
Sales growth t0–t2	32.267*** (3.824)	9.295*** (2.033)	−22.972*** (3.483)	0.619 (2.885)
Observations	2,629	2,629	2,629	2,629
R squared	0.111	0.121	0.108	0.071

Note: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Standard errors (in parentheses) are clustered at the level of the establishment.

Additional control variables: initial employment (6 categories); initial log sales; dummy variable that equals 1 if initial technology status is above average compared to other establishments in the same industry; full sets of federal state and two-digit industry dummies; and a time dummy denoting the second of the two time intervals under consideration.

Table 3: International trade and worker turnover: employment-weighted regression

	JFR	AR	SR	CR
Initially importing	0.521 (2.701)	-0.803 (1.476)	-1.323 (2.547)	-2.828* (1.695)
Increasing imports t0-t2	2.422 (1.962)	0.091 (1.072)	-2.331 (1.719)	-1.020 (1.124)
Decreasing imports t0-t2	2.972 (2.472)	1.372 (1.126)	-1.600 (2.034)	0.059 (1.189)
Initially exporting	4.829* (2.750)	1.245 (1.368)	-3.584 (2.872)	-2.015 (1.857)
Increasing exports t0-t2	-0.260 (2.431)	-0.017 (1.028)	0.243 (2.110)	-0.136 (1.201)
Decreasing exports t0-t2	1.189 (2.824)	0.988 (1.161)	-0.201 (2.461)	1.911 (1.468)
Sales growth t0-t2	30.784*** (5.392)	9.017*** (2.056)	-21.768*** (4.651)	3.776* (2.022)
Observations	2,629	2,629	2,629	2,629
R squared	0.200	0.423	0.134	0.221

Note: \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

See notes below Tables 2.

Table 4: Fixed-effects linear regression: international trade and worker turnover

	JFR	AR	SR	CR
Initially importing	−3.432 (7.071)	−3.442 (3.776)	−0.010 (6.438)	2.527 (5.681)
Increasing imports t0–t2	−1.330 (5.001)	−4.569* (2.671)	−3.239 (4.554)	−6.964* (4.018)
Decreasing imports t0–t2	−5.138 (5.327)	−5.558* (2.844)	−0.419 (4.850)	−4.582 (4.280)
Initially exporting	9.379 (7.769)	1.702 (4.149)	−7.677 (7.074)	−4.324 (6.242)
Increasing exports t0–t2	1.821 (5.662)	1.185 (3.024)	−0.636 (5.156)	1.308 (4.550)
Decreasing exports t0–t2	3.604 (6.112)	0.969 (3.264)	−2.635 (5.566)	−0.879 (4.911)
Sales growth t0–t2	22.232*** (5.478)	6.163** (2.925)	−16.069*** (4.987)	9.528** (4.401)
Observations	1,556	1,556	1,556	1,556
R squared (within)	0.156	0.112	0.087	0.031

Note: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Standard errors in parentheses. Additional control variables: initial employment (6 categories); initial log sales; dummy variable that equals 1 if initial technology status is above average compared to other establishments in the same industry; and a time dummy denoting the second of the two time intervals under consideration.

Table 5: International trade and the job flow rate: different specifications

OLS	(1)	(2)	(3)
Initially importing	-2.602 (2.940)	-1.024 (2.720)	-2.012 (3.031)
Increasing imports t0-t2	-0.491 (2.569)		0.540 (2.551)
Decreasing imports t0-t2	-1.626 (2.618)		-2.388 (2.707)
Initially exporting	5.167* (2.824)	6.012** (2.485)	5.240* (2.848)
Increasing exports t0-t2	0.275 (2.585)		-0.134 (2.601)
Decreasing exports t0-t2	2.540 (3.023)		0.757 (3.089)
Sales growth t0-t2	32.267*** (3.824)		28.693*** (4.014)
More reliance on suppliers t0-t2			0.511 (2.257)
Investments in ICT t0-t2			4.002 (2.724)
Organizational change t0-t2			0.400 (2.211)
Observations	2,629	2,629	2,452
R squared	0.111	0.049	0.094

  

Fixed effects	(1)	(2)	(3)
Initially importing	-3.432 (7.071)	-6.857 (5.566)	-0.539 (7.714)
Increasing imports t0-t2	-1.330 (5.001)		-0.059 (5.457)
Decreasing imports t0-t2	-5.138 (5.327)		-8.275 (5.902)
Initially exporting	9.379 (7.769)	9.800 (7.041)	14.117* (8.425)
Increasing exports t0-t2	1.821 (5.662)		0.429 (6.196)
Decreasing exports t0-t2	3.604 (6.112)		0.755 (6.753)
Sales growth t0-t2	22.232*** (5.478)		14.882** (6.445)
More reliance on suppliers t0-t2			-2.647 (5.197)
Investments in ICT t0-t2			0.130 (5.430)
Organizational change t0-t2			-0.270 (5.128)
Observations	1,556	1,556	1,362
R squared (within)	0.136	0.156	0.147

Note: \* p&lt;0.10, \*\* p&lt;0.05, \*\*\* p&lt;0.01

See notes below Tables 2 and 4.



Table 6: International trade and skill-specific job flow rates

Job flow rate	OLS		Fixed effects	
	Low-skilled	High-skilled	Low-skilled	High-skilled
Initially importing	−2.349 (3.387)	−3.338 (3.137)	−2.909 (8.930)	−5.517 (7.944)
Increasing imports t0–t2	−2.383 (2.759)	2.091 (2.776)	−7.192 (6.316)	1.550 (5.619)
Decreasing imports t0–t2	−0.204 (3.203)	−3.996 (2.752)	−2.608 (6.727)	−5.185 (5.985)
Initially exporting	1.032 (3.489)	6.845** (3.125)	8.555 (9.812)	6.533 (8.729)
Increasing exports t0–t2	0.933 (2.970)	−0.873 (2.868)	−0.509 (7.151)	2.540 (6.362)
Decreasing exports t0–t2	1.549 (3.538)	1.086 (3.260)	−1.450 (7.720)	3.733 (6.868)
Sales growth t0–t2	28.680*** (4.054)	24.569*** (4.245)	23.311*** (6.918)	9.598 (6.154)
Observations	2,629	2,629	1,556	1,556
R squared/ R squared (within)	0.068	0.070	0.074	0.103

Note: \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

See notes below Tables 2 and 4.

Table 7: International trade and skill-specific worker flow rates

Accession rate	OLS		Fixed effects	
	Low-skilled	High-skilled	Low-skilled	High-skilled
Initially importing	1.755 (2.326)	-0.859 (1.926)	-2.656 (5.099)	-7.726 (5.183)
Increasing imports t0-t2	-2.253 (1.705)	-1.065 (1.740)	-6.628* (3.606)	-4.498 (3.666)
Decreasing imports t0-t2	-0.982 (2.171)	-3.836** (1.578)	-2.361 (3.841)	-6.761* (3.905)
Initially exporting	-0.662 (2.511)	1.161 (1.971)	9.290* (5.602)	-1.860 (5.695)
Increasing exports t0-t2	-0.909 (2.019)	-1.431 (1.581)	4.642 (4.083)	0.404 (4.151)
Decreasing exports t0-t2	-1.227 (2.348)	0.483 (1.879)	1.569 (4.408)	2.409 (4.481)
Sales growth t0-t2	9.969*** (2.381)	9.606*** (2.412)	11.601*** (3.950)	0.951 (4.015)
Observations	2,629	2,629	1,556	1,556
R squared/ R squared (within)	0.065	0.077	0.077	0.081

  

Separation rate	OLS		Fixed effects	
	Low-skilled	High-skilled	Low-skilled	High-skilled
Initially importing	4.103 (2.899)	2.479 (2.912)	0.252 (7.061)	-2.209 (6.792)
Increasing imports t0-t2	0.130 (2.506)	-3.156 (2.433)	0.564 (4.994)	-6.049 (4.804)
Decreasing imports t0-t2	-0.779 (2.902)	0.160 (2.584)	0.246 (5.319)	-1.576 (5.117)
Initially exporting	-1.694 (2.905)	-5.684** (2.765)	0.735 (7.758)	-8.392 (7.463)
Increasing exports t0-t2	-1.841 (2.538)	-0.559 (2.467)	5.152 (5.654)	-2.136 (5.439)
Decreasing exports t0-t2	-2.775 (2.985)	-0.603 (2.775)	3.018 (6.104)	-1.324 (5.872)
Sales growth t0-t2	-18.711*** (4.082)	-14.963*** (3.418)	-11.710** (5.470)	-8.647 (5.262)
Observations	2,629	2,629	1,556	1,556
R squared/ R squared (within)	0.049	0.061	0.044	0.050

Note: \* p&lt;0.10, \*\* p&lt;0.05, \*\*\* p&lt;0.01

See notes below Tables 2 and 4.

Table 8: Origin of accessions and destination of separations: flows per 100 workers by international trade involvement of establishments

	Acc Tot	Acc NE	Acc EE	Sep Tot	Sep NE	Sep EE
All	24.64	15.48	9.17	29.56	18.46	11.10
<i>By export activity</i>						
Never exports	32.72	22.48	10.24	37.11	25.61	11.50
Increasing exports	21.29	11.74	9.55	24.72	15.72	9.00
Decreasing exports	23.17	14.25	8.92	29.96	16.02	13.94
Constant exports	19.58	11.75	7.83	27.20	15.98	11.22
Stops exporting	24.50	17.32	7.18	29.22	17.33	11.89
Starts exporting	24.65	16.74	7.91	25.49	17.40	8.09
<i>By import activity</i>						
Never imports	30.91	21.38	9.52	34.19	23.46	10.73
Increasing imports	21.44	13.47	7.97	24.59	15.38	9.22
Decreasing imports	21.12	12.54	8.58	27.77	16.92	10.85
Constant imports	21.72	13.10	8.61	27.53	16.14	11.39
Stops importing	26.16	16.84	9.32	30.86	20.17	10.70
Starts importing	31.15	18.27	12.88	35.38	22.15	13.23

Note: The table decomposes total accessions (Acc Tot) and separations (Sep Tot) into direct transitions (Acc EE/Sep EE – within 60 days without an intervening spell of unemployment) between two (full-time) employment relationships and transitions between employment and non-employment (Acc NE/Sep NE). Figures employ sampling weights. See Table 1 for further explanations.

Table 9: Origin of accessions and destination of separations:skill-specific regression

Accession rate	OLS						Fixed effects					
	Low-skilled			High-skilled			Low-skilled			High-skilled		
	NE	EE		NE	EE		NE	EE		NE	EE	
Initially importing	3.008*	-1.254	(1.811)	-0.416	-0.442	(1.583)	-1.455	-1.202	(4.094)	-1.864	-5.861**	(2.801)
Increasing imports t0-t2	-0.865	-1.388	(1.251)	-0.268	-0.797	(1.444)	-5.069*	(3.326)	(2.896)	0.622	-5.120***	(1.981)
Decreasing imports t0-t2	-0.084	-0.898	(1.679)	-1.601	-2.235**	(1.265)	-0.934	-1.427	(3.084)	-5.485*	-1.275	(2.110)
Initially exporting	-0.866	0.203	(1.866)	0.548	0.613	(1.238)	4.794	4.496	(3.221)	-3.856	1.997	(3.696)
Increasing exports t0-t2	(2.060)	(1.411)	(1.612)	(1.618)	(1.144)	(1.429)	(4.498)	(3.654)	(2.506)	(4.698)	(3.077)	(2.421)
Decreasing exports t0-t2	0.816	-1.725*	(1.704)	0.291	-1.722*	(1.771)	0.515	4.127	(3.436)	-2.920	3.324	(2.243)
Sales growth t0-t2	0.276	-1.502	(1.866)	1.119	-0.636	(1.429)	-2.767	2.992	(3.539)	-1.922	3.559	(2.170)
Observations	4.841***	5.127***	(1.612)	4.506***	5.100***	(1.657)	7.609**	(3.171)	(2.577)	(3.312)	(2.170)	(1.556)
R squared (within)	0.065	0.062	0.062	0.077	0.097	0.077	0.031	0.088	0.031	0.039	0.113	0.039
Separation rate	OLS						Fixed effects					
	Low-skilled			High-skilled			Low-skilled			High-skilled		
	NE	EE		NE	EE		NE	EE		NE	EE	
Initially importing	2.474	1.629	(1.800)	2.568	-0.089	(1.839)	2.098	-1.846	(4.953)	-0.530	-1.679	(4.345)
Increasing imports t0-t2	0.567	-0.436	(1.636)	-2.255	-0.902	(1.477)	0.330	(4.596)	(3.503)	(5.288)	-4.449	(3.073)
Decreasing imports t0-t2	-0.710	-0.069	(1.787)	0.481	-0.321	(1.798)	-1.484	(3.251)	(3.503)	(3.740)	-3.052	(3.073)
Initially exporting	(1.647)	(2.228)	(1.677)	(1.689)	(2.043)	(1.635)	(3.731)	(3.462)	(3.503)	(3.984)	(3.273)	(3.073)
Increasing exports t0-t2	-3.144*	1.450	(1.767)	-4.916***	-0.768	(1.585)	(5.442)	1.802	(5.050)	-8.785	0.392	(4.774)
Decreasing exports t0-t2	-0.738	-1.103	(2.076)	0.103	-0.662	(2.207)	5.514	-0.362	(5.810)	-0.589	-1.547	(4.345)
Sales growth t0-t2	(1.413)	(2.003)	(1.635)	(1.305)	(2.067)	(1.635)	(3.966)	(3.681)	(3.973)	(4.235)	(3.756)	(3.073)
Observations	-1.160	(2.343)	(1.635)	-1.141	0.538	(2.482)	3.909	-0.890	(3.973)	-0.345	-0.979	(3.756)
R squared (within)	-11.649***	-7.062**	(2.440)	-7.687***	-7.276***	(2.165)	-10.134***	-1.576	(3.837)	-5.339	-8.108**	(3.366)
Observations	(2.440)	(3.199)	(2.440)	(2.165)	(2.702)	(2.165)	(3.837)	(3.561)	(4.096)	(4.096)	(3.366)	(3.366)
R squared (within)	0.056	0.036	0.036	0.093	0.032	0.032	0.038	0.032	0.032	0.033	0.052	0.052

Note: \* p<0.10, \*\* p<0.05, \*\*\* p<0.01

See notes below Tables 2 and 4.

# Appendix

Table A1: Summary statistics

	Mean	Std. Dev.
Initially importing	0.53	0.50
Increasing imports t0–t2	0.17	0.38
Decreasing imports t0–t2	0.17	0.37
Initially exporting	0.49	0.50
Increasing exports t0–t2	0.26	0.44
Decreasing exports t0–t2	0.18	0.39
Sales growth t0–t2	−0.02	0.41
More reliance on suppliers t0–t2*	0.18	0.38
Investments in ICT t0–t2	0.70	0.46
Organizational change t0–t2*	0.21	0.41
Establishment size 5–19	0.21	0.41
Establishment size 20–49	0.16	0.36
Establishment size 50–99	0.11	0.31
Establishment size 100–499	0.24	0.42
Establishment size > 500	0.11	0.31
Initial log sales (in year-2000 euros)	15.39	2.34
Technology above average	0.67	0.47
Time interval 2001–2003	0.58	0.49

\* Note: Due to missing values based on only 2,452 observations (instead of 2,629) for the pooled sample.