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Implications for firms in Germany

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Globalization: Implications for firms in Germany

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1 Introduction

There is little doubt that Germany as a country is one of the big players in the "globalization game" as regards trade and foreign direct investment (FDI). Official figures from the Federal Statistical Office indicate that exports reached 1.2 trillion euro in 2016, while imports stood at 960 bn in the same year. Both almost doubled since 2000. According to the *CIA World Factbook*, this caused Germany to jump to third position in both its export and import ranking after the US and China.[2] In terms of FDI, data from the *UNCTAD World Investment Report* indicate that Germany invested 1.6 bn euro abroad in 2014, while inward investment was at 740 bn euro. Both roughly trebled in value since 2000. The report also shows that, again, Germany is third in the international ranking of outward investors (after the US and the UK) but only sixth in the ranking of inward investments (after the US, China, Singapore, the UK and Brazil).[3]

At the same time, GDP per capita has risen from 26,000 euro in 2000 to 37,900 in 2016 according to the Federal Statistical Office. While there is no claim to causality here, the correlation between increases in trade and GDP growth, and FDI and GDP growth are in line with academic papers evaluating the gains from trade for various countries (e.g., Costinot and Rodriguez-Clare, 2014) or the growth effect of FDI in cross-country regressions (e.g., Alfaro et al., 2004). From these aggregate studies, one would be likely to conclude that Germany, as a country, has been one of the winners from globalization.

This paper, however, is not about evaluating whether or not Germany has, on aggregate, done well out of globalization. Rather, we dig deeper into the economy and acknowledge the fact that it is not countries that trade or invest, but rather firms. We therefore look at data at the micro (firm or establishment) level to shed light on questions such as: What types of firms are involved in trade or investments? What distinguishes these globalized firms, if anything, from firms that are not engaged in these international activities? What benefits are there for the firms and also their workers?

To look at these questions, the first part of the paper provides some insights from the existing literature. We firstly review what has become a substantial literature on exporting activity, using data for German firms. Interestingly, but in a sobering way, studies on imports are far less prolific.

[2] China is the top exporter with the US as runner up, while the US is the largest importer, followed by China. Information available at https://www.cia.gov/library/publications/the-world-factbook/rankorder/2078rank.html for exports and https://www.cia.gov/library/publications/the-world-factbook/rankorder/2087rank.html for imports, respectively (accessed 17 August 2017).

[3] Available at http://unctad.org/en/PublicationsLibrary/wir2015_en.pdf, accessed 17 August 2017.

This knowledge gap is most likely due to a lack of data on import activities of firms. We also look at some studies that investigate the implications of inward investment, or foreign ownership, as well as outward investment by German multinational enterprises (MNEs) at the firm level.

In Section 3 of the paper we then use establishment data to provide some more recent evidence on these relationships. While our data easily cover the activities of exporting and foreign ownership, a clear definition of outward investment by German MNEs is more difficult. Information on import activities is not at all available in our data set, the *IAB Betriebspanel*, which we describe in more detail below. We describe the participation of establishments in international activities. Additionally, we estimate performance premia for establishments engaged in these activities. Finally, we also investigate whether firms starting these activities experience performance improvements as a result. By "performance" we mean establishment productivity and innovation activity, but also employment, wages and skill structure of establishments in order to say something about workers in these types of firms.

In the final part of the paper we summarize the main findings, both from our own work and the existing literature, and offer some conclusions.

2 Insights from the literature

2.1 Firm heterogeneity and trade

The groundbreaking theoretical work by Clerides et al. (1998) and Melitz (2003) reshaped the field of international trade by introducing the concept of heterogeneous firms into trade theory.[4] In these models, participation in international activities involves paying an up-front sunk cost, as well as a per-period fixed cost. A plant needs to be productive and profitable enough to cover the sunk costs to start an international activity or the fixed costs to continue it. Moreover, plants switch into and out of international markets, suggesting that participation in globalization is a dynamic decision. However, there is also inertia or partial irreversibility: each period a plant faces some probability that it will be able to switch its status but otherwise remains in the previous status.

[4] This work was extended by Helpman, Melitz and Yeaple (2004) for FDI, and Atkeson and Burstein (2010) for trade and innovation, to name but a few.

The implications of these models for empirical research are that, firstly, there should be selection into exporting. Only the "best" firms, i.e., those with the highest productivity or profitability levels, are able to overcome the costs of exporting and should select into exporting. The second implication is that opening up an economy then leads to expanding markets abroad, which allows the most productive firms to expand their operations and grow. Low productivity domestic firms are then driven out of the market. Both mechanisms combine to trigger increases in aggregate productivity for the economy as highly productive exporters begin to make up a larger share of the economy.

These theoretical models clearly establish that causality runs from firm characteristics to the firm's export decisions – only highly productive firms decide to start exporting. The empirical literature has, however, also investigated whether there is evidence for a causal relationship of starting to export on firm performance – so called learning-by-exporting. While the theoretical underpinning for these effects is less formally established, such learning-by-exporting effects, or additional gains in terms of productivity growth, can accrue thanks to several channels. Intense competition may spurn exporters to faster improvements. It may give firms greater incentives and broader opportunities to innovate.[5] These decisions translate into higher labour and total factor productivity growth following the entry into foreign markets, making the already highly productive group of firms even more pronounced.

A large literature using firm level data for many countries has investigated these firm level implications and, in particular, the question of selection vs learning-by-exporting.[6] One of the more comprehensive descriptive cross- and within- country comparisons of European firms that internationalize is given by Mayer and Ottaviano (2007). For Germany, the authors use an Establishment Level Panel Data over 1995-2004 for trade statistics and the Micro-Database Foreign Direct Investment (MiDi) of the Deutsche Bundesbank for FDI to find that exporters are generally better performers, with the difference particularly pronounced for employment and value added, and firms engaged in FDI outperform exporters. Their data for Germany, however, do not allow for a detailed analysis of the learning-by-exporting effects; the authors of the report can only calculate performance ratios of switchers over non-exporters and do not find any clear trend.

Arnold and Hussinger (2005) use an extract from the Mannheim Innovation Panel from the Centre for European Economic Research (ZEW) over 1992-2000 to study the performance differences between exporters and non-exporters. A peculiar feature of their study is that they use a threshold to define

[5] See the theoretical framework for this channel in Holmes and Schmitz (2001).
[6] See Wagner (2007a) for a survey.

exporters as those firms which ship at least 5 percent of their sales abroad. Exporters in their sample have almost three times as many employees and display notable differences in productivity, sales, propensity to innovate, R&D expenditure conditional on innovation, and rates of introduction new products.[7] Size, productivity and R&D intensity are the single most important predictors of the propensity to export in their study. Looking at ex-ante differences in productivity, the authors find that three years prior to exporting, future exporters are virtually indistinguishable from the firms who never export. However, the differences become marked in the year prior to exporting. Using Granger causality tests and matching, the authors find that all of the total factor productivity differences between exporters and non-exporters are due to self-selection and no learning-by-exporting effects, neither in levels nor in growth rates, are present.

Bernard and Wagner (2001) use an unbalanced panel data set on 7624 German plants during 1978-1992 from Lower Saxony (confidentiality requirements did not allow the researchers to include data from other regions). They find that future exporters are decidedly "better" than non-exporters several years prior to exporting and these differences are accentuated in the run-up to exporting. The years prior to entry reveal significantly faster growth in employment, shipments and productivity. The differences in size are not as marked as in the study by Arnold and Hussinger (2005): exporters in Lower Saxony are only a third to 50 percent larger than non-exporters. Additionally, labor productivity differences, as measured in output or value added per worker, are negligible. Not only do they not find any learning-by-exporting effects but they find that directly following export entry, the growth rates of exporters drop dramatically. At best, there are no significant differences with non-exporters. In some cases - for example, wages - exporters even underperform.

Wagner (2002) applies the same dataset of firms from Lower Saxony but uses a new method, propensity score matching, to reveal a causal effect of starting to export on firm growth: between t-1 and t+3 the growth rate magnitude for export starters was almost 12 percent. Non-exporters, in comparison, reported growth rates of approximately minus 2 percent. Wages grew by nearly 5 percent in export starters compared to approximately 2 percent for non-exporters. Any positive effects for labor productivity growth rates were not statistically significant.

Hansen (2010) uses a unique matching of micro-level data for German and Austrian firms over 1994-2003 and finds that German and Austrian exporters are on average 40 percent more productive than

[7] Wagner (2006) also finds this higher innovativeness of exporting firms on a sample of firms in Lower Saxony.

non-exporters. Additionally, exporting raises the annual average labor and total factor productivity by 1 to 1.5 percent. For Germany, the author uses a survey by the University of Munich matched with Amadeus database by the Bureau van Dijk to create an unbalanced panel of 417 German firms. To obtain information on export activities, the author uses data from Hoppenstedt and Thomson ONE Banker data. He finds additional productivity gains from exporting. These gains are proportional to export intensity and are higher for export intensive firms. Moreover, this productivity gap widens over time.

Fryges and Wagner (2008) also find some learning-by-exporting effects over certain ranges of the exports-to-sales ratio. Specifically, Fryges and Wagner (2008) merge two German surveys – a monthly report for establishments in manufacturing industries and an annual cost structure survey for enterprises – to create a unique dataset that allows the investigation of the effect of exporting on profits. Controlling for unobserved firm heterogeneity with fixed enterprise effects, the researchers show that a firm exporting 50 percent of its products reports, on average, a profit rate that is 1.5 percentage points higher than a non-exporting firm from the same industry, of the same size and with the same share of employees in R&D. However, this effect is not causal. When disentangling the causal effect of exporting and self-selection of better performers into exporting, the authors arrive at a unique finding: in contrast to all literature on the link between exporting and productivity, there is no evidence for self-selection of more profitable firms into exporting. The authors cannot investigate post-entry differences in profitability between export starters and non-exporters due to data limitations. Instead they use a Generalized Propensity Score (GPS) method – a continuous treatment approach that allows to investigate "dosage response" – to demonstrate that the maximum value of the profit rate of 13.5 percent is reached at an export intensity of 49 percent. In comparison, non-exporting firms show an expected profit rate of 11.2 percent. In addition, the researchers show that exporting increases profitability almost over the whole range of export intensity and even firms that export a very small portion of their total sales show a profit rate that exceeds that of non-exporting firms.

Looking at a different outcome variable, Görg and Hanley (2017) use new and unique data from a recent large scale firm survey of management practices in Germany (GMOP). This data is used to calculate management scores for firms as in Bloom et al. (2013), which indicate how structured management is in a given firm. The paper then investigates how these management indices change over time and whether firms' engagement abroad can partly explain these changes. The empirical results (based on difference-in-differences estimation) show that switching into exporting (and to a

lesser degree opening up affiliates abroad) is related to improving management performance, in the sense of firms applying more structured management practices. As more structured management is related to higher productivity (Broszeit et al., 2016), these findings suggest a mechanism for learning-by-exporting: firms need to improve their management performance to withstand stronger international competitive pressure, and this action improves productivity performance as well.

Employees in exporting firms are also likely to be on the winning side. One of the stylized facts in the literature on firm-level international trade is that exporters also pay higher wages than the firms who serve only domestic markets. For Germany, Schank et al. (2008) use linked employer-employee data for the period 1994 to 2005. In the raw data, they find that compared to non-exporters, export starters have on average about three times the number of employees and pay wages that are about 30 percent higher. However, once they control for observable establishment and worker characteristics, wages in export starters and in non-exporters do not differ significantly. What matters, however, is the export intensity of the firm (rather than a simple export dummy). They find from individual level wage regressions that both blue and white collar workers earn more, ceteris paribus, in establishments with higher export ratios. For example, a blue collar worker earns about 1.8% more in a firm exporting 60 percent of its output, compared to a worker in a similar non-exporting establishment. For a white collar worker, the corresponding premium amounts to 0.9 percent.[8,9]

In sum, there is clear evidence for Germany that the most productive firms are most likely to become exporters, and that they tend to pay higher wages on average. There is also some evidence suggesting learning-by-exporting, i.e., firms are able to improve their performance after entering

[8] Using data for an earlier period 1978 to 1992, Bernard and Wagner (1997) find that, controlling for some firm characteristics, exporters do pay higher wages than non-exporters. These authors do not have access to linked employer-employee data, however, and thus cannot control for as many observables as Schank et al. do.

[9] Krishna et al. (2014) use firm-level data from Brazil and find that, consistent with earlier studies, averages wages in exporting firms increase in response to trade liberalization. However, when they use linked employer-employee data and introduce adjustments for the endogenous assignment of workers to firms due to match-specific productivity, this exporter wage premium disappears. Identical workers in exporters and non-exporters are reimbursed similarly. However, the workforce composition in exporting firms improves systematically in terms of worker ability and the quality of worker-firm matches in response to trade liberalization, offering a new explanation to the wage export premium. Intuitively, a worker with fixed innate ability who stays with the exporting firm will not experience any differential effect on his or her wage relative to an identical worker at a non-exporting firm. Workers who switch to firms with which they are better matched will, however, earn higher wages because of their higher productivity there. Exporting firms pay more because post-liberalization they employ workers with better innate ability and also because of the better worker-firm match quality. Theoretical underpinnings of the empirical research on trade-induced sorting and wages can be found in Davidson et al. (2014) and Sampson (2014).

export markets due to their exposure to foreign competition.[10] This shows that firms directly engaged in exporting are clearly winners from globalization.[11]

The empirical literature has also expanded to consider importing at the firm level. The theoretical assumption is similar to that of exporting – importing involves substantial sunk costs and only the most productive firms are able to cover those costs and become successful importers (e.g., Muuls and Pisu, 2009). Furthermore, importers may be able to improve their productivity, as they may import sophisticated material or capital inputs which may not otherwise be available (e.g., Görg et al., 2008, Fritsch and Görg, 2015, Halpern et al., 2015). Empirical work on these mechanisms at the level of the firm for Germany is, to the best of our knowledge, not available. This is most likely due to the unavailability of firm level import data until very recently.

In one of the first papers on imports at the firm level, Wagner (2011) combines various sources of administrative data from the Federal Statistical Office to generate a data set that allows researchers to investigate exporting and importing at the firm level. This data set is available for 2001 to 2007. The analysis shows that (i) the majority of firms exports and imports simultaneously (as in Muuls and Pisu, 2009), and (ii) firms that export and import simultaneously, or those that only import, are statistically significantly less likely to exit an industry. In other words, firms are more likely to die if they do not export or import. This finding is, of course, in line with what heterogeneous firm type models would predict. Opening up to foreign markets allows the more productive firms to expand, while low productivity domestic firms will exit the market.

In related work, Raff and Wagner (2009) offer a theoretical framework that shows that, in the short run, adjustment is driven by the exit of the least efficient and thus smallest firms in response to increased imports. The authors use data for the German clothing industry over 2000-2006 to test the short-term predictions of their model. They find that the increase in import penetration (measured at the industry level) forces the least efficient domestic firms to exit the market, lowers the average

[10] Kneller and Pisu (2010) also report substantial learning-by-exporting effects using firm level survey data for the United Kingdom.

[11] Recall that, even in the absence of learning-by-exporting, increasing exports would be beneficial to aggregate productivity growth as the most productive firms are able to expand and therefore contribute more to productivity growth.

output and raises the average productivity of domestic survivors, the latter effect being economically small and statistically insignificant.[12]

Does this imply that the dying firms – and their workers – are really the losers of globalization? Not to the extent as it appears, as suggested by work using data for the US. Bernard and Jensen (1999) in their empirical analysis of plant level data indicate significant reallocation effects, most taking place within an industry, with resources that are abandoned in dying firms being re-absorbed by the growing firms. Bernard and Jensen (1999) estimate the reallocation of resources (both labor and capital) from less efficient to more efficient plants as making up over 40 percent of total factor productivity growth in the manufacturing sector in the US over 1983-1992. Half of this reallocation occurs within industries and occurs towards exporting and not simply more productive plants. The impacts are felt even in import-competing and non-tradable sectors. This is an important finding from a policy perspective since it illustrates that capital and workers from the failing plants do not "perish" but are continuously re-employed in growing firms.

Following on from this empirical finding, Bernard et al. (2007) offer a model which embeds heterogeneous firms in a framework of comparative advantage and derives a set of new predictions about what happens when countries get exposed to trade liberalization. This model is particularly useful in understanding what happens to the dying plants and their workers, as well as to the more general returns to labor and capital.

In their model, the creative destruction of firms does take place in all sectors but it is more highly concentrated in comparative advantage industries. However, comparative advantage industries enjoy net job creation. This is because job loss due to exiting firms is dominated by the entrance and expansion of higher-productivity firms. Comparative disadvantage industries exhibit net job destruction as the laying-off of workers by exiting lower-productivity plants exceeds the hiring by expanding, higher-productivity firms.

The researchers demonstrate that the relative growth of high-productivity firms raises aggregate productivity in all industries, but this productivity growth is highest in comparative advantage sectors. The price declines associated with productivity increases, inflate the real-wage gains of relatively abundant factors and dampen, or even potentially overturn, the real-wage losses of relatively scarce factors.

[12] Chen et al. (2009) use data for ten manufacturing sectors in seven EU countries, including Germany, over 1989-1999 to examine the impact of imports on prices, mark-ups and productivity and find pro-competitive effect of trade liberalization in the short but not in the long run.

In a paper using data for Germany, Dauth et al. (2016) look at both exporting and importing behavior of the firm and identify comprehensively the winners and losers of trade in Germany. The authors use individual level data from the Sample of Integrated Labour Market Biographies from the German Institute for Employment Research (IAB) to follow individual employees over 1990-2010 and study whether and how they were affected by the increased exposure to trade through important historical events such as the fall of the Iron Curtain, the transformation of the former socialist countries in Eastern Europe and the rise of China, events which combined to induce major globalization shocks for Germany. They find that rising import penetration exerted an adverse effect on individuals' earnings, while rising export opportunities work in the opposite direction. Overall, the latter channel is quantitatively more important, which suggests that rising trade exposure was beneficial for German manufacturing workers. However, for workers starting out in import-competing industries, they find substantial earnings losses. The researchers conclude that the recent globalization shock has contributed to rising inequality within Germany.

More specifically, they find that an increase in import penetration by one percentage point reduces normalized cumulative earnings over ten years by about 1.8 percentage points, while rising exports lead to an increase of about 2.2 percentage points. Import shocks seem to trigger workers to abandon the exposed sectors, while intra-industry adjustments across regions or plants are of minor importance. In fact, in an earlier version of their analysis, Dauth et al. (2015) emphasize that the adverse effects of import competition, especially on earnings, are mitigated, when workers move to *different* industries and that moves within the same industry, even if it involves moving to other regions, are less effective as a shock absorber. For positive export shocks, most of the benefits accrue within worker-establishment pairs and there is little evidence for additional market "pull effects" into export-oriented sectors. Overall, this finding shows that workers in firms that do not export, do not necessarily have to lose out to globalization.

Overall, this brief review of the literature indicates that exporters benefit unsurprisingly from globalization. Low productivity non-exporters may be driven out of the industry. Import activity is also associated with high productivity firms, and may also provide channels for productivity improvements through access to higher quality inputs. Workers in exporting firms are also likely to be on the winning side. For importing industries, increased competition may lead to adjustments in employment, but theory and evidence suggests that workers losing their jobs in these firms can be gainfully re-employed in other firms in other sectors. This indicates the importance of labour mobility for softening the adverse effects of international competition on labour.

2.2 Multinational activity

Trade is only one of the mechanisms to engage in globalization and exports represent only one of the ways to serve foreign customers. Helpman et al. (2004) introduce a model in which heterogeneous firms decide whether to serve a foreign market through exports or local subsidiary sales (FDI). These modes of market access differ in relative costs: exports are characterized by lower fixed costs while FDI involves lower variable costs. Intuitively, firms invest abroad when the gains from avoiding trade costs outweigh the costs of maintaining capacity in multiple markets. Mirroring the finding on trade, only the most productive firms engage in foreign activity and, of those which do, only the most productive engage in FDI. The authors use US exports and affiliate sales data that cover 52 manufacturing sectors and 38 countries to provide empirical support for the predictions of the model. There is a 15 percent productivity advantage of MNEs over exporters. In addition, FDI sales relative to exports are larger in sectors with more firm heterogeneity, i.e. in sectors where we observe a broader range of productivities for operating firms.

What does empirical work tell us about the link between foreign ownership and/or multinational status and performance in the case of Germany? Formal investigations of the Helpman (2004) model for Germany are offered by Wagner (2005) and Arnold and Hussinger (2006). The latter test the predictions of the model by merging firm-level data from the Mannheim Innovation Panel with complete records on foreign subsidiaries from the micro-data base MiDi of the German Bundesbank. Their dataset covers the period 1996-2002, allowing them to compare the productivity distributions of exporters, German multinationals and non-exporters. Exporters outperform domestically owned firms over the entire productivity distribution. The authors also find that German multinationals are the most productive group. Wagner (2005) also finds evidence supportive of the model using value added per worker in a sample of firms from Lower Saxony in 1995.

While these studies look at German multinationals, other work has also considered the role of foreign ownership. Temouri et al. (2008) use Orbis data for Germany to compare firm-level total factor productivity across 22 manufacturing and 17 service industries in Germany during 1995-2004. They also find significant differences between multinationals (German and foreign) and domestic firms, while there are no strong differences between foreign or German multinationals. Arndt and Mattes (2010) use data from the Micro-database Direct Investment of the German Central Bank and the Dafne database by the commercial data vendor Bureau van Dijk over 1997-2003 to find that foreign owned multinationals (FMNEs) are smaller and more productive than their domestic German

counterparts (DMNEs). Specifically, FMNES are about 15 percent smaller, their total factor productivity is 6.4 percent higher and their labor productivity is 37 percent higher than that of German MNEs. After the acquisition of a domestic multinational by a foreign owner, employment remains unchanged. However, both labor and total factor productivity improve, with the maximum improvement reached during the second year after the ownership change.

An empirical challenge of the literature on the ownership performance premium is the endogeneity of a takeover decision by foreign investors as they may strategically target best performing domestic companies for acquisitions.[13] Gelübcke (2012a) uses German data and finds evidence for both "cherry picking" and "lemon grabbing" behaviors on the part of investors. Specifically, he finds a diametrically opposite effect of profitability and productivity on the likelihood of being targeted by domestic versus foreign firms. Several data sets were merged for this study – the new, post-2007, FATS (Foreign Affiliates Statistics), the cost structure survey and monthly reports from the manufacturing, mining and quarrying sectors and a structural survey of the service sector within the AFiD-Project – to construct a 2008-2009 panel for services and a 2007-2008 panel for manufacturing to study the firms' outcomes during the pre-acquisition period. The author uses kernel density functions and non-parametric tests to compare the existence and the significance of differences in pre-takeover performance. Importantly, the paper finds that the determinants of acquisition do not differ across foreign or German investors.

Gelübcke (2012b) continues to look at the post-takeover effects and his data offer an important advantage in that he is capable of distinguishing between domestic and foreign takeovers. He finds stronger post-acquisition productivity effects for domestic than for foreign takeovers, the latter being economically ambiguous depending on specification and statistically insignificant. However employment effects are negative, significant and higher for foreign acquisitions (a reduction of 10-19 workers for domestic and 18 to 39 workers for foreign takeovers). Results for average wages, however, indicate an increase of more than 10 percent, in line with the labor force whose composition changes in response to trade shocks.

Zooming in more closely on the labour market effects of FDI, Becker and Muendler (2008) construct a novel linked employer-employee panel data set for Germany and show that domestic MNEs provide more job security. More specifically, they show that German firms that expand abroad have higher job retention rates than otherwise comparable firms without foreign investments. They estimate a

[13] Such "cherry picking" behavior by foreign investors is, e.g., found for the UK (Harris and Robinson, 2002) and Finland (Huttunen, 2005).

separation rate of 14 percent among workers at MNEs and 18 percent among workers at firms with no foreign affiliates. The difference in job retention is particularly pronounced for high skilled workers.

In related work, Buch and Lipponer (2010) use data from the firm-level Microdatabase Direct Investment from the Deutsche Bundesbank and the firm-level database Dafne from Bureau van Dijk to investigate employment volatility in firms. Their data has the advantage of allowing the authors distinguish between purely domestic firms, domestic multinationals, their foreign affiliates, and foreign firms that operate in Germany. They find no evidence whatsoever that employment with foreign firms or multinationals is more volatile than employment in comparable domestically-owned firms.

There is also evidence that foreign multinationals pay a wage premium. Hijzen et al. (2013) use linked employer-employee data for Germany, UK, Portugal, Brazil and Indonesia and find that in all countries such a wage premium exists. Exploiting the linked data, they also show that higher wages generally accrue to workers moving from domestic to foreign firms, while there is no impact on employee wages after a foreign takeover. In line with the studies above, they also do not find any evidence that employment in foreign firms is less stable after the takeover.

To complete the review of the firm-level evidence on FDI effects, it is important to mention studies analyzing differences in innovation activities between domestic and foreign owned firms. Theoretical predictions for the relationship between R&D and FDI are ambiguous. Intuitively, this is driven by opposing forces: the transfer of new technologies associated with FDI might stimulate R&D activities to insure that new technologies can be adapted to the local production process and implemented in practice. At the same time, multinationals may want to concentrate R&D activity in their headquarter abroad.

Wagner (2006) uses data from the Hannover Firm Panel project in Lower Saxony in 1995. In his descriptive exercise, he finds that foreign owned firms and exporters have a higher innovation performance as measured by patents or product innovations, while there is no such difference in terms of newly introduced process innovations.

Focusing on estimating causal effects, Stiebale and Reize (2011) use data from the "KfW Mittelstandspanel" for 2002 and 2004 and Amadeus database for 2000, 2002 and 2004 and arrive at somewhat different findings. They use the generalized tobit model, augmented with an FDI equation

to control for endogeneity and selection. They find that foreign takeovers exert a large and significantly negative impact on the probability that a German target firm conducts R&D as well as the R&D intensity of the German target. However, innovation output in terms of new products is not significantly affected in any direction. This suggests the possible reallocation of R&D activity to the new headquarters abroad, while innovation performance is not negatively affected. Stiebale (2016) finds further evidence in line with this based on a larger dataset of European firms.[14]

To summarize, there are sound theoretical arguments and empirical evidence that suggest that multinationals (either foreign-owned or domestic) perform better than purely domestic firms. The only apparent caveat is that a foreign takeover may reduce R&D activity in the takeover target, though it does not affect innovation output in the affiliate. Furthermore, the fear that foreign acquisitions or expansions abroad by domestic multinationals lead to higher employment volatility, appear to be unfounded. If anything, the available evidence suggests that employment becomes more stable in these firms, due to their better performance on international markets.

While the discussion thus far considers the direct firm level impact of multinational activity, an important remaining question is how the influx of foreign multinationals affects the performance of domestic firms. On top of the increased competitive pressures and the resulting reshuffling of resources to more productive uses, within and across firms, foreign multinationals bring in new technologies and may set a new standard for what is best practice in the industry. They may also provide inputs that have either been previously unavailable in the domestic market or are technologically more advanced, less expensive, or are accompanied by provision of complementary services. This process of providing inputs leads, accordingly, to additional "knowledge flows." Intuitively, multinationals may have incentives to prevent information leakage that would enhance the performance of their competitors, however, multinationals do benefit from transferring knowledge to their local suppliers or clients. While the influx of new technologies should improve the performance of domestic firms, the effect of additional competitive pressure is ambiguous: either domestic competitors are able to improve their performance as a result, or they may be crowded out, resulting in productivity decreases and plant exit.

[14] However, using firm level panel data for Sweden an econometric techniques to identify causal effects, Bandick et al. (2011) find that foreign acquisitions have positive effects on R&D activity of domestic multinational and non-multinational targets.

While there is a large international literature on such so-called "spillovers", there is almost no study that we are aware of that looks specifically at Germany.[15] The reason for this is not clear, as data availability should not be an issue, as the data sets mentioned above can be used for such analyses. Perhaps it reflects the assumption on the part of researchers and policy makers that there may be no spillovers in Germany, as Germany is an advanced economy where firms may have nothing to learn. This belief could be mistaken, however, as evidence for other advanced countries such as the US or the UK show strong evidence for positive spillovers from foreign investors benefiting local firms (e.g., Keller and Yeaple, 2009, Girma et al, 2008.)

An interesting exception is a study by Franco and Gelübcke (2013) who analyze the displacement effects of the influx of FDI in industries on domestic firms in Germany during 2007-2009. They create a database by merging three sources: (1) monthly and annual reports of establishments from the manufacturing, mining, and quarrying sectors administered by the German statistical offices; (2) Enterprise Group Database by the German Federal Statistical Office; and (3) the German Turnover Tax Statistics Panel with the AFiD-Project. They find evidence for FDI crowding out local firms in low tech sectors. By contrast, domestic firms in high tech sectors experience improved survival probabilities in sectors with a high influx of FDI.[16] This may suggest that the negative competition effect outweighs any potentially positive impacts on local firms in low tech sectors, while firms in high tech sectors benefit from new technology and competitive pressure through foreign firms, and can improve their performance and survival chances.

However, to come to a more robust conclusion as to the indirect effects of the influx of foreign ownership on domestic firms in Germany, more research along the lines of the international literature is clearly necessary.[17]

3 Evidence for German establishments

3.1 Data

[15] The exact mechanisms for these effects as well as the large international evidence are summarized in, e.g., Görg and Greenaway (2003), Havranek and Irsova (2011) or Irsova and Havranek (2013).

[16] This finding is similar to the results by Görg and Strobl (2003) for Ireland.

[17] Girma et al. (2015) link the literature on spillovers to the literature on direct FDI effects by arguing that examining direct effects of FDI and spillovers in isolation can lead to biased estimates. They use firm-level data for Chinese manufacturing to estimate the direct effect of foreign ownership on the productivity of foreign firms and two types of indirect effects – on domestic and other foreign firms – to arrive at a total effect of foreign ownership on domestic economy. They find this effect to be non-monotonic, i.e. foreign presence needs to achieve a certain threshold level for positive effects to take place. Hence, the stage is set for more integrated research that recognizes heterogeneity and non-linearity of effects.

In the remainder of this paper we turn to providing some new evidence on the link between globalization and establishment performance in Germany. In doing so, we not only provide some more up-to-date evidence but we also aim to shed some light on the question as to whether Small and Medium Sized establishments (SMEs) – the *German Mittelstand* – behave different than their larger sized counterparts in industry. Given the standing of SMEs in the public and policy debates in Germany,[18] it is somewhat curious that the academic literature has not looked at this before. After all, from Melitz (2003) or Helpman et al. (2004) one would expect that the largest firms are also most likely to be internationally engaged. Whether or not this is the case in Germany remains to be seen.

To conduct our empirical analysis, we use data from the IAB Establishment Panel, a representative annual survey of approximately 16,000 plants located in Germany. The survey is undertaken by the Institute for Employment Research (IAB) at the Federal Employment Agency in Nuremberg. Since 1996, the panel offers a nationwide survey capturing all industries and establishment sizes.[19] The data set covers 1% of all plants and 7% of all employment in Germany. Note that our analysis differs from much of the previous work in that we do not restrict ourselves to manufacturing industries only, but use data for the whole economy. After all, the importance of manufacturing has decreased world-wide in recent decades; according to World Bank data, manufacturing accounted for 23 percent of GDP in Germany in 2016 (compared to 16 percent in the EU overall).[20]

The survey includes not only general information on establishments, such as employment development, sales, wages and composition of the workforce, but also includes some variables that can be used to gauge an establishment's global engagement activities. Firstly, we have information on exports which we use to define a dummy variable equal to one if the firm exports some or all of its output, and zero if not. We also have information on an establishment's ownership structure. Specifically, the survey question asks whether an establishment is majority or fully owned by a private German, private foreign, or public owner. We use this information to define a foreign ownership dummy equal to one if an establishment is has a private foreign majority owner. Finally, in the 2010 survey, establishments were also asked whether they were "engaged abroad" through the takeover of a firm abroad, setting up an affiliate abroad or owning at least 10 percent of the

[18] See, for example, the praise of SMEs in a statement by the Federal Economics Ministry ("Erfolgsmodell Mittelstand", available at http://www.bmwi.de/Redaktion/DE/Dossier/politik-fuer-den-mittelstand.html, accessed 16 August 2017.)

[19] This random sample of establishment is based on the establishment file from the Federal Employment Agency, which includes information on two million employers that are surveyed repeatedly every year. A non-negligible additional source of information at the disposal of the Federal Employment Agency is an employee history of approximately two million employees of these firms.

[20] Data are from http://data.worldbank.org/indicator/NV.IND.MANF.ZS, accessed 23 August 2017.

shares of a firm abroad. We use this to generate a dummy equal to one if the answer to this question was yes, otherwise it is zero. We refer to this variable as "overseas affiliates".

While information on exporting and foreign ownership is collected annually, the question on establishments' involvement abroad is only available in 2010.[21] Given this constraint, we use data covering the period 2008 to 2012.

Table 1 shows the level of engagement of German establishments abroad, using data for the period 2008 to 2012. Overall, about 8 percent of establishments in the whole economy export, 4 percent are foreign owned and 7 percent have overseas affiliates.[22,23]

There is some variation across establishment size classes. We distinguish small establishments with less than 50 employees, medium sized with 50 – 249 employees, and large establishments with at least 250 employees. Interestingly, the data show that the export participation rate is highest among medium sized firms. While this is perhaps not what one would have expected based on the standard heterogeneous firm model, it does give an indication of the importance of the "Mittelstand" for export activity in Germany. For the other two globalization indicators, the ranking is as expected from theory, however: the largest shares of foreign ownership or overseas engagement are to be found among the large establishments with 250 employees or more.

[21] These questions are similar to those in the GMOP Survey used in our work on globalization and management practices (Görg and Hanley, 2017).

[22] Wagner (2011a) shows that, in manufacturing in 2006, about 81 percent of German firms exported. His analysis is based on data available from the Federal Statistical Office. The share of foreign owned firms is in line with Andrews et al. (2009) who also use the *IAB Betriebspanel* and report that 4 and 2 percent of establishments in West and East Germany, respectively, were foreign owned in 2004.

[23] Note that the total number of observations used is smaller for exporters than for foreign ownership, due to a large number of missings for the export information in the survey. Overseas affiliates information is only available for 2010, while exports and foreign ownership are available throughout the 2008 – 2012 period.

Table 1: Global engagement of German establishments (percentage shares)

	All firms	Small (less than 50 employees)	Medium (50 – 249 employees)	Large (more than 249 employees)	Total # of obs
Exporters	7.7	5.7	12.2	10.0	241,001
Foreign owned	3.5	2.4	6.6	7.8	342,113
Overseas affiliates	6.7	3.1	11.7	22.9	16,221

Source: Own calculations based on IAB Betriebspanel, 2008 - 2012

3.2 Globalization premia

In order to look at "globalization premia", we estimate simple regressions (as, for example, in Wagner, 2007) of the following form:

$$\ln(y_{it}) = \beta_1 \, global\_engagement_{it} + \beta_2 \ln(size)_{it} + d_j + \varepsilon_{it} \qquad (1)$$

where *y* is a vector of measures of establishment performance. In line with the literature reviewed above, we are interested in establishment performance in terms of labour productivity (defined as output per worker) and innovation, as well as average labour market outcomes in the establishment: average wages paid, total employment and the share of skilled workers (where skills are defined as workers with tertiary education). The variable *global engagement* is a vector including the three forms of globalization (dummies for exports, foreign ownership, overseas affiliates) as defined above. The globalization premium, calculated as $100*(\exp(ß_1)-1)$, shows the average percentage difference between globalizers and non-globalizers conditional on the controls included in the model (establishment size and industry dummies). Equation (1) is estimated using simple OLS.

Results for export premia are presented in Table 2. They show, as expected, positive and statistically significant coefficients on the export dummy for most outcome variables. From column (1) we can calculate that exporters are, on average, 50 percent more productive than non-exporters, controlling for lagged employment size, industry and year. They are also more likely to carry out innovation activity in terms of upgrading existing products, developing new products that are new to the

market, and implementing new production processes.[24] In terms of labour market variables, the results show that exporters are roughly 2 percent larger in terms of employment, and pay 40 percent higher wages than non-exporters. These findings are broadly in line with the literature cited above. Hansen (2010) finds an export premium of around 40 percent in terms of productivity, while Schank et al. (2008) find that, on average, exporters pay about 30 percent higher wages. That paper, of course, also shows that this wage premium diminishes as one controls for establishment and worker characteristics. This is likely to be true in our case as well, as exporters are more productive than non-exporters. However, note that we do not find that, on average, exporters have higher shares of skilled workers than non-exporters in our data.

In a further step of the analysis we divide our sample of establishments into large firms and SMEs. The results are reported in column (2) respectively column (3). Two differences between the two types of firms are notable. Firstly, the wage premium, that is the difference in wages between exporters and non-exporters, is much larger in SMEs than in large firms. Secondly, while SME exporters are more likely to implement process innovation compared to non-exporting SMEs, there is no such difference observable for large firms.

[24] The innovation variables are defined as dummies equal to one if the establishment reports that the activity was carried out in the current year. We acknowledge that this is a binary dependent variable which we estimate as a linear probability model using OLS.

Table 2: Export premia

	(1)	(2)	(3)
Premium for Dependent variable	All firms	Large firms	SMEs
ln(labour productivitiy)	0.407 (0.018)***	0.400 (0.069)***	0.371 (0.019)***
product upgrade	0.157 (0.009)***	0.126 (0.029)***	0.154 (0.010)***
new product	0.064 (0.006)***	0.048 (0.024)**	0.061 (0.006)***
new production process	0.085 (0.007)***	0.050 (0.030)	0.078 (0.007)***
ln(employment)	0.019 (0.002)***	0.017 (0.006)***	0.021 (0.002)***
ln(wage)	0.340 (0.021)***	0.092 (0.025)***	0.265 (0.023)***
skill share	0.003 (0.006)	0.021 (0.020)	-0.003 (0.006)

Note: Table presents the estimated coefficient on the globalization measure (β_1 in equation 1) and the cluster-robust standard error (clustered at establishment level). Control variables are lagged ln(employment), a full set of industry and time dummies. *** and ** indicate statistical significance at the 1 and 5 percent level, respectively.

Source: Own calculations based on IAB Betriebspanel, 2008 - 2012

Turning to foreign ownership, we find in Table 3 that they are more productive, more skill intensive and pay higher wages than their domestic counterparts. This is again in line with theoretical expectations and literature on Germany and other countries. These premia are observable for both large firms and SMEs, although the productivity premium for SMEs is substantially higher than that of large firms. With regard to the other establishment outcomes, the picture is more diverse. We find that only SMEs are more likely to innovate, or are larger, if foreign owned compared to non-foreign owned SMEs. Such premia are not observable for large firms. This may seem unexpected at first, but it should perhaps not be too surprising. Among large firms, we may not expect much of a difference between foreign and domestic owned establishments, as even domestic firms are likely to be multinationals with foreign affiliates themselves. Among small and medium sized firms we may

expect much more of a difference between foreign owned firms and domestic firms which are unlikely to be multinationals.

Table 3: Foreign ownership premia

	(1)	(2)	
Premium for Dependent variable	All firms	Large firms	SMEs
ln(labour productivitiy)	0.506 (0.027)***	0.300 (0.051)***	0.513 (0.031)***
product upgrade	0.064 (0.013)***	0.020 (0.023)	0.061 (0.016)***
new product	0.010 (0.010)	-0.035 (0.023)	0.013 (0.010)
new production process	0.039 (0.012)***	-0.003 (0.028)	0.029 (0.013)**
ln(employment)	0.012 (0.003)***	-0.005 (0.005)	0.014 (0.004)***
ln(wage)	0.182 (0.024)***	0.121 (0.0218)***	0.147 (0.031)***
skill share	0.028 (0.009)***	0.044 (0.016)***	0.024 (0.011)**

Note: Table presents the estimated coefficient on the globalization measure (β_1 in equation 1) and the cluster-robust standard error (clustered at establishment level). Control variables are lagged ln(employment), a full set of industry and time dummies. *** and ** indicate statistical significance at the 1 and 5 percent level, respectively.

Source: Own calculations based on IAB Betriebspanel, 2008 - 2012

This difference is also apparent when comparing establishments that have overseas affiliates with those that have not.[25] Among SMEs, those firms that are in that way globally engaged are more productive, more innovative, larger and pay higher wages than their domestic SME counterparts. Large firms with overseas affiliates also pay higher wages than domestic large firms, but are not more productive, nor are they more likely to introduce new products.

[25] Recall that this variable is only available in 2010, so the premia regressions are based on a cross section for 2010 which implies that we have substantially fewer observations than in the previous tables.

Table 4: Overseas affiliates premia

	(1)	(2)	
Premium for Dependent variable	All firms	Large firms	SMEs
ln(labour productivitiy)	0.360 (0.038)***	0.100 (0.071)	0.419 (0.046)***
product upgrade	0.156 (0.017)***	0.082 (0.030)***	0.158 (0.021)***
new product	0.066 (0.014)***	0.086 (0.032)	0.038 (0.015)**
new production process	0.118 (0.017)***	0.083 (0.039)**	0.096 (0.019)***
ln(employment)	0.018 (0.007)**	0.004 (0.010)	0.018 (0.008)**
ln(wage)	0.067 (0.044)	0.110 (0.037)***	0.125 (0.057)**
skill share	0.005 (0.010)	0.003 (0.018)	0.022 (0.012)

Note: Table presents the estimated coefficient on the globalization measure (β_1 in equation 1) and the cluster-robust standard error (clustered at establishment level). Control variables are lagged ln(employment), a full set of industry and time dummies. *** and ** indicate statistical significance at the 1 and 5 percent level, respectively.

Source: Own calculations based on IAB Betriebspanel, 2008 - 2012

Unfortunately, the overseas affiliates variable is only available for 2010. The survey does ask a somewhat related question annually, namely whether an establishment has relocated parts of its operations in the previous year. However, this does not distinguish between relocations abroad and domestically, but includes both. Hence, it is not really comparable to the overseas affiliates variable, but may potentially provide some additional insights on firms' decisions to relocate production. The premia regressions with a dummy variable defined as 1 if the establishment carried out such relocation are reported in Table 5. There is little evidence of any positive premia for any of the outcome variables.

Table 5: Relocation premia

	(1)	(2)	
Premium for Dependent variable	All firms	Large firms	SMEs
ln(labour productivitiy)	0.005 (0.049)	0.050 (0.082)	-0.005 (0.060)
product upgrade	0.016 (0.019)	0.015 (0.030)	0.016 (0.025)
new product	0.020 (0.014)	-0.003 (0.025)	0.030 (0.016)
new production process	0.045 (0.018)**	0.031 (0.032)	0.044 (0.021)**
ln(employment)	-0.011 (0.012)	-0.026 (0.013)**	-0.008 (0.016)
ln(wage)	-0.466 (0.065)***	-0.143 (0.047)***	-0.557 (0.092)***
skill share	0.004 (0.011)	0.033 (0.014)**	-0.001 (0.014)

Note: Table presents the estimated coefficient on the globalization measure (β_1 in equation 1) and the cluster-robust standard error (clustered at establishment level). Control variables are lagged ln(employment), a full set of industry and time dummies. *** and ** indicate statistical significance at the 1 and 5 percent level, respectively.

Source: Own calculations based on IAB Betriebspanel, 2008 - 2012

3.3 Switching into globalization

These globalization premia cannot be interpreted as the causal effect of the global activity on performance. Firstly, causality may go from performance to global engagement, as indicated by the theoretical work on heterogeneous firms. In this case, it is good performance that leads to engagement on global markets, not the other way around. Secondly, well performing firms are different than poorly performing firms along a range of firm characteristics, of which global engagement, size and sector are only a few. Other time varying factors (e.g., management ability) are not observable to the researcher and are not controlled for in equation (1).

In order to make some progress towards estimating causal effects, we, hence, turn to a different identification strategy. The idea is to look at "switchers", that is, establishments that do not engage

in any global activity at the beginning of our period of analysis, but which then start to export, or start having foreign owners, or open up affiliates. These switchers are then compared with a control group of establishments which do not engage in any global activity throughout the sampling period, controlling for observable characteristics. This strategy places a heavier burden on the data, as we drop all establishments that are continuously engaged in the global activity. Identification of the globalization effect comes only from switchers. This may be considered cleaner than equation (1) in order to identify a globalization effect on establishment performance.[26] One problem, however, is that we cannot identify firms switching into "overseas affiliates", i.e., opening up new affiliates abroad, as this question is only available in 2010. We do, however, consider firms switching into "relocation", acknowledging that this, as pointed out above, includes relocation abroad as well as domestically.

For the further analysis, we restrict our sample to firms that did not export, have foreign ownership, or relocated activities in 2008 and 2009. Out of this group, we can then identify switchers as those reporting exports, foreign ownership or relocation in t = 2010. We compare the changes in establishment performance (over the period 2010 – 2011) for these switchers compared to the control group comprised of firms having no global engagement in 2008, 2009 and 2010.[27] The identifying assumption is that the switch into global engagement is exogenous, i.e., not correlated to unobservables, conditional on observables in the model. As we control for a number of important observables and for the level of the performance measure y in 2009, this may not be too unreasonable an assumption.

The estimating equation is as follows

$$\ln(y_{it+1}) - \ln(y_{it}) = \gamma_1 \, switcher_{it} + \gamma_2 \ln(size)_{it} + d_j + \varepsilon_{it} \qquad (2)$$

Based on the identifying assumption, γ_1 can be interpreted as the causal effect of switching into global engagement on the growth in establishment performance measure y.[28]

[26] Such an identification strategy is also used in Görg and Hanley (2017) and Godart et al. (2017).
[27] This implies that our data set in this part is collapsed to a cross section in 2010 with lagged and lead values of variables.
[28] Looking at change rather than levels of the performance measure allows us to cancel out establishment heterogeneity in performance levels, making this a difference-in-differences estimation.

One word of warning: Only a relatively small number of firms will, in any year, adopt a treatment. This is why the number of observations appearing in this part of the analysis are smaller than the numbers of firms observed in the section dealing with globalization premia (See Appendices A1a – A6b for information on the size of subsets used to estimate these regressions). Due to the comparatively small numbers of firms involved in these switching regressions, it is not unusual to see lower levels of significance as it becomes more difficult for a researcher to detect systematic patterns.

We begin by taking the now familiar outcome variables, logged labour productivity, logged wages, logged employment and the firm's skill share regressed on our three switching dummies (exports, foreign ownership, relocation). Firms choosing to relocate for the first time in the observation period, firms which have undergone a foreign takeover or who have commenced exporting are regarded as having switched to the globalization treatment. Accordingly, the coefficients reported, are the γ_1 which relate to these Switcher firms. The comparison point, or baseline, is firms that did not undertake any of these globalization strategies in the period prior to 2010.

The results, reported in Table 6 for all establishments, are quite sobering. We do not find evidence for any learning, or more appropriately, post-switching effects of exporting or foreign ownership, for any of the establishment performance variables. We can, however, see that firms choosing to relocate part of their plant in 2010 revealed a negative pattern for wages. It is important to point out that this relates to wage growth, not levels. In other words, the results suggest that establishments relocating activities have lower wage growth than non-relocating comparable firms. It does not mean that wages fall in absolute terms. There were no similar patterns for foreign ownership takeovers or firms that commenced exporting.

Table 6: Switcher effects (all firms)

	(1)	(2)	(3)	(4)
	ln(labour productivitiy)	ln(wage)	ln(employment)	skill share
Switched to:				
Relocation	0.03	**-0.22*** **	-0.05	0.01
Foreign ownership	-0.00	-0.18	0.01	-0.01
Exporting	0.03	0.04	-0.00	0.00

Note: Table presents the estimated coefficient on the globalization measure (γ_1 in equation 2). Control variables are lagged ln(employment), the lagged levels of y and a full set of industry dummies. Standard errors are clustered at establishment level. ***, ** and * indicate statistical significance at the 1, 5 and 10 percent level, respectively. See Table A1a & A1b in Appendices for more detailed tables

Source: Own calculations based on IAB Betriebspanel, 2010

However, if we look at the patterns for large firms belonging to the Switcher and Non-Switcher subgroups (Table 7), not only do we have a repetition of the negative relationship of relocation on wage growth. We also see, for the first time, a positive relationship between foreign takeovers and the change in skill share. This positive finding for foreign takeovers is intuitive: foreign firms bring new technology, the implementation of which needs employees with high skill endowments.

Table 7: Switcher effects (large firms)

	(1)	(2)	(3)	(4)
	ln(labour productivitiy)	ln(wage)	ln(employment)	skill share
Switched to:				
Relocation	-0.10	**-0.17*** **	-0.00	-0.00
Foreign ownership	-0.03	0.04	0.06	**0.06*** **
Exporting	0.02	0.05	-0.03	0.01

Note: Table presents the estimated coefficient on the globalization measure (γ_1 in equation 2). Control variables are lagged ln(employment), the lagged levels of y and a full set of industry dummies. Standard errors are clustered at establishment level. ***, ** and * indicate statistical significance at the 1, 5 and 10 percent level, respectively. See Table A2a & A2b in Appendices for more detailed tables

Source: Own calculations based on IAB Betriebspanel, 2010

Finally, the patterns for SMEs in Table 8 are similar to the initial findings we report for the pooled sample (in fact, since most firms are small, it is unsurprising that the pooled sample and the small-firm sample report similar findings). Here we again see the negative connection between wage growth and relocation. We also see a significantly negative pattern for employment. We can summarize by saying that small firms that fragment their activities domestically or internationally, are associated with lower wage and employment growth compared to firms that do not engage in such activities.

Table 8: Switcher effects (SMEs)

	(1)	(2)	(3)	(4)
	ln(labour productivitiy)	ln(wage)	ln(employment)	skill share
Switched to:				
Relocation	0.08	**-0.24****	**-0.08***	0.01
Foreign ownership	-0.01	-0.26	-0.00	-0.02
Exporting	0.02	0.03	0.00	0.00

Note: Table presents the estimated coefficient on the globalization measure (γ_1 in equation 2). Control variables are lagged ln(employment), the lagged levels of y and a full set of industry dummies. Standard errors are clustered at establishment level. ***, ** and * indicate statistical significance at the 1, 5 and 10 percent level, respectively. See Table A3a & A3b in Appendices for more detailed tables

Source: Own calculations based on IAB Betriebspanel, 2010

Another useful way to assess how well firms are performing is in terms of the firm's innovativeness. Here, we attempt to capture how the adoption of certain globalization strategies is echoed in the firm's production patterns. Table 9 reports these patterns for the pooled sample. Disappointingly, we do not register any effects. It should be noted that innovation is primarily a large firm phenomenon.

Table 9: Switcher effects on innovation (all firms)

	(1)	(2)	(3)
Dependent variable innovation defined as:	Product upgrade	New product	New Production Process
Switched to:			
Relocation	-0.04	0.01	-0.01
Foreign ownership	-0.03	0.00	0.02
Exporting	-0.01	-0.00	-0.03

Note: Table presents the estimated coefficient on the globalization measure (γ_1 in equation 2). Control variables are lagged ln(employment), the lagged levels of y and a full set of industry dummies. Standard errors are clustered at establishment level. ***, ** and * indicate statistical significance at the 1, 5 and 10 percent level, respectively. See Table A4a & A4b in Appendices for more detailed tables

Source: Own calculations based on IAB Betriebspanel, 2010

Since the pooled sample reflects more the activities of SMEs, it may be more informative to turn to the patterns for large firms (Table 10). Here we see that relocation is associated with a higher share of firms registering the most radical type of innovation: innovations of new products that are new to the market. Although the association for product upgrade is negative, this category of innovation is imitative and therefore not as novel as the 'new to market' category.

Table 10: Switcher effects on innovation (large firms)

	(1)	(2)	(3)
Dependent variable innovation defined as:	Product upgrade	New product	New Production Process
Switched to:			
Relocation	**-0.13****	**0.11***	0.01
Foreign ownership	-0.07	-0.06	0.08
Exporting	0.06	-0.00	-0.15

Note: Table presents the estimated coefficient on the globalization measure (γ_1 in equation 2). Control variables are lagged ln(employment), the lagged levels of y and a full set of industry dummies. Standard errors are clustered at establishment level. ***, ** and * indicate statistical significance at the 1, 5 and 10 percent level, respectively. See Table A5a & A5b in Appendices for more detailed tables

Source: Own calculations based on IAB Betriebspanel, 2010

Similar to the results in the pooled sample, the patterns for SMEs are statistically insignificant (Table11). Therefore, any patterns we see for innovation are restricted to large firms.

Table 11: Switcher effects on innovation (SMEs)

	(1)	(2)	(3)
Dependent variable innovation defined as:	Product upgrade	New product	New Production Process
Switched to:			
Relocation	0.00	-0.03	-0.01
Foreign ownership	-0.02	0.01	-0.01
Exporting	-0.01	-0.01	-0.02

Note: Table presents the estimated coefficient on the globalization measure (γ_1 in equation 2). Control variables are lagged ln(employment), the lagged levels of y and a full set of industry dummies. Standard errors are clustered at establishment level. ***, ** and * indicate statistical significance at the 1, 5 and 10 percent level, respectively. See Table A6a & A6b in Appendices for more detailed tables

Source: Own calculations based on IAB Betriebspanel, 2010

4 Conclusion

A number of conclusions can be derived from the review of the literature and our own empirical work. As regards exporting firms, it is clear that there is selection: exporters are more productive, larger and pay higher wages than comparable non-exporters. Whether or not there are learning effects from exporting is still open to debate, as different studies in the literature find different effects, reflecting differences in data and methodologies used. We do not find any learning effects in our analysis.

Interestingly, studies that do reveal learning effects do not reveal such effects for the exporting or not exporting dichotomy but rather find that these effects depend on the export intensity, i.e., the share of output a firm exports. Two studies (Hansen, 2010, Fryges and Wagner, 2008) show learning effects with increasing export intensity. In line with this, Schank et al. (2008) who look at changes in wages after starting to export also find that exporting vs. not exporting does not matter, but that wages rise with increases in export intensity. What drives this relationship is not entirely clear. Is it just exporting "more"? Or is it rather the case that firms increase their export intensity by exporting

new products to new markets, and that there are learning effects from developing these new products and entering new, previously less accessible markets? In order to find a satisfactory answer for the question of learning by exporting in Germany, analyses based on transaction level data, which provide information on both the product and the destination profile of exports by firms, may provide the way forward. This data has only recently become available for Germany (see Wagner, 2014) and its potential has yet to be realized.

What is generally less well recognized in the public debate is that importers are also the "better" performing firms compared to non-importers. There are similar premia to importing as there are to exporting. This reflects that there are additional costs to importing (similar to exporting) and only well performing firms can bear these additional costs. There are also good reasons to think (from theory and empirical evidence for other countries) that importing can improve importers' productivity, as they have access to better quality imports and / or at lower prices.

There are a number of implications from this "selection" in trade. Firstly, as exporters or importers expand, purely domestic firms may be driven out of the market or at least have to fight increased competitive pressure. Exporters and importers are more likely to survive in the market. Secondly, as there is a wage premium in trading firms, workers in non-trading firms are left behind. To what extent this wage premium really accrues to incumbent workers or new hires is still debated, but it is likely that, ceteris paribus, workers in trading firms earn more. This is thus a potential source of wage inequality in the economy. Thirdly, while it is well accepted in the literature that importing leads to adjustment costs and pressure on, in particular, low skilled labour (e.g., Dauth et al., 2016, Baumgarten et al., 2013), the findings on selection suggest that it is likely that workers in importing or exporting firms may be less affected than workers in firms that do not engage in such activities themselves. Finally, on the subject of trade, the literature suggests that the negative implications of labour adjustments are softened if the labour market is flexible to allow movement of workers.

The conclusions related to ownership structure are somewhat similar to those on trade. Multinationals, be they domestic or foreign owned, represent the better performing firms in any industry. They are also likely to pay higher wages to their employees. In addition to the remarks made about exporting firms above, one finding may be particularly noteworthy in the light of the public debate on globalization and, in particular, relocation of activities: Empirical studies for Germany do not generally find negative labour market effects of foreign or domestic multinationals for employees at home. In fact, one empirical study finds that employment in German multinationals

expands as these firms invest abroad (Becker and Muendler, 2008). The intuition behind this is that firms can increase their international competitiveness by investing abroad, and this also affects positively operations in the home country.

Our empirical analysis shows, however, that establishments that relocate activities in a given year show lower wage growth than comparable firms that do not relocate. However, unfortunately our relocation variable does not allow us to distinguish relocation abroad and domestically. Hence, this negative association with wage growth (not levels!) may just reflect a general effect of restructuring production rather than starting overseas activities.

The literature also highlights one important possible downside of foreign takeovers in Germany, however. Empirical work by Stiebale and Reize (2011) and Stiebale (2016) finds that foreign takeovers lead to a reduction in R&D activity in Germany, though innovation output is not affected. This suggests that R&D is relocated to the headquarter country of the new owner, which may have negative implications for scientists, researchers and technicians involved in R&D. This does not appear to affect negatively the performance of the takeover target in terms of innovation output, however. Our empirical analysis also does not indicate any negative effects of a foreign takeover on innovation output in the target, relative to a control group of comparable establishments that did not change ownership.

One novel finding comes out of our analysis, namely, that there are differences between large and SME establishments in terms of performance premia associated with globalisation. This has not been systematically documented for Germany before. Regarding exporting, the differences are mainly related to wages, where the wage premium in a SME exporter is roughly two and a half times the size of the premium for large exporters. Concerning ownership, we find that SMEs that are foreign owned or have own affiliates overseas have higher productivity and innovation premia than globalized large establishments. In other words, among SMEs, the globalizers perform generally much better than their non-globalized counterparts. However, among large firms, the striking difference between globalizers and non-globalizers is reduced. Learning or switching effects appear absent for both types of establishments, however.

What to conclude for policy? It is clear that globalized firms are better performers than non-globalizers. This may help firms (and therefore also their workers) to better withstand the competitive pressure from operating in international markets and, in particular, from imports. Whether this globalization activity brings with it any further gains in terms of further growth is still

being debated. Even in the absence of such learning effects, it appears that there may be a role for policy in helping firms to improve their performance (in terms of productivity, innovation and wages) in order to be able to "jump the hurdle" and enter into the global markets. Importantly, the focus is on *improving performance*, as just helping firms to enter foreign markets may not be a successful strategy if firms do not learn from global engagement. Rather, they need to have the strong fundamentals that allow them to enter global markets and withstand the competitive pressure in a globalized market.

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Table A1a Productivity, wage, employment and skills when firms relocate/change to foreign ownership: all firms

Depvar:	(1) prod	(2) wages	(3) employ	(4) skill	(5) prod	(6) wages	(7) employ	(8) skill
switcher_relocate	0.03	**-**	-0.05	0.01				
	(0.52)	**(-2.56)**	(-1.53)	(0.48)				
l_ln_employ2010	0.02***	0.06***	-	0.004**				
	(7.59)	(2.64)	(-2.03)	(3.62)				
l_ln_lab_prod201	-							
	(-2.69)							
l_ln_wage2010		-0.03						
		(-1.46)						
l_skill2010								
				-0.04***	-0.00	-0.18	0.01	-0.01
switcher_foreign				(-5.07)	(-0.02)	(-1.00)	(0.36)	(-0.43)
					0.02**	0.06**	-	0.003**
l_ln_employ2010					(7.2)	(2.65)	(-2.22)	(3.59)
					-			
l_ln_lab_prod201					(-2.88)			
						-0.03		
l_ln_wage2010						(-1.54)		
l_skill2010								-0.04***
								(-5.17)
Industry dummies	yes	yes	yes	yes				
Observations	6,148	7,732	9,729	9,729	5,915	7,512	9,437	9,437
R-squared	0.03	0.01	0.01	0.01	0.03	0.01	0.01	0.01

*Notes: OLS regressions with errors clustered at the firm level. . All dependent variables, apart from skills, expressed as logged values for 2010. *** p<0.01, ** p<0.05, * p<0.1*

Table A1b Productivity, wage, employment and skills when firms commence exporting: all firms

Depvar:	(1) prod	(2) wages	(3) employ	(4) skill
switcher_export	0.03	0.04	-0.00	0.00
	(1.13)	(0.79)	(-0.08)	(0.39)
l_ln_employ2010	0.02***	0.07***	-0.00	0.005***
	(5.00)	(2.99)	(-1.12)	(3.80)
l_ln_lab_prod2010	-0.04***			
	(-3.28)			
l_ln_wage2010		-0.04*		
		(-1.88)		
l_skill2010				-0.04***
				(-5.21)
Industry dummies	yes	yes	yes	yes
Observations	4,553	6,156	7,842	7,842
R-squared	0.02	0.02	0.01	0.01

*Notes: OLS regressions with errors clustered at the firm level. . All dependent variables, apart from skills, expressed as logged values for 2010. *** p<0.01, ** p<0.05, * p<0.1*

Table A2a Productivity, wage, employment and skills when firms relocate/change foreign ownership: large firms

Depvar:	(1) prod	(2) wages	(3) employ	(4) skill	(5) prod	(6) wages	(7) employ	(8) skill
switcher_relocate	-0.10	**-0.17*** **	-0.00	-0.00				
	(-0.89)	**(-2.73)**	(-0.10)	(-0.33)				
l_ln_employ2010	0.06**	-0.005	0.00	0.00				
	(2.11)	(-0.17)	(1.05)	(0.61)				
l_ln_lab_prod2010	-0.11*							
	(-1.82)							
l_ln_wage2010		0.02						
		(0.71)						
l_skill2010				-0.05				
				(-2.76)				
switcher_foreign					-0.03	0.04	0.06	**0.06*** **
					(-0.52)	(0.67)	(1.02)	**(2.02)**
l_ln_employ2010					0.07***	0.00	0.01	0.00
					(2.17)	(0.21)	(0.93)	(0.50)
l_ln_lab_prod2010					-0.13*			
					(-1.78)			
l_ln_wage2010						0.01		
						(0.31)		
l_skill2010								-0.05***
								(-3.19)
Industry dummies	yes	yes	yes	yes	yes	yes	yes	yes
Observations	519	847	1,044	1,044	469	800	989	989
R-squared	0.19	0.08	0.09	0.06	0.19	0.06	0.09	0.08

*Notes: OLS regressions with errors clustered at the firm level. . All dependent variables, apart from skills, expressed as logged values for 2010. *** p<0.01, ** p<0.05, * p<0.1*

Table A2b Productivity, wage, employment and skills when firms commence exporting: large firms

Depvar:	(1) prod	(2) wages	(3) employ	(4) skill
switcher_export	0.02	0.05	-0.03	0.01
	(0.21)	(1.13)	(-0.92)	(0.35)
l_ln_employ2010	0.15*	-0.02	0.01	
	(1.84)	(-0.73)	(0.83)	
l_ln_lab_prod2010	-0.18*			
	(-1.79)			
l_ln_wage2010		0.03		
		(1.10)		
l_skill2010				
Industry dummies	yes	yes	yes	yes
Observations	232	565	705	705
R-squared	0.21	0.07	0.15	0.07

*Notes: OLS regressions with errors clustered at the firm level. . All dependent variables, apart from skills, expressed as logged values for 2010. *** p<0.01, ** p<0.05, * p<0.1*

Table A3: Productivity, wage, employment and skills when firms relocate/change ownership, small firms

Depvar:	(1) prod	(2) wages	(3) employ	(4) skill	(5) prod	(6) wages	(7) employ	(8) skill
switcher_relocate	0.08	**-0.24****	**-0.08***	0.01				
	(1.10)	**(-1.95)**	**(-1.73)**	(0.76)				
l_ln_employ2010	0.03***	0.09***	-0.003*	0.01***				
	(5.86)	(3.36)	(-1.79)	(4.15)				
l_ln_lab_prod2010	-0.02***		.					
	(-2.23)							
l_ln_wage2010		-0.03*						
		(-1.76)						
l_skill2010				-0.01***				
				(-4.90)				
switcher_foreign					-0.01	-0.26	-0.00	-0.02
					(-0.14)	(-1.09)	(-0.06)	(-0.90)
l_ln_employ2010					0.02**	0.09	-0.004***	0.01***
					(5.40)	(3.34)	(-2.24)	(4.27)
l_ln_lab_prod2010					-0.02***			
					(-2.47)			
l_ln_wage2010						-0.03*		
						(-1.82)		
l_skill2010								-0.04***
								(-5.03)
Industry dummies	yes	yes	yes	yes	yes	yes	yes	yes
Observations	5,629	6,885	8,685	8,685	5,629	6,712	8,448	8,448
R-squared	0.02	0.01	0.01	0.02	0.02	0.01	0.00	0.01

*Notes: OLS regressions with errors clustered at the firm level. . All dependent variables, apart from skills, expressed as logged values for 2010. *** p<0.01, ** p<0.05, * p<0.1*

Table A3: Productivity, wages, employment and skills when firms commence exporting: small firms

Depvar:	(1) prod	(2) wages	(3) employ	(4) skill
switcher_export	0.02	0.03	0.00	0.00
	(0.72)	(0.59)	(0.10)	(0.26)
l_ln_employ2010	0.02***	0.10***	-0.00	0.01***
	(4.02)	(3.56)	(-1.23)	(3.68)
l_ln_lab_prod2010	-0.03***			
	(-2.92)			
l_ln_wage2010		-0.04***		
		(-2.12)		
l_skill2010				-0.05***
				(-5.01)
Industry dummies	yes	yes	yes	yes
Observations	4,321	5,591	7,137	7,137
R-squared	0.02	0.02	0.00	0.01

*Notes: OLS regressions with errors clustered at the firm level. . All dependent variables, apart from skills, expressed as logged values for 2010. *** p<0.01, ** p<0.05, * p<0.1*

Table A4a Innovation when firms relocate/change to foreign ownership: all firms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Depvar:	Product upgrade (i_i)	New product (i_o)	New to market (i_n)	New Production Process (i_p)	Product upgrade	New product	New to market	New Production Process
switcher_relocate	-0.04	0.00	0.01	-0.01				
	(-0.92)	(0.06)	(0.31)	(-0.22)				
l_ln_employ2010	0.01***	0.003	0.00	0.007***				
	(3.20)	(1.02)	(1.53)	(2.38)				
l_i_i	-0.03***							
	(-3.45)							
l_i_o		-0.04***						
		(-2.99)						
l_i_n			-0.06***					
			(-3.10)					
l_i_p				-0.05***				
				(-3.50)				
switcher_foreign					-0.03	0.02	0.00	0.02
					(-0.56)	(0.33)	(0.07)	(0.52)
l_ln_employ2010					0.01***	0.00	0.003*	0.002
					(3.09)	(1.01)	(1.77)	(0.88)
l_i_i					-0.04			
					(-3.47)			
l_i_o						-0.04***		
						(-2.94)		
l_i_n							-0.06***	
							(-3.19)	
l_i_p								-0.04**
								(-2.62)
Industry dummies	yes	yes	yes	yes	yes	yes	yes	yes
Observations	9,587	9,610	9,625	9,602	9,294	9,316	9,329	7,735
R-squared	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

*Notes: OLS regressions with errors clustered at the firm level. . All dependent variables, apart from skills, expressed as logged values for 2010. *** p<0.01, ** p<0.05, * p<0.1*

Table A4b Innovation when firms commence exporting: all firms

Depvar:	(1) Product upgrade (i_i)	(2) New product (i_o)	(3) New to market (i_n)	(4) New Production Process (i_p)
switcher_export	-0.01	0.02	-0.00	-0.03
	(-0.23)	(0.52)	(-0.12)	(-1.13)
l_ln_employ2010	0.01***	0.00	0.00	0.00
	(2.63)	(0.88)	(1.52)	(1.28)
l_i_i	-0.03***			
	(-2.13)			
l_i_o		-0.04***		
		(-2.62)		
l_i_n			-0.05**	
			(-2.19)	
l_i_p				-0.06***
				(-3.31)
Industry dummies	yes	yes	yes	yes
Observations	7,722	7,735	7,747	7,728
R-squared	0.00	0.01	0.01	0.01

*Notes: OLS regressions with errors clustered at the firm level. . All dependent variables, apart from skills, expressed as logged values for 2010. *** p<0.01, ** p<0.05, * p<0.1*

Table A5: Innovation when firms relocate/change to foreign ownership: large firms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Depvar:	Product upgrade (i_i)	New product (i_o)	New to market (i_n)	New Production Process (i_p)	Product upgrade	New product	New to market	New Production Process
switcher_relocate	**-0.13****	-0.02	**0.11***	0.01				
	(-1.94)	(-0.22)	**(1.89)**	(0.08)				
l_ln_employ2010	0.01	-0.02	0.00	0.01				
	(0.94)	(-1.30)	(0.06)	(0.78)				
l_i_i	-0.07							
	(-2.13)**							
l_i_o		-0.02						
		(-0.67)						
l_i_n			-0.08*					
			(-1.80)					
l_i_p								
switcher_foreign					-0.07	**0.35*** **	-0.06	0.08
					(-0.55)	**(2.61)**	(-1.49)	(0.57)
l_ln_employ2010					0.02	-0.02	-0.01	0.01
					(1.05)	(-1.00)	(-0.37)	(0.61)
l_i_i					-0.09**			
					(-2.44)			
l_i_o						-0.04		
						(-1.19)		
l_i_n							-0.07	
							(-1.58)	
l_i_p								-0.37
								(-1.02)
Industry dummies	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1,012	1,015	1,017	1,015	954	957	957	957
R-squared	0.05	0.04	0.05	0.06	0.06	0.06	0.05	0.08

*Notes: OLS regressions with errors clustered at the firm level. . All dependent variables, apart from skills, expressed as logged values for 2010. *** p<0.01, ** p<0.05, * p<0.1*

Table A5: Innovation when firms commence exporting: large firms

Depvar:	(1) Product upgrade (i_i)	(2) New product (i_o)	(3) New to market (i_n)	(4) New Production Process (i_p)
switcher_export	0.06	-0.07	-0.00	-0.15
	(0.61)	(-0.51)	(-0.10)	(-1.20)
l_ln_employ2010	0.02	-0.00	-0.00	-0.00
	(0.78)	(-0.10)	(-0.24)	(-0.14)
l_i_i	-0.06			
	(-1.58)			
l_i_o		-0.00		
		(-0.17)		
l_i_n			-0.01	
			(-0.23)	
l_i_p				-0.05
				(-1.19)
Industry dummies	yes	yes	yes	yes
Observations	676	679	678	677
R-squared	0.04	0.05	0.07	0.10

*Notes: OLS regressions with errors clustered at the firm level. . All dependent variables, apart from skills, expressed as logged values for 2010. *** p<0.01, ** p<0.05, * p<0.1*

Table A6a Innovation when firms relocate/change to foreign ownership: small firms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Depvar:	Product upgrade (i_i)	New product (i_o)	New to market (i_n)	New Production Process (i_p)	Product upgrade	New product	New to market	New Production Process
switcher_relocate	0.00	0.01	-0.03	-0.01				
	(0.19)	(0.12)	(-0.97)	(-0.30)				
l_ln_employ2010	0.01***	0.00	0.00	0.01**				
	(2.80)	(0.06)	(0.71)	(2.43)				
l_i_i	-0.04***							
	(-2.96)							
l_i_o		-0.04***						
		(-2.85)						
l_i_n			-0.06***					
			(-2.69)					
l_i_p				-0.05***				
				(-3.12)				
switcher_foreign					-0.02	-0.06	0.01	-0.01
					(-0.28)	(-0.99)	(1.53)	(-0.30)
l_ln_employ2010					0.01***	-0.00	-0.00	0.01***
					(2.85)	(-0.12)	(-0.06)	(2.45)
l_i_i					-0.04***			
					(-2.90)			
l_i_o						-0.03***		
						(-2.61)		
l_i_n							-0.06***	
							(-2.84)	
l_i_p								-0.06***
								(-3.75)
Industry dummies	yes	yes	yes	yes	yes	yes	yes	yes
Observations	8,575	8,595	8,608	8,587	8,340	8,359	8,372	8,351
R-squared	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

*Notes: OLS regressions with errors clustered at the firm level. . All dependent variables, apart from skills, expressed as logged values for 2010. *** p<0.01, ** p<0.05, * p<0.1*

Table A6b Innovation when firms commence exporting: small firms

Depvar:	(1) Product upgrade (i_i)	(2) New product (i_o)	(3) New to market (i_n)	(4) New Production Process (i_p)
switcher_export	-0.01	0.02	-0.01	-0.02
	(-0.34)	(0.66)	(-0.33)	(-0.64)
l_ln_employ2010	0.01***	-0.11	0.00	0.01*
	(2.16)	(-0.30)	(0.44)	(1.76)
l_i_i	-0.02*			
	(-1.78)			
l_i_o		-0.04***		
		(-2.63)		
l_i_n			-0.06**	
			(-2.23)	
l_i_p				-0.06
				(-3.08)
Industry dummies	yes	yes	yes	yes
Observations	7,046	7,056	7,069	7,051
R-squared	0.01	0.01	0.01	0.01

*Notes: OLS regressions with errors clustered at the firm level. . All dependent variables, apart from skills, expressed as logged values for 2010. *** p<0.01, ** p<0.05, * p<0.1*