Greenfield FDI and Skill Upgrading: a Polarised Issue*

Ronald B. Davies†
(University College Dublin)

Rodolphe Desbordes‡
(University of Strathclyde)

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Abstract

Outbound FDI is often accused of increasing income inequality in developed countries by shifting labour demand from low-skilled towards high-skilled workers (wage polarisation). In response, we employ data on greenfield FDI which, in contrast to M&As, may be more clearly linked to skill upgrading. Our data also delineate greenfield FDI by sector, function and destination, allowing us to control for different motives and skill intensities for seventeen developed countries for 2003-2005. We find that greenfield FDI in support services, e.g. back and front office services, induces *polarised* skill upgrading, benefitting high-skilled at the expense of medium-skilled workers, thereby polarising wages.

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†School of Economics, University College Dublin, Newman Building (Room G215), Belfield, Dublin 4 Ireland. Email: ronbdavies@gmail.com

‡Department of Economics, Sir William Duncan Building, University of Strathclyde, 130 Rottenrow, Glasgow G4 0GE, Scotland, United Kingdom. Telephone/Fax number: (+44) (0)141 548 3961/4445. E-mail: rodolphe.desbordes@strath.ac.uk

1 Introduction

When a firm announces its intention to engage in outbound foreign direct investment (FDI), this is almost invariably greeted with dismay by local workers out of the fear that this means a decline in the demand for their services. Effects on absolute and relative labour demands for different types of workers depend on the type of FDI. Horizontal (market-seeking) FDI, by replacing home exports, reduces absolute labour demand for both skilled and unskilled labour at home in roughly equal proportions, at least in the short run. On the other hand, vertical (efficiency-seeking) FDI, by exploiting international factor price differences, shifts production of some goods and service inputs overseas, where they are produced at a relatively lower cost and then exported back to the home country. As a result, some workers, depending on the relative skill intensity of the function offshored, will be more affected than others, creating shifts not only in absolute labour demands but also in relative labour demands.[1] This latter possibility suggests equity concerns as the increase in FDI observed over the last few decades has taken place during a period of increasing income inequality in the OECD. Despite such widely held concerns, the empirical evidence is fairly mixed.[2] Regarding total employment, depending on the study, outbound FDI can actually increase parent employment. Evidence of 'skill upgrading' in the home country, that is, a shift in relative labour demand from low-skilled workers towards more skilled workers, is also ambiguous. *In-house offshoring*, i.e. FDI, is conducive to the relocation of parts of the production abroad and seems to have a positive impact on skill upgrading in firm-level studies, whereas evidence of this effect vanishes at the industry-level. On the other hand, *broad offshoring*, which we define as imports of intermediate goods and service inputs produced abroad in-house or outsourced to a foreign firm, has clear skill-upgrading effects.[3] Overall, existing research suggests that the generalised skill upgrading observed across sectors of the economy of rich countries in the last two decades cannot be explained by the in-house activities of multinational enterprises (MNEs) (Navaretti and Venables, 2006).

This paper contributes to the debate on skill upgrading induced by the activities of MNEs by employing new,

[1] See Markusen (1984) for seminal work on horizontal FDI and Helpman (1984) for that on vertical FDI. Navaretti and Venables (2006) provide an overview of the FDI literature, including that on skill upgrading. Grossman and Rossi-Hansberg (2008) and Rojas-Romagosa (2011) are recent theoretical treatments of trade in tasks.

[2] See Crinò (2009) for a recent and excellent overview of the literature on the effect of FDI and imports on domestic labour markets.

[3] For instance, Crinò (2012) finds that both material and service broad offshoring changes the composition of labour demand in favour of more skilled workers.

proprietary data on FDI activities. These data cover outbound greenfield capital investment in real projects.[4] FDI can take place either through the construction of a new overseas facility (greenfield FDI, GFDI) or by the acquisition of an existing overseas facility (mergers and acquisitions, M&A). This is an important distinction when anticipating domestic employment effects because M&A activity can be driven by different motives than GFDI. For example, M&A activity can represent the purchase of a new technology or the elimination of a foreign competitor.[5] Hence, GFDI, especially when its motive is unambiguously vertical, is conceptually closer to the theoretical notion of 'jobs being sent overseas', and therefore potentially more tightly linked to skill upgrading than M&A where even a vertical acquisition potentially has additional, conflicting effects on home labour markets. Therefore, our first contribution is to use data specifically on GFDI, avoiding any aggregation bias resulting from having GFDI and M&A FDI together.

These new data provide three additional benefits. First, they break down GFDI into its primary functions (such as manufacturing, customer support, or R&D). Since different functions likely have different motives and different skill-intensities, allowing for these distinctions can give us more clear-cut results on potential skill upgrading. As will be shown, such disaggregation is crucial as it is only some functions that influence home labour patterns.[6] Second, they cover outbound FDI from a broad group of countries at the country-sector level. Hence, in contrast to other studies estimating the impact of FDI on skill upgrading in a single home labour market, we are able to use labour market data from multiple countries.[7] Third, they allow us to investigate the impact of GFDI according to its destination. Previous work has emphasised the need to account for the destination of FDI. In particular, if FDI in different locations represents the hiring of foreign workers with different skill levels, theory suggests that this would have differential impacts on skill upgrading at home.[8]

[4]The bulk of the literature, including the present study, examines the impact of outbound FDI. Heyman, Sjoholm, Tingvall (2011) and Heyman, Sjoholm, Tingvall (2007), who use Swedish employee-firm data, are exceptions.

[5]Hansson, et al (2007) find that, for Swedish MNEs, technology and market acquisition are key factors influencing the FDI decision.

[6]This relates to a small literature on how trade affects domestic workers according to the function the home worker is employed in. Becker, Eckholm, and Muendler (2013) use German micro data and find that outbound FDI tend to benefit workers engaged in skill-intensive functions. Klein, Moser, and Urban (2010) use similar data and find that workers in skill-intensive functions also tend to benefit when their employer begins exporting. Kemeny and Rigby (2012) find a similar result for US data, where increased imports benefit those in nonroutine tasks (which are arguably skilled workers). However, to our knowledge, no one has used information on overseas functions to explain domestic labour market shifts.

[7]Slaughter (2000) uses US data, whereas Head and Ries (2002) use Japanese data and Hansson (2005) uses Swedish data. Mariotti, Piscitello, and Elia (2010), Elia, Mariotti, and Piscitello (2009), and Castellani, Mariotti, and Piscitello (2006) use Italian data. The only papers to our knowledge estimating the impact of FDI on multiple home country labour markets are Becker, Ekholm, Jackle, and Muendler (2005), who use German and Swedish data, and Konings and Murphy (2006), who cover a set of European countries. These studies, however, estimate total changes in home employment using firm level data, not skill upgrading.

[8]Typically, this breakdown is done by wage or income of the host. Hansson's (2005) breakdown uses OECD membership. Konings and Murphy (2006) use regions within Europe (North, Central, or South). Harrison and McMillan (2006) instead classify outbound

On the whole, we find that outbound GFDI in support services (SS), which corresponds to the back and front office services that are traditionally offshored for efficiency-seeking purpose and is present across sectors, has the most robust impact on home labour markets.[9] For this function, we observe a general pattern wherein increased GFDI, especially to developing countries, increases the relative labour demand for high-skilled (HS) workers and decreases the relative labour demand for their medium-skilled (MS) counterparts, as supported by opposite shifts in the compensation shares of these two skill groups. On the other hand, low-skilled (LS) workers appear to be little affected by GFDI in SS. The yearly GFDI in SS could potentially explain as much as 7% of the yearly rise in the compensation share of HS workers over the 2003-2005 period, 29% of the decline in the compensation share of MS workers and a modest 1.4% of the fall in the compensation share of LS workers. Similar results are achieved when estimating conditional absolute labour demands (holding output and capital fixed), in line with a traditional 'specialisation argument', whereby part of the in-house service offshoring performed by home firms substitutes to MS workers and leads home firms to concentrate on HS-intensive activities. Other functions, including manufacturing, frequently fail to have a statistically significant impact. Our findings are robust to a variety of robustness checks, which include an instrumental variables approach. It is also robust to the inclusion of data on imports which themselves have no significant impact when controlling for the destination of GFDI. To our knowledge, ours is the first paper to include both FDI and trade in this type of analysis.[10]

Overall these results suggest that outbound GFDI in SS, a 'vertical' type of in-house service offshoring, has contributed to *polarised* skill upgrading, in contrast to the trade literature which generally finds that broad service offshoring leads to *generalised* skill upgrading. This finding echoes the predictions of Levy and Murnane (2004) who argue that "*computer substitution and [foreign] outsourcing are affecting many of the same occupations*" (p.21), i.e. those involving routine (expressible in rules) tasks, creating conflict primarily between the most skilled workers and the MS workers rather between those two groups and the lowest skilled workers. Indeed, Goos, Manning, and Salomons (2010) find that the technology-driven "routinisation" of the jobs typi-

FDI as horizontal or vertical rather than relying on the assumption that horizontal FDI is in a high-income host and vertical is in a low-income host.

[9]Mattoo, Stern, and Zanini (2008) provide an excellent overview on trade in services.

[10]Geishecker, Reide, and Frijters (2012), who analyse household concerns over job loss, include both FDI and import measures, finding that high-skilled workers tend to be the most sensitive to fears of offshoring.

cally performed by MS workers has been the dominant factor in the shift in labour demand from MS workers towards other groups documented across developed economies.[11] Nevertheless, their estimates still find a role for globalisation as more easily offshored tasks tend to experience falling relative labour demand. In a similar vein, Becker, Eckholm, and Muendler (2009), Klein, Moser, and Urban (2010) and Kemeny and Rigby (2012) also find that increased trade benefits the non-routine workers to the detriment of those performing routine tasks. Thus, our results, although relying on very different data (and in particular using the function of GFDI rather than the tasks of workers), is in line with existing results.

The paper proceeds as follows. Section 2 provides some stylised predictions about the effects of outbound GFDI on skill upgrading in developed countries. Section 3 describes our empirical approach and our data. Section 4 presents our main results and various robustness checks. Section 5 concludes.

2 Conceptual framework

As we will describe in the next section, data limitations on the rental price of capital and output prices constrain us to estimate a short-run cost function, where capital and output are fixed and the only variable factors are low-skilled (LS) workers, medium-skilled (MS) workers, and high-skilled (HS) workers.[12] This implies that our estimates will not capture any technical efficiency or scale effects resulting from an endogenous change of capital and/or output to outbound GFDI. They will purely reflect how outbound GFDI influences relative labour demands, as measured by the share of a given category of workers in total compensation.

Two conditions need to be met for outbound GFDI (as well as M&A) to influence relative labour demands. The first is that the relative skill intensity of the foreign and remaining domestic activities must differ. Second, GFDI must have some vertical features; the overseas activity substitutes for a given category of workers at

[11] See Autor, Katz, and Kearney (2006) for the US, Goos and Manning (1997) for the UK, and Goos, Manning, and Salomons (2009) for 16 European countries.

[12] The bulk of the literature considers delineates workers of by skill levels. A recent literature has arisen that focuses on the specific tasks workers do rather than their skill level. This matters for two reasons. First, as hypothesised by Autor, Levy, and Murnane (2003), some tasks (particularly those performed by MS workers) have become routine. As such, they are potentially more offshorable, something confirmed in the estimates of Goos, Manning, and Salomons (2010). Hakkala, Heyman, and Sjöholm (2008) find that when looking at the impact of foreign-ownership on Swedish wages, the estimated impact can depend on whether one looks at workers grouped by task or by education. Second, within a skill category, some tasks are not offshorable but others are (e.g. low-skilled assembly work can be offshored but low-skilled janitorial work cannot). This implies that the estimated impact of globalisation on a skill group will be clouded somewhat by the mix of tasks performed by the group. Nevertheless, with these caveats in mind, we follow the literature in our analysis.

home because intra-firm imports replace them or a certain group of workers are complementary to the overseas activity.[13] If these two criteria are not satisfied, relative labour demands will remain unchanged (even though that may not be the case for unconditional absolute labour demands).

Thus, the impact of GFDI on relative labour demands can be broken down according to the skill intensity and verticality of the overseas activity with the anticipated effects depending on these features. Pure horizontal GFDI entails the replication abroad of the same activities as those performed domestically. Given that the skill-intensities of the domestic and foreign activities do not differ and no trade in intermediate goods takes place, this will not influence the relative labour demands for high-skilled (HS), medium-skilled (MS) or low-skilled (LS) workers. Thus, no skill upgrading occurs. Vertical GFDI, on the other hand, is the geographical dispersion of the production stages according to their factor-intensities. When the overseas affiliate begins operations, this offshoring of a part of the production process reduces the relative home demand for those workers used intensively in that stage of production. Which workers those are depends on what type of activities are being sent overseas. If the offshored activity is intensive in LS workers, as is generally assumed for manufacturing offshored to developing countries, this change leads to an increase in the relative labour demands for HS and MS workers (as was observed in the 1980s and early 1990s in the developed countries). Thus, this type of GFDI results in *generalised* skill upgrading.

In contrast, consider the offshoring of routine cognitive tasks (anecdotally to locations like India or China), which can be easily codified and transmitted via-ICT and which do not require physical proximity (Levy and Murnane, 2004; Blinder, 2006). These services are usually performed by MS workers and therefore the jobs they occupy are most at threat. In contrast to manufacturing offshoring which has traditionally been associated with worsening wage and employment conditions for LS workers, service offshoring is mainly believed to shift relative demand only among the skilled workers. Thus, this type of GFDI works to the detriment of MS workers but to the benefit of HS workers, resulting in *polarised* skill upgrading. Finally, vertical GFDI does not necessarily have to be located in a developing country. In fact, the biggest exporters of services are developed countries (Jensen, 2011). From this perspective, vertical services GFDI in another, and potentially more skill-

[13] Vertical GFDI can also replace home workers by increasing intra-firm imports of final goods and services. However, given that we assume that output in the home country is fixed in our discussion of the expected effects of GFDI on relative labour demands, we solely describe vertical GFDI here as involving intra-firm imports of intermediates, or, in the branching FDI case, as exports of intermediate services, which leave home production unchanged.

abundant, developed country may lead to the relocation of highly-skilled domestic activities abroad. This would induce a fall in the relative demand for HS workers, a potential rise in the relative demand for MS workers, and a rise in the relative demand for LS workers. Thus, offshoring to a developed country can result in *polarised* skill *downgrading*. This is indeed the pattern found by Ekholm and Hakkala (2006b) for Swedish intermediate imports and relative wages, particularly for imports from other high income countries.

This description of the effects of outbound GFDI is extremely stylised, especially the 'pure' designation for horizontal GFDI. As discussed by Head and Ries (2002), there is a distinction between pure horizontal FDI, which involves replication of *all* activities, and branching FDI, which replicates production of final goods only while upstream skill-intensive activities remain at home (this being the type of FDI discussed by Markusen, 1984). Because branching GFDI still has trade in skill-intensive headquarter services, it can result in *generalised* or *polarised* skill upgrading as the opening of a new plant abroad is complementary to the home employment of skilled workers. Nevertheless, the effects of outbound GFDI on relative labour demands likely depend on the nature and relative skill intensity of the overseas activity, distinctions which cannot be achieved by solely relying on aggregated outbound GFDI data across industries. However, as we will explain in the next section, we can distinguish between different GFDI functions and different GFDI destinations in our data, allowing us to better control for the nature and skill intensity of the overseas activity.

3 The Empirical Model and Data

3.1 Empirical model

We follow the existing literature by estimating a set of relative labour demand equations in which GFDI serves as a demand shifter by affecting the cost function. To arrive at the relative labour demand equations for our three worker types, high-skilled (HS), medium-skilled (MS), and low-skilled (LS), we begin with a cost minimising representative firm in a particular country-industry-year (the subscripts for which are omitted for simplicity). This firm minimises the short-run translog cost function $C(.)$ by choosing the number of each group of workers (HS, MS, LS):

$$
\begin{aligned}
\ln C = {} & \alpha + \sum_{i \in I} \beta^i \ln w^i + \beta^Y \ln Y + \beta^K \ln K + \sum_{z \in Z} \beta^z \ln z \\
& + \tfrac{1}{2} \left(\sum_{i \in I} \sum_{j \in I} \beta^{i,j} \ln w^i \ln w^j + \beta^{Y,Y} (\ln Y)^2 + \beta^{K,K} (\ln K)^2 + \sum_{z \in Z} \sum_{k \in Z} \beta^{z,k} \ln z \ln k \right) \\
& + \sum_{i \in I} \beta^{i,Y} \ln w^i \ln Y + \sum_{i \in I} \beta^{i,K} \ln w^i \ln K + \sum_{i \in I} \sum_{z \in Z} \beta^{i,z} \ln w^i \ln z \\
& + \beta^{Y,K} \ln Y \ln K + \sum_{z \in Z} \beta^{Y,z} \ln Y \ln z + \sum_{z \in Z} \beta^{K,z} \ln K \ln z
\end{aligned} \tag{1}
$$

where w^i is the wage of worker type i, Y is the target level of output, K is its capital stock, and Z is a vector of factors (including GFDI intensity) which are exogenous to the firm that shift its production function and therefore affect total costs.[14]

Applying Shepard's lemma to (1) and using linear price homogeneity and symmetry, we get three compensation share functions, where the share of labour type i in total labour compensation (S^i) is:[15]

$$
S^i = \beta^i \sum_{j \in I} \beta^{i,j} \ln w^j + \beta^{i,Y} \ln Y + \beta^{i,K} \ln K + \sum_{z \in Z} \beta^{i,z} \ln z. \tag{2}
$$

Thus, if $\beta^{i,GFDI}$ is positive, this means that an increase in GFDI increases the share of labour type i in total compensation. As explained above, we expect that $\beta^{i,GFDI}$ will depend on the function offshored, the level of skills, and the destination of the GFDI. First differencing these level equations, results in two equations to be estimated (one for the relative share of HS workers and one for the relative share of MS workers):

$$
\begin{aligned}
\Delta S^{HS}_{s,c,t} &= \alpha^{HS} + \beta^{HS}_1 \Delta ln(\frac{w^{HS}_{s,c,t}}{w^{LS}_{s,c,t}}) + \beta^{HS}_2 \Delta ln(\frac{w^{MS}_{s,c,t}}{w^{LS}_{s,c,t}}) + \beta^{HS}_3 \Delta ln(K_{s,c,t}) \qquad (3) \\
& + \beta^{HS}_4 \Delta ln(Y_{s,c,t}) + \beta^{HS}_5 \Delta ICT_{s,c,t} + \sum_{l=6}^{12} \beta^{HS}_l \Delta GFDIINT_{f,s,c,t} + T^{HS}_t + \Delta \epsilon_{s,c,t} \\
\Delta S^{MS}_{s,c,t} &= \alpha^{MS} + \beta^{MS}_1 \Delta ln(\frac{w^{HS}_{s,c,t}}{w^{LS}_{s,c,t}}) + \beta^{MS}_2 \Delta ln(\frac{w^{MS}_{s,c,t}}{w^{LS}_{s,c,t}}) + \beta^{MS}_3 \Delta ln(K_{s,c,t}) \qquad (4) \\
& + \beta^{MS}_4 \Delta ln(Y_{s,c,t}) + \beta^{MS}_5 \Delta ICT_{s,c,t} + \sum_{l=6}^{12} \beta^{MS}_l \Delta GFDIINT_{f,s,c,t} + T^{MS}_t + \Delta \upsilon_{s,c,t}
\end{aligned}
$$

[14] This approach has been employed by Morrison and Siegel (2001), Falk and Koebel (2001), Ekholm and Hakkala (2006), Hijzen et al. (2005), and Crinò (2012) among others. See Berman, et. al (2004) for a more complete discussion.

[15] To see why this results in the compensation share rather than labour demand, note the use of logs in (1).

where Δ indicates that the variable has been first-differenced and $\epsilon_{s,c,t}$ and $\upsilon_{s,c,t}$ are error terms. The z variables in equations (3) and (4) are GFDI intensity ($GFDIINT$, distinguished by function), computerisation (ICT), and, in some specifications, imports (*IMPORTS MAN*, *IMPORTS ALL*). First-differencing the data allows us to remove any unobserved fixed industry-country effects which may be correlated with the other regressors, including our variable of interest, $GFDI$.

Our dependent variable $\Delta S^{i}_{s,c,t}$ is the change in the share of a given category of workers in total labour compensation in sector s of home country c at time t.[16] We have data on three categories of workers: HS, MS and LS. $GFDIINT_{f,s,c,t}$ is our function f-specific sectoral measure of GFDI. Our control variables are the ratios of the skill-specific hourly wages $w_{s,c,t}$, capital services $K_{s,c,t}$, value added $Y_{s,c,t}$, and computer intensity $ICT_{s,c,t}$.[17] T_t are time fixed effects. Given the restrictions imposed and the fact that our dependent variables sum up to unity, we can retrieve the estimates of the parameters of the $\Delta S^{LS}_{s,c,t}$ equation from the estimated coefficients of equations (3) and (4). We do so through seemingly unrelated estimation of both equations, with a variance-covariance matrix adjusted for clustering at the sector-country level. In line with earlier work, we weigh all our regressions, including those underlying our descriptive statistics, by the average sector share in total labour compensation across the OECD. In that way, by giving more weight to large sectors, we may obtain a more representative impact of outbound GFDI on the labour market of home countries.[18]

Estimation of (3) and (4) may be affected by endogeneity due to time-varying omitted variables or simultaneity. We first attempt to address these issues by employing alternative specifications of our econometric model. To attenuate a potential omitted variable bias, we control for country-specific time trends by including country-specific fixed effects in (3) and (4). Further, in some specifications, we allow for industry-country-specific time trends by again first-differencing (3) and (4).[19] In these ways we control not only for slow-changing unobserved industry-country factors which may have an impact on the *levels* of our dependent variables but also for unobserved country or industry-country factors that change at a roughly constant rate

[16]Our data also provide information on hours worked. When using this alternative, results were comparable. This is important because it indicates that GFDI does not just have an impact on wage negotiations due to a threat of potential offshoring, as proposed by Leamer (2007) or Blinder (2006, 2009) in terms of 'job contestability', but also a real job displacement effect resulting from a shift in the skill intensity of domestic activities. These results are available on request.

[17]Berman et al. (1994) argue for not including relative wages in equations (3) and (4). As we will show in section 4.3, our results are robust to the omission of the wage terms.

[18]Our results are qualitatively similar when our regressions are unweighted.

[19]We denote double-differencing with Δ^2.

which may affect the *changes* in our dependent variables. Given the short time-dimension of our panel (three years), this specification allows us to control for most omitted variables (see Haskel et al. (2007) for a similar strategy). Regarding the potential simultaneity bias, some regressions use GFDI lagged by two years. Given that we were unable to reject the absence of serial correlation of order 2 of the residuals of (3) and (4), these lagged values of GFDI should not be correlated with the error terms.[20] Another benefit of this approach is that it allows us to examine whether the $GFDI$ effects are fully contemporaneous or take time to manifest.

We also address the possibility of an omitted variable bias through an Instrumental Variables (IV) strategy. This is a difficult endeavour as we cannot employ standard IV or Anderson-Hsiao (1981) style IV approaches because an external instrument for our $GFDI$ variable would have to to be function-industry-country specific and time-varying and our short time dimension, especially when we use a double-difference estimator, precludes us from using lagged values of $GFDI$. We circumvent these difficulties by relying on a new method of achieving identification proposed by Lewbel (2012), based on a heteroskedastic covariance restriction. More precisely, adopting the same notations as Lewbel, the omitted variable issue may be interpreted as the absence of identification in the following triangular system of equations:

$$Y_1 = X'\beta_1 + Y_2\gamma_1 + \epsilon_1 \tag{5}$$

$$Y_2 = X'\beta_2 + \epsilon_2 \tag{6}$$

where Y_1 is the outcome of interest ($\Delta^2 S^i_{s,c,t}$), X is a vector of assumed exogenous control variables ($\Delta^2 w_{s,c,t}$, $\Delta^2 K_{s,c,t}$, $\Delta^2 Y_{s,c,t}$,$\Delta^2 ICT_{s,c,t}$ and the time dummies) and Y_2 is a vector of assumed endogenous variables ($\Delta GFDIINT_{f,s,c,t}$). Endogeneity arises because $\epsilon_1 = \alpha U + V_1$ and $\epsilon_2 = \alpha_2 U + V_2$, where U is an omitted variable or an unobserved factor, which may directly influence both Y_1 and Y_2.

In the context of a two-stage least squares estimation, consistent estimation of the parameters in equation 5 requires that one of the exogenous variables only appears in equation 6 with a non-zero coefficient. Such an identification assumption may be extremely hard to satisfy in practice, due to a lack of plausibly valid "external" instruments, as in our case. However, Lewbel notes that "internally-generated" instruments can be

[20]This lack of serial correlation also suggests that we have not omitted any relevant (persistent) explanatory variables.

constructed, as long as there is presence of scale heteroskedasticity with respect to Z, i.e. $cov(Z, \epsilon_2^2) \neq 0$, and the following moment conditions hold: $E(X\epsilon_1) = 0$, $E(X\epsilon_2) = 0$, $Cov(Z, \epsilon_1\epsilon_2) = 0$, where Z is equal to, or is a subvector of, X. Under these assumptions, which are no more stringent than those usually made in standard IV approaches, suitable instruments for the endogenous regressors can be generated. They correspond to the products of the residuals $\widehat{\epsilon_2}$ of the regression of the endogenous variables on all exogenous variables with each (or some) of the included exogenous variables in mean-centered form, i.e. $(Z - \overline{Z})\widehat{\epsilon_2}$.

While these residuals are by definition uncorrelated with the exogenous regressors used to construct them, the existence of scale heteroskedasticity implies that their products with the centered exogenous regressors will not be zero. The larger the scale heteroskedasticity in the error distribution, the stronger the correlation of the generated instruments with the troublesome variables, and the more likely that the instrument relevance condition will be satisfied. Encouragingly, we find in preliminary testing strong evidence of scale heteroskedasticity in the residuals from equation 6, notably with respect to sector-specific value added and capital services, suggesting that the dispersion of the unaccounted for changes in GFDI intensity tends to be related to the scale of the sector.[21] Average firm size in a given sector tends to increase with the size and capital intensity of this sector (Kumar et al, 1999) and large firms are more likely to engage in FDI (Head and Ries, 2003; Helpman et al, 2004; Mayer and Ottaviano, 2008). Hence, a possible explanation for the observed scale heteroskedasticity is that it reflects a growing presence of large MNEs as the scale or capital intensity of a sector increases. Firms in large or capital-intensive sectors have a greater ability to generate large FDI shocks than firms in smaller and less capital-intensive sectors, due to the combined effects of their size and their higher probability to invest abroad. Whatever the reasons for scale heteroskedasticity, the relevance of the internally generated instruments can be formally tested using tests for weak identification. In addition, as long as the previously mentioned moment conditions are satisfied, implying that the variables used to construct the instruments are truly exogenous and uncorrelated with the product of the two stages' errors, the second crucial assumption for identification, instrument exogeneity, will also be satisfied since $(Z - \overline{Z})\widehat{\epsilon_2}$ will be uncorrelated with ϵ_1. The exogeneity of the internally generated instruments can be assessed with a test of overidentifying restrictions.

Like the Anderson-Hsiao (1981) style IV approaches, this new IV estimator makes uses of the existing

[21] We use Szroeter's (1978) rank test for heteroskedasticity.

data to construct 'internal' instruments and obtain consistent estimation. However, whereas appropriately transformed lagged values of the regressors are used in the first case, Lewbel (2012)'s estimator exploits the presence of scale heteroskedasticity, which intuitively provides a new piece of relevant information about the endogenous regressors that can be used to identify their parameters. Although Lewbel's paper has only been published recently, the idea to use heteroskedasticity to help estimation already appeared in Wright (1928) and has been exploited in various forms by Leamer (1981), Feenstra (1994), Dagenais and Dagenais (1997), Lewbel (1997), Rigobon (2003) and Klein and Vella (2010).[22] Concerning Lewbel's specific identification strategy, it has been used, among other published studies, in Sabia (2007), Emran and Shilpi (2012), Kelly et al. (2012) and Denny and Oppedisano (2013). Overall, this short overview suggests that Lewbel (2012)'s IV strategy is a sound and increasingly accepted approach and one especially useful when no external instruments are available.

3.2 Sectoral data

Data for our dependent and control variables come from the EU KLEMS database, which report at the sector-level for a large number of OECD countries over the 1970-2005 period comparable data on value added (Y), labour compensation, capital compensation (K, taken as a proxy for capital services), share of ICT capital in total capital compensation (ICT, taken as proxy for technological change), and skill composition of the labour force.[23] In particular, the shares of HS, MS, and LS workers in total compensation are given. Typically, HS workers have a tertiary education, MS workers have at most an upper secondary education and LS workers have stopped their education at the lower secondary education level.[24] In addition, the KLEMS database provides information on imports of material goods (*IMPORTS MAN*). This was supplemented with data on imports of services (creating *IMPORTS ALL*) coming from version 8.6 of the Trade in Services database (see Francois, Pindyuk, and Woerz (2009) for details). After matching with our GFDI database, we have data for seventeen industries in seventeen OECD countries over the 2003-2005 period, with an overall number of 852 observa-

[22] This list of studies is not exhaustive. See Lewbel (2012) for a full review of the literature.

[23] The database is available at http://www.euklems.net/. All nominal values have been expressed in US$ using the exchange rate reported in the Penn World Tables 7.2 (http://pwt.econ.upenn.edu/php_site/pwt_index.php) and deflated using the deflators reported in the EU KLEMS database.

[24] As our data define worker groups are defined by education, not task, we cannot perform the analysis done by Goos, Manning, and Salomons (2010).

tions.[25] Table 1 lists the sectors and their average share in total labour compensation in our data. On average, these sectors represent 60% of total labour compensation in the OECD .[26]

[Table 1 about here.]

Table 2 provides summary statistics on the evolution of compensation shares during 2003-2005. Averages and standard errors have been obtained by regressing the variable of interest on a constant and reporting the coefficient on the latter, along with the standard error. We distinguish between Financial and Business Services (FBS; sectors 65t67 and 71t74) and non-FBS sectors. The main reason is that FBS sectors, which account for about one-third of the overall labour compensation in our data, have been reported to be the heaviest importers of services while they import little in the way of intermediate manufacturing goods (see Jensen (2011) for the US and Winkler (2009) for Germany). On the other hand, the manufacturing industries in the non-FBS sectors (sectors 15t16 to 34t35), which account for another one-third of the overall labour compensation in our data (and about one-half of overall labour compensation in non-FBS sectors), import both manufacturing and services intermediate inputs. Hence, both groups of sectors may be exposed to offshoring but with potentially different impacts on the labour market. For instance, we would expect MS workers to be relatively more harmed by service offshoring than by material offshoring in FBS sectors than in non-FBS sectors, where both MS and LS workers may be affected. Table 2 also shows that FBS sectors are much more skill and ICT intensive than non-FBS sectors. In both groups of sectors, the compensation of HS workers have significantly increased over time while those of MS and LS workers have stagnated or decreased. Furthermore, LS workers seem to have experienced larger changes in non-FBS sectors than in FBS sectors.[27] Finally, as ICT intensity in both sectors has decreased or stagnated, which implies that increased computerisation is unlikely to explain these trends.

[Table 2 about here.]

[25] The countries are Australia, Austria, Belgium, Germany, Denmark, Spain, Finland, France, United Kingdom, Ireland, Italy, Japan, Luxembourg, Netherland, Portugal, Sweden and United States.

[26] Our results are robust to the inclusion of sectors for which we never observe outbound FDI in our data.

[27] The trends are the same when we only consider manufacturing in non-FBS sectors.

3.3 Outward GFDI data

Our GFDI data on capital investment, originally available at the firm level, come from *fDi Markets*, which is a commercial database tracking cross-border GFDI covering all sectors and countries worldwide since 2003.[28] This database has two unique features. First, it provides bilateral panel GFDI data with a wide coverage of countries and sectors, which allows us to match it with the sectoral KLEMS database and distinguish FDI by destination countries. Second, and crucially for this paper, it also classifies projects by function. Thus, although we cannot control for the tasks performed by home workers, this gives us a rough ability to control for the tasks that are offshored. We aggregate eleven of these functions f into six main groups:

1. *BB Services [BS]*: Business to Business professional services (e.g.: consultancy, marketing, legal, financial services, recruitment).
2. *Support Services [SS]*: Customer Support Centres (e.g.: call centres); Sales; Marketing and Support Centres (e.g.: sales and support office); Shared Service Centre (e.g.: accounts processing, HR/payroll processing, back-office activities).
3. *Knowledge Services [KS]*: Design, Development and Testing (e.g.:technology centres, application centres, testing centres); Education and Training (e.g.: internal training centre); National or Regional Headquarters; Research and Development.
4. *Infrastructure Services [IS]*: ICT Infrastructure (e.g.: broadband infrastructure, Internet data centres, data recovery centres); Logistic, Distribution and Transportation (e.g.: logistics hub, distribution centre).
5. *Manufacturing Activities [MAN]*: Production or processing of any good (e.g.: manufacturing plant, processing plant, production facility).
6. *Retail [RET]*: Any retail operation (e.g.: opening of a store/agency).

Hence, our GFDI figures correspond to the total value of the capital investments in new (greenfield) projects made abroad in function f by MNEs headquartered in country c into sector s at time t.[29] As illustrated in Figure

[28]fDi Markets can be found at http://www.fdimarkets.com/ and are notably the exclusive source of GFDI data for the UNCTAD World Investment Report (e.g. UNCTAD, 2006). The limitations on the start date of these data limit our time period.

[29]Different studies measure FDI in differently depending on data availability. Several, including Braconier and Ekholm (2000), Becker, Ekholm, Jackle, and Muendler (2005), and Konings and Murphy (2006), use a function of the wages in the host country (or

1, GFDI is dominated by manufacturing, followed by retail and infrastructure services. Further, GFDI, unlike M&A FDI, is concentrated in the developing countries.[30] If this is more closely aligned to vertical motivations, this then suggests that any skill upgrading effects may be more observable in these data than in aggregated FDI data. Note that it is by definition a flow variable, i.e. the change in the stock from $t-1$ to t, therefore we do not first difference it in equations (3) and (4) because, following others, the stock of GFDI activity would be an element of z in (2). We deflate these values using the value added deflators reported in the EU KLEMS database and we normalise them by expressing them as a percentage of the last period's value added. Our variable of interest is therefore equal to $100 * \frac{GFDI_{f,s,c,t}}{Y_{s,c,t-1}}$, a proxy of the change in the GFDI intensity of sector s in country i, so that $\Delta GFDIINT_{f,s,c,t} = 100 * \frac{GFDI_{f,s,c,t}}{Y_{s,c,t-1}}$. We will show that our results are robust to alternative measures of changes in GFDI intensity. We similarly normalise our import data, making *IMPORTS MAN* or *IMPORTS ALL* a measure of the broad offshoring intensity of a sector. Following other studies, our import variables are first-differenced in equations (3) and (4).

[Figure 1 about here.]

Table 3 gives descriptive statistics, again distinguishing between FBS and non-FBS sectors. Once again, averages and standard errors have been obtained by regressing the variable of interest on a constant and reporting the coefficient on the latter, along with the standard error. The average normalised GFDI outflows in non-FBS sectors is much larger than in FBS sectors, partly due to the fact that the range of functions in non-FBS FDI is much more restricted than for FBS. By their very nature, FBS sectors tend to invest in services (*BS*, *SS*, *KS*) whereas non-FBS sectors, despite having a clear preference for (manufacturing) functions related to the production, distribution and sale of goods (*IS*, *MAN*, *RET*), nevertheless invest in several service functions. For instance, normalised GFDI outflows in SS are greater in the manufacturing non-FBS sectors than in FBS sectors. Finally, in both groups, GFDI has been equally distributed between developed and developing countries.[31] An exception are manufacturing activities, which are predominantly located in developing countries, as these

the average across hosts). Others, such as Head and Reis (2002), Hansson (2005), Mariotti, Piscitello, and Elia (2010), and Elia, Mariotti, and Piscitello (2009) use information on the number of overseas workers. Our FDI measure is closest to the use of capital stock (Slaughter, 2000) and the dummy variable for whether a firm engages in FDI or not (Castellani, Mariotti, and Piscitello, 2006).

[30]Thus, to the extent that the correlation here is weaker than one might imagine, it may to a degree shield our estimates to the omission of M&A FDI.

[31]We group the destination countries into developed or developing countries, based on the World Bank definition *circa* 2000. The income classification can be found at http://nyudri.org/resources/global-development-network-growth-database/

countries probably enjoy a labour cost advantage over more advanced countries.

[Table 3 about here.]

In line with our previous discussion, two conditions are required for outbound GFDI to exert an impact on relative labour demands (in the absence of a scale effect): the skill intensity of the foreign and remaining domestic activities must differ and the GFDI must have vertical features. Under these conditions, GFDI will generally lead to a rise in intermediate material and service inputs which substitute for a given category of workers. Functions *BS*, *SS*, *KS* and *MAN* are anecdotally the most likely to meet this criteria. Among them, *SS* is the most promising. Its definition is tightly linked to the back and front office services that are traditionally offshored for efficiency-seeking purpose and outbound GFDI in this function is present across sectors. On the other hand, the magnitude of GFDI in *BS*, *KA* and *MAN* is more sector-specific and their purpose may be to serve the local market of their host countries. For instance, the US BEA reports that in 2004, only 11% of the sales of goods of the manufacturing majority-owned foreign affiliates of US MNEs were exported to their US parents, while the corresponding number for the sale of services by majority-owned foreign affiliates in the finance industry is 7%.[32] Hence, we expect that the evidence for a short-run impact of outbound GFDI on the labour markets of OECD countries will be the strongest for the *SS* function and may be weak or non-existent for the other functions.

Although our compensation data limit the time horizon of our analysis, our GFDI data cover the 2003-2010 period. Figure 2 summarises the evolution of the volume of total outbound GFDI done by firms located in our seventeen OECD countries over the 2003-2010, distinguishing by function and destination.

[Figure 2 about here.]

In terms of pure size, the picture provided by Figure 1 or Figure 2 are very similar, with manufacturing being the predominant function offshored in-house. However, over the 2003-2010 period, the functions SS and BS are those which have generally experienced the highest yearly growth and the largest shift towards developing countries. Furthermore, its sustained rise over time suggests that the offshoring of this function on home labour

[32] See http://www.bea.gov/international/usdia2004f.html

markets has not vanished post-sample period, consistent with the emergence in recent years of a debate on the number of service-sector jobs susceptible to be offshored (e.g. Blinder, 2006) and the relatively high economic impacts that we have found despite the small size of yearly GFDI flows in SS relative to sectoral value added. Finally, the shift of GFDI in SS and BS towards developing countries makes likely that the effects of GFDI estimated below for these two functions have increased post-sample period, as more GFDI was done after 2005 in countries presumably relatively abundant in MS workers.

4 Empirical results

4.1 Baseline results

We start the presentation of our results by investigating the effects of outbound GFDI on the labour market of home countries without distinguishing by destination countries. Results are given in Table 4 where again the compensation shares are the dependent variables. In the first column, we explicitly control for country-fixed effects in our first-differenced equations ($F - DIFF$). In the second column, we further control for industry-country-specific time trends by again differencing our equations in first differences ($D - DIFF$, for double differencing); this will be our baseline specification. In the third column, we investigate whether GFDI in some functions may have a larger impact in sectors intensive in those functions by simultaneously including an interaction between GFDI in Business Services and a dummy equal to one for the Financial and Business Services sectors and an interaction between GFDI in manufacturing and a dummy equal to one for the manufacturing sectors. In the fourth column, we include imports of manufacturing goods for sector s from the EU KLEMS database. Note that this limits the sample to manufacturing sectors. Column 5 reintroduces the services sectors by combining the EU KLEMS manufacturing imports with the Trade in Services services imports. With these trade variables, we attempt to control partly for foreign outsourcing (which includes activities not undertaken via domestically owned GFDI). In the sixth column, we revert to a specification with country-fixed effects and lag our GFDI variables by two periods ($GFDI$ in $t - 2$). Given the short dimension of our panel, lagging the GFDI variables prevent us from including industry-country fixed effects. Finally, in the seventh column, we also control for current and lagged imports of goods and services.

Across specifications, GFDI in *SS* (Support Services) has a consistent and statistically significant influence on relative labour demands. GFDI in *SS* tends to increase the relative demand for HS workers, to decrease the relative demand for MS workers, and, in some regressions, to have a small negative impact on LS workers. These effects are consistent with GFDI in *SS* displacing domestic production of the routine, offshorable tasks previously done by MS workers in the home country. Using for illustrative purpose the average values given in Tables 2 and 3 and the 'high' estimates of column (5) of Table 4, the yearly GFDI in SS could potentially explain as much as 7% of the yearly rise in the compensation share of HS workers over the 2003-2005 period, 29% of the decline in the compensation share of MS workers and a modest 1.4% of the fall in the compensation share of LS workers.[33] In absolute terms, the yearly change in compensation share induced by GFDI in SS would be 0.04 percentage points (p.p.) for HS workers, -0.04 p.p. for MS workers and -0.01 p.p. for LS workers. Considering the low relative size of GFDI flows in SS, about 0.10% of a given sector's value added, these predicted effects appear large relative to the small size of GFDI. Furthermore, the use of lagged values of $GFDI$ suggest that the effects of GFDI in SS are not the outcome of a simultaneity bias as the coefficient on GFDI in SS remains statistically significant. The coefficient is also larger, suggesting that the effects of GFDI in SS may grow over time. However, given that these regressions rely on only one period of differenced data and do not implicitly control for industry-country specific effects, we are hesitant to make strong claims on the potential dynamic effects of GFDI.

GFDI in most other functions does not appear to have a statistically significant impact on compensation shares. Only GFDI in *RET* (Retail) tends to be statistically significant across regressions. Puzzlingly, the coefficient of the 'short-run' effects of columns (2)-(5) changes sign when using lagged GFDI values. Besides more mundane reasons, such as an omitted variable bias, a possible explanation is that different groups of workers are affected by the offshoring of the retail function at different points in time. When firms invest in their own distribution networks instead of using the services of a local sales agent, MS domestic managers may be negatively affected first, followed two years later by the domestic HS managers when the transfer of upper-level management to the foreign retail unit takes place. This would explain the short-run negative impact on MS workers in columns (2)-(5) and, in columns (6)-(7), the negative impact on HS workers occurring

[33] To obtain these, note that for example, $\frac{(0.10*0.433)}{0.613} = .07$.

simultaneously with the non-skill specific positive impact on MS and LS workers.

[Table 4 about here.]

The above descriptive statistics indicate that the volume of GFDI in some functions differs greatly between user industries. For instance, GFDI in *BS* (Business Services) unsurprisingly tends to occur in the FBS sectors while GFDI in the *MAN* (Manufacturing) and *RET* functions tends to take place in non-FBS sectors. In column (3), to investigate whether GFDI in some functions may have a larger impact in sectors intensive in those functions, we interact GFDI in the BS function with a FBS sector dummy, and GFDI in the MAN function with a MAN sector dummy.[34] In both cases, we cannot reject the null hypothesis that the slopes are homogeneous across sectors for the BS and MAN functions. In agreement with our conceptual framework, this suggests that the relative skill intensity of outbound GFDI in BS and MAN functions does not differ from the skill intensity of the domestic activities in the FBS and MAN sectors respectively, leaving relative demands and relative wages unchanged in those sectors. This might be the case if these investments are driven by non-wage factors, such as a relatively low foreign corporate tax rates. Alternatively, this lack of impact may result from a predominantly horizontal orientation of GFDI in both sectors.

One concern when using GFDI as the sole measure of globalisation is that the GFDI variables may be correlated with overall offshoring, including that done through outbound MNEs and that outsourced to foreign producers. If that is the case the effects on the home labour market of transferring a function abroad but keeping it in-house may be confounded with those of contracting out this function to a foreign entity. As such, the coefficients on our GFDI variables may suffer from an upward or downward bias depending on the relative effects of these two types of globalisation. To control for this possibility, columns (4) and (5) include imports of industry s's goods (including final and intermediates) relative to $t-1$ value added in s.[35] Column (4) uses import data from the EU KLEMS database alone (*IMPORTS MAN*) and therefore limits the sample to manufacturing sectors. In column (5), we combine the EU KLEMS with data for the manufacturing sectors with intermediate services imports from the Trade in Services database, creating a variable *IMPORTS ALL* which allows us to

[34] Note that this is a comparison across home workers employed in the two sectors, not differentiating between the sectors of a firm undertaking the FDI (something, unfortunately, our data do not permit us to do as FDI measures investment *into* sector s, not the sector of the firm making the FDI).

[35] An added benefit of this is that, as total FDI and trade are correlated, this can help to control for M&A FDI which, unfortunately, we cannot directly control for due to data unavailability.

include all seventeen sectors. Columns (4) and (5) show that including these trade variables do not change our main results, with little impacts on the coefficients on our GFDI variables.[36] If anything, the coefficients on GFDI in the SS function slightly increase, suggesting that outbound GFDI in SS and foreign outsourcing are correlated but have different impacts on home labour markets, potentially because the relative skill intensity of the activities transferred abroad in-house are different from those outsourced to a foreign independent supplier. We will discuss this possibility in detail in Section 5, only noting here that the negative impact of trade on the compensation share of HS workers concomitant with a (MS-biased) positive impact on MS and LS workers would suggest that imports of goods and services tend to be overall HS-intensive and are substitutes to HS workers.[37] However, when we include the contemporaneous values of total trade and the lagged values of total trade in column (7), we find no significant impact for HS or MS workers. For LS workers, trade seems to exert a statistically significant but ambiguous effect depending on whether attention is focused on current or lagged values. One interpretation to the positive impact in the short-run and the negative impact two years later is that the effect of higher trade on the compensation share of LS workers is transitory and tends to vanish over time. Overall, our results are robust to the inclusion of the trade variables, the effects of which are not clear-cut.

Table 5 reports the coefficients on the control variables. Surprisingly, a rise in the share of ICT capital in total capital compensation (ICT), seems to have a negative, albeit very small, impact on HS workers. Looking at Table 2, this negative correlation may arise the fact that the compensation share of HS workers increased over the 2003-2005 period despite the stagnation or the relative decline of ICT. This inverse relationship is particularly strong in FBS sectors. Alternatively, Antras, Garicano, and Rossi-Hansberg (2006) suggest that, through technological improvement, a single manager can effectively manage a larger number of workers. This would lead to a potential decline in the share of compensation going to the manager if the rise in underlings is sufficiently large. In any case, while it unclear whether technological change has ceased to be skill-biased, our estimates indicate that a lack of technological change, at least when proxied by the ICT variable, does not seem to have hindered the rise of the share of HS workers in total compensation.

[Table 5 about here.]

[36]Similar results are achieved when we restrict our sample to non-manufacturing sector.

[37]Lawrence (2008) calculates that US imports in 2005 tend to be concentrated in relatively high-wage US manufacturing industries and that over the 2000-2005, it is mostly MS and HS workers which have been displaced by trade.

Theory implies that the cost function must be concave in the wages of the three groups of workers. Following previous research, we checked concavity in the prices of these factors by investigating whether the own-wage elasticities are non-positive. Based on the coefficients on the wage terms, and calculating own-wage elasticities, evaluated at the sample mean of the skill-specific compensation shares ($\overline{WSH}^i$), as $\epsilon^i = \frac{\beta_1^i}{\overline{WSH^i}} + \overline{WSH^i} - 1$, we did not find that the own-wage elasticities are statistically greater than zero.[38] Finally, the coefficients on value added (Y) and capital (K) are not statistically significant. This absence of statistically significant impacts may be due to measurement errors exacerbated by differencing highly persistent variables (Griliches and Hausman, 1986).[39]

In unreported results, we verified that our baseline results are robust to potential outliers in our GFDI intensity variable. First, we replaced our initial GFDI intensity variable by the transformed values of GFDI flows using an inverse hyperbolic sine (IHS) transformation, to reduce the influence of large values, and the logarithmic values of the $t-1$'s value added, to control for scale. Second, in the same econometric model, we replaced the IHS-transformed values of GFDI flows with the IHS-transformed cumulated number of GFDI projects, giving in that way equal weight to large and small projects. Finally, we employed robust-to-outlier regression methods. The qualitative nature of these alternative approaches was identical to what is presented here. These results are available on request.

4.2 Distinction by destination country

We have previously argued that if outbound GFDI in some functions has a similar skill intensity to the home activities (which should be the case if it is horizontal), this may explain the absence of an impact of GFDI on the labour markets.[40] This may be particularly pertinent for GFDI in the *MAN* function. One way of investigating this is to distinguish between GFDI going to developed countries and GFDI going to developing countries (i.e. by decomposing our GFDI variable into two variables, differentiated by the destination of the GFDI). We

[38]Results are available upon request. As we explain in footnote 19, the wage terms are potentially endogenous, resulting in inflated own-wage elasticities. We show in section 4.3 that our results are robust to the omission of these wage terms, and we report that controlling for their endogeneity results in much 'more negative' own-wage elasticities.

[39]Crinò (2012) also frequently fails to find a statistically significant impact of K on compensation. However, its use of a within estimator and greater time-dimension allows him to obtain much more precise estimates for the impact of Y.

[40]In their study of Swedish intermediates imports, Ekholm and Hakkala (2006a) find that failing to distinguish between imports from high and low income countries results in insignificant estimates.

expect GFDI going to the latter group of countries to have a stronger impact on compensation shares as those host nations should have different relative skill endowments from our developed home countries, therefore attracting GFDI in activities that are relatively LS intensive relative to what remains in the home country. In addition, the potentially smaller local markets of these countries may limit market-seeking horizontal GFDI. This distinction by destination countries is carried out in Tables 6 to 8, with Tables 6, 7, and 8 presenting the results for the HS, MS, and LS workers respectively.

[Table 6 about here.]

[Table 7 about here.]

[Table 8 about here.]

Across tables, the results suggest that GFDI in most functions is indeed horizontal, as even GFDI to developing countries does not seem to have a significant impact on compensation shares. Nevertheless, we do find significant effects for some functions. In particular, GFDI in *SS* results in *polarised* skill *upgrading* but this effect appears much stronger when GFDI in this function is located in a developing country. In addition, GFDI in this function in a developing country also lowers the compensation share of LS workers. This underlines how differences in relative skill intensity is a second and necessary condition for GFDI to have an impact on home relative labour demands. In particular, the developing country pattern matches that found by Ekholm and Hakkala (2006a) who find polarised skill upgrading from Swedish imports. In contrast, however, we find the same for GFDI into developed countries whereas they find that imports from those nations increase relative MS compensation but lower HS compensation. Using for illustrative purpose the average values given in Tables 2 and 3 and the estimates of column (5) of Table 6 and 7, the yearly GFDI in SS in developing countries could explain 5% of the yearly rise in the compensation share of HS workers over the 2003-2005 period and 20% of the decline in the compensation share of MS workers and 0.04% of the fall in the compensation share of LS workers. In absolute terms, the respective values for the percentage points (p.p.) change in compensation shares are 0.03 p.p. for HS workers and -0.03 p.p. for MS workers, with virtually no absolute impact on LS workers. These values imply that GFDI in SS to developing countries account for more than two-thirds of the overall effects on relative labour demands that we previously found when we did not distinguish by destination.

In addition, disaggregating by destination unveils other patterns. Focusing on GFDI on columns (6) and (7) of Tables 6 to 8, i.e. when we allow time for the effects of GFDI in a given function on relative labour demands to occur, and keeping in mind the caveats that we previously evoked regarding these regressions, we observe a series of interesting patterns for GFDI that indicate differences between that destined for developed and developing countries. For example, *IS* GFDI in a developing country results in polarised skill upgrading whereas that into a developed country has the opposite effect. This would be consistent with *IS* in a HS abundant country replacing HS workers at home whereas that in a less skilled host increases relative demand for HS workers. Given that opposite effects occur depending on the destination of GFDI, effectively offsetting each other, this explains why we did not previously find a statistically significant of GFDI in this function on relative labour demands. Similar differences between the estimates for developed and developing countries are also found in *KS*, where GFDI in a developed country benefits HS workers whereas that in a developing country benefits MS workers with no impact on LS workers in either case. GFDI in the *RET* function in developed countries tends to result in *generalised* skill *downgrading* with a negative impact on HS workers, an insignificant effect on MS workers and a positive impact on LS workers. This would be consistent with easy access to a large pool of suitable foreign managers for the *RET* function in developed countries. In contrast, we find no effect on any group for *RET* in developing countries. Together, these results indicate that the results for *RET* in Table 4 are driven largely by the developed economies, which is not surprising given the size of their markets. Finally, note that for LS workers, we find a significantly positive impact from *MAN* in a developing country but a significantly negative effect for that in (another) developed country. Thus, by separating out hosts with different abundancies we are able to tease out additional effects that are not observed in the combined data.

Turning to the trade measures of offshoring, in columns (4) and (5) of Tables 6 to 8, the coefficients on the trade variables have lost both size and significance.[41] The main reason seems to be their correlation with GFDI in SS to developed countries ($r \approx 0.42$), whose coefficient also becomes insignificant in presence of our proxies of foreign outsourcing. The correlation of these two variables and the behaviour of their respective coefficients when they are jointly included support the idea that both GFDI in SS to developed countries and, to a greater extent, the imports of goods and services, are relatively HS-intensive. Thus, when forcing the effect

[41] Note that due to data limitations, we cannot decompose our import variable by exporting country.

of GFDI to be the same regardless of its destination, a part of the differential effect was being pushed onto the trade variables.

Overall this section has highlighted the importance of not only distinguishing GFDI by function but also by destination. In line with previous results, GFDI in the *SS* function appears to have the most robust impact on relative labour demands, especially when, as predicted by theory, it is between countries which differ in their relative skill endowments.

4.3 Testing for endogeneity

So far, we have tried to deal with the possibility of an omitted variable or simultaneity bias by controlling for industry-country fixed effects and industry-country specific time trends, adding additional control variables, and lagging our GFDI variables by two years. In this section, we go one step further by using the innovative IV approach proposed by Lewbel (2012) to control for a potential omitted variable bias. As explained in section 3.1, we use our control variables (excluding the time effects) in the construction of internally generated instruments. The IV estimator is the two-step efficient generalised method of moments (GMM) estimator. We focus on the 'short-run' double-difference regressions (columns (3) in most of our Tables) as the use of lagged values of GFDI in other regressions weaken considerably the link between the exogenous regressors and the scale heteroskedasticity in the distribution of the error terms, resulting in weak identification and ultimately unreliable estimates. Results are presented in Table 9. In columns (1)-(3), the results for the HS workers are reported, (4)-(6) reports the MS results, and (7)-(9) the LS results. The top half of the table gives results when combining the developed and developing countries with the bottom half separating by destination.

[Table 9 about here.]

Across specifications and tables, we observe that our main result, the statistically significant effects of outbound GFDI in SS on the compensation and employment shares of the different types of workers, especially when it is GFDI to developing countries, holds when we use this IV approach. The magnitude of the coefficients is very close to what we previously found, suggesting the absence of a strong endogeneity bias. This is confirmed by the endogeneity tests reported at the bottom of each table, which shows that we cannot reject the hypothesis that our GFDI variables are exogenous. In terms of the validity of our internally generated instruments, the Angrist-Pischke (AP) first-stage F statistics suggest that they are, in most cases, strongly relevant. However, in column (4) of Table 9, the absence of correlation of our instruments with the error terms is frequently rejected by the Sargan-Hansen test of overidentifying restrictions. A possible reason is that our relative wage terms are endogenous, as suggested by Berman et al. (1994), who also argue for their omission from the estimated equations. Indeed, once we omit these variables from our econometric model, the exogeneity of our instruments is no longer rejected by the Sargan-Hansen tests[42] and whatever the estimation method used, the non-IV or IV approach, our key results remain robust to the exclusion of the relative wage terms.[43] Finally, in some regressions, the coefficients on outbound GFDI in functions different from SS are statistically significant, particularly for RET. However, these results appear fragile as they are heavily influenced by the estimation method used. Thus, these estimates suggest that our previous 'short-run' results have not been strongly affected by an endogeneity bias, in the form of an omitted variable(or measurement error).

4.4 Does the distinction by function matter?

Before comparing our results with those of previous research, we investigate in this subsection the benefits of having access to our data on outbound GFDI by function. As mentioned above, if the tradability of tasks is key to understanding polarisation, it is important to see what using function allows us to observe that aggregate GFDI does not. To this end, we re-estimate our regressions using the normalised sum of GFDI in sector s of country c at time t as the variable of interest, using compensation shares as our dependent variables. In columns (1)-(3), we do not distinguish by destination, whereas we do so in columns (4)-(6). Table 10 shows that our results would have been much different if we did not have any information about the functions of GFDI, as is true in other studies using industry-level data. Based on the estimates of columns (1)-(6), we would have concluded that GFDI does not have any impact on relative labour demands in the source countries, except when it is located in developed countries. The same conclusions would have been reached using employment shares as

[42] This difference of outcomes is very encouraging with respect to the power of our test of overidentifying restrictions. The Sargan-Hansen tests appear to have correctly signalled as endogenous the variables precisely identified by the literature as most likely to fail the exogeneity assumption.

[43] In unreported regressions, using our IV approach, we instrumented the relative wage terms, in addition to the GFDI variables. Interestingly, we find lower estimates, suggesting an upward simultaneity bias. With these new values, the own-wage elasticities remain negative and larger (in absolute values) and reach a higher level of statistical significance.

our dependent variables. The difference between the results of Table 10, which are evidently suffering from an aggregation bias, and our previous results, based on data disaggregated by function, highlights the importance of using the latter to investigate the impact of outbound GFDI on relative labour demands, particularly for GFDI destined to developing countries.

[Table 10 about here.]

4.5 Contrasting in-house offshoring and broad offshoring

In a work closely related to ours, Crinò (2012) investigates the impacts of broad service and material offshoring on relative labour demands. He finds in both cases that offshoring raises the relative labour demands of HS and MS workers, at the expense of LS workers.[44] For service offshoring, he concludes that, between 1990, and 2004 "*service offshoring may have caused the wage bill shares of high- and medium-skilled workers to rise by 0.02 p.p. and that of low-skilled workers to fall by 0.04 p.p.*" (p.52). Our results for in-house service offshoring diverge from these findings, in terms of magnitude and signs. For comparison, based on the estimates of column (5) of Table 4, we find that, on average, GFDI in SS have led to a yearly increase in the compensation share of HS workers of about 0.04 p.p. between 2003 and 2005, i.e. a yearly impact 14 times larger than what Crinò (2012) finds. More importantly, we find that GFDI in SS has a negative impact on the compensation share of MS workers and little impact on that of LS workers. Hence, it appears that the impact of imported service inputs on relative labour demands strongly differ depending on whether offshored services can be both outsourced and done in-house through GFDI or are uniquely done in-house.

These differences can arise from several sources. First, Crinò's time horizon is earlier than ours and, given the trends in Figure 2, were potentially a period with more limited services offshoring. Further, Crinò (2012) reports that about 85-90% of service imports of the 13 OECD countries in his sample come from other developed countries, relatively more intensive in HS service workers than developing countries. He also finds evidence for a "skill-complementarity argument", whereby high skill-intensive foreign services complement

[44]Note that, to a certain extent, these findings are at odds with ours when including the trade variables. In Table 4, we find that higher trade in goods and services raises the relative demands of MS and LS workers at the expense of HS workers. However, once we distinguish GFDI by destination, coefficients on the trade variables becomes small and statistically not significant. Further, in unreported results not including GFDI, we find that the impact of trade is significantly different from our presented results, suggesting, as we previously argued, that trade variables picked up some of the effects of GFDI in SS to developed countries. Finally, both sets of results are not truly comparable due to differences in countries, time, and trade data sources.

with domestic labour, especially HS and MS workers. In contrast, developing countries figure far more heavily in our GFDI data, particularly in SS. If this function is MS intensive, this suggests the hosts of this FDI are potentially relatively more abundant in MS. In addition, in unreported results using the same methodology as Crinò (2012), we find that the impacts of GFDI in SS on conditional absolute labour demands (using the log of the number of hours worked by a given skill group and still holding capital and output fixed), weigh more in favour of the traditional "specialisation argument", as we find that in-house service offshoring in SS substitutes to MS workers and leads home firms to concentrate on HS-intensive activities. Hence, differences in the skill intensity of the main exporters of services between the two studies may explain why our results differ from those of Crinò (2012). The last important difference between Crinò's (2012) results and ours concerns the impact of material offshoring. In contrast to Crinò, we do not find in-house material offshoring, proxied here by GFDI in MAN, exerts any impact on relative labour demands. It could be argued that foreign projects in MAN take more time to come 'on-line' than foreign projects in SS but we still fail to find any effect when we use lagged values of our GFDI variables. It is possible that the main labour demand shifts related to the offshoring of manufacturing activities took place before our period of investigation (but during Crinò's) and that now GFDI in MAN is much more 'horizontal' (market-seeking) than 'vertical' (efficiency-seeking).

5 Conclusion

The goal of this paper was to contribute to the debate on offshoring and skill upgrading by using a proprietary data set on GFDI for a number of source OECD countries. In contrast to M&A FDI, these data are likely to be more tightly linked to the decision of whether to do activities locally or overseas based on relative factor prices and therefore to the possibility of skill upgrading. We are also able to distinguish between the various functions that firms offshore. These offshored functions are likely to diverge in skill intensity and motivation, with ultimately different repercussions of GFDI on home labour markets, depending on the part of the valued added chain located abroad. Finally, we know the destination of the GFDI. Taking into account international differences in relative skill endowments seems important to assess the skill intensity and orientation of the function offshored. Our analysis results in several insights.

First, our empirical analysis demonstrates that it is extremely important not to treat outbound GFDI as a homogeneous bundle of foreign activities. Indeed, a failure to distinguish FDI by function would have led us, like the other studies surveyed in Navaretti and Venables (2006), to conclude that the foreign activities of MNEs cannot explain the average skill upgrading that has been observed in OECD countries over the last decade. Once we do so, however, we find evidence that GFDI in support services (SS), e.g. back and front office services, have contributed to *polarised* skill upgrading. More specifically, we find that greater GFDI in this function increases the relative labour demand for high-skilled (HS) workers, decreases the relative labour demand for medium-skilled (MS) workers and has little impact on low-skilled (LS) workers. These results are consistent with Levy and Murane (2004) who contend that service offshoring can have the same polarisation effects as computerisation by substituting to the jobs occupied by MS workers, which tend to carry out routine and easily codified cognitive tasks. The lack of a consistent impact for GFDI in other functions suggests that they have little 'vertical' orientation or have similar skill-intensities as the remaining activities performed in the source country. Somewhat surprisingly, this conclusion also seems to hold for GFDI in manufacturing activities.

Second, just as it can be problematic to aggregate GFDI with different functions, it is important to distinguish between destinations. The impact of GFDI in SS generates much larger and statistically significant shifts in relative labour demands when it is located in developing countries rather than in developed countries. This is in agreement with the idea that the observation of GFDI-induced changes in relative labour demands requires that significant differences in relative skill endowments and in economic development exist between the home and host countries. For MS workers, but not always for HS workers, GFDI in SS to both groups of countries appears to exert a consistent negative effect on relative and absolute labour demands. This suggests that the competition that MS workers face is not limited to workers from developing countries, as seemed to be previously the case for material offshoring.

Finally, as in other studies investigating the impact of global integration (be it through trade or FDI) on changes in the skill composition of labour demand, we find that the effects are relatively small, at the exception of those on MS workers; the yearly GFDI in SS could potentially explain as much as 29% of the decline in the compensation share of MS workers over the 2003-2005 period. Hence, although we find that the process of globalisation may have contributed to a polarisation of skill demands resulting in upper-tail inequality, our study nevertheless concludes that its effects are by no means the driving force behind the rising overall inequality observed in OECD countries. As such, calls for protectionism to reduce inequality are potentially misguided.

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Figure 1: Greenfield FDI by function and destination

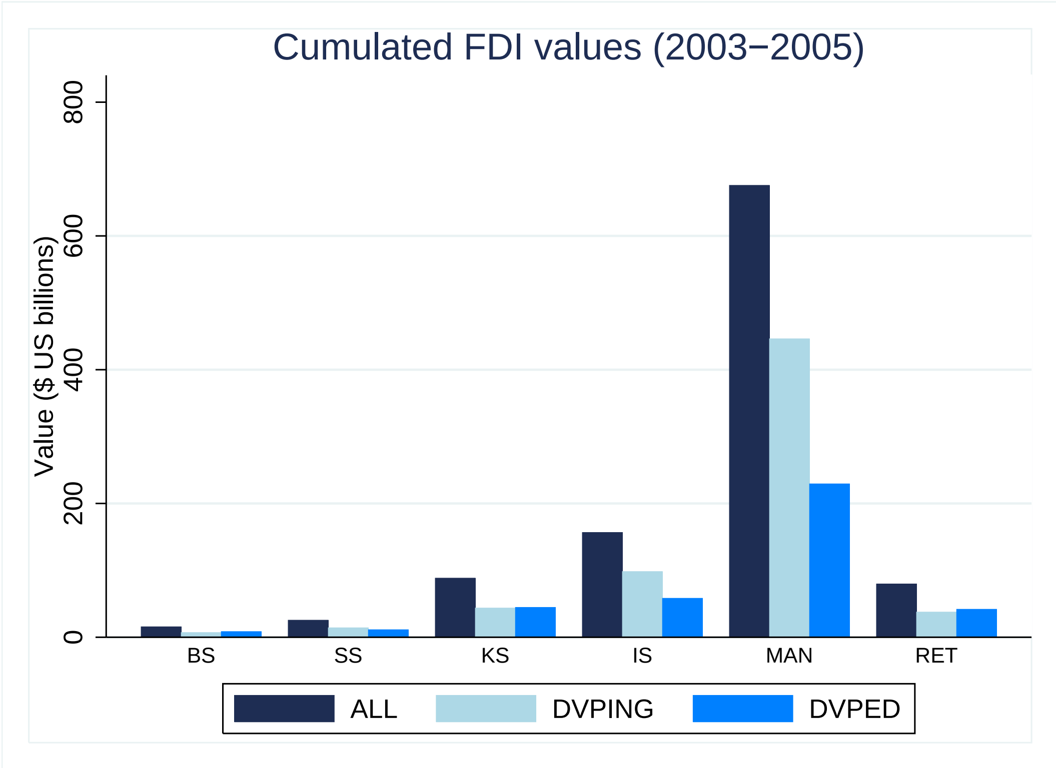
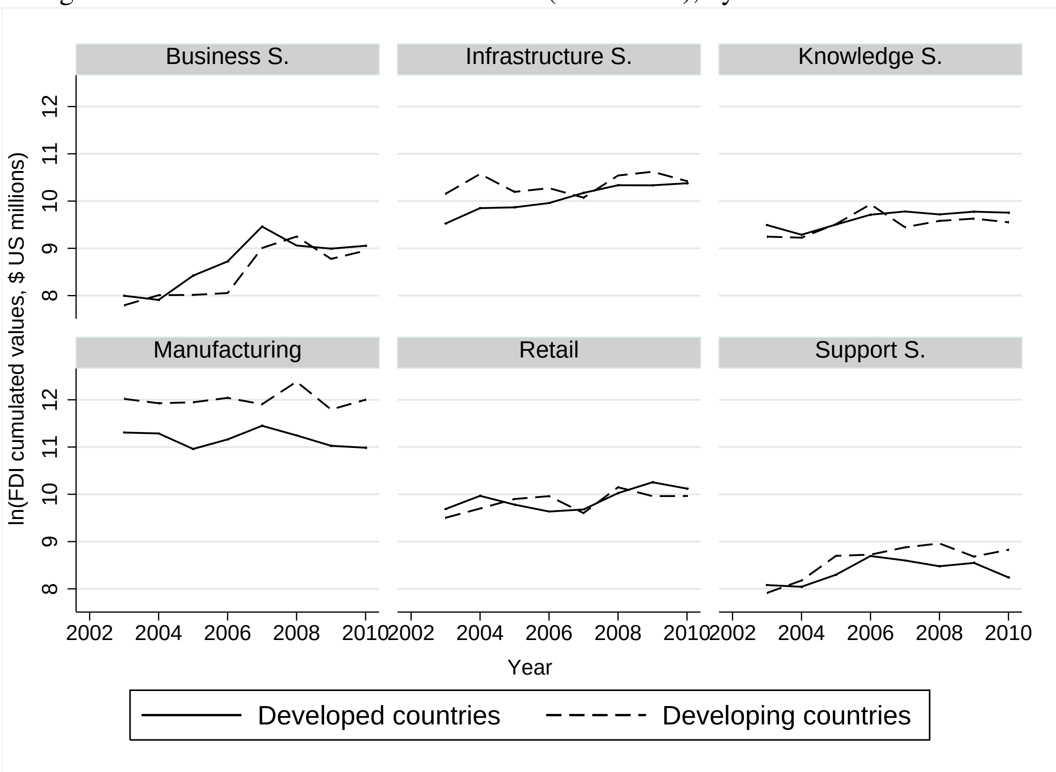


Figure 2: Evolution of the volume of GFDI (2003-2010), by function and destination



Notes: S: Services.

Table 1: Sectors

Broad ISIC sector	Definition	Average share in total compensation across OECD countries (2003-2005)
15t16	Food, beverage and tobacco	3
17t19	Textiles, textile products, leather and footwear	1
20	Wood and products of wood and cork	1
21t22	Pulp, paper, paper products, printing and publishing	3
23t25	Chemical, rubber, plastics and fuel	4
26	Other non-metallic mineral products	1
27t28	Basic metals and fabricated metal products	4
29	Machinery [mac], nec	4
30t33	Electrical and optical equipment [eqpt]	11
34t35	Transport equipment	4
52	Retail trade, except of motor vehicles and motorcycles	10
60t63	Transport and storage	7
65t67	Financial intermediation	8
70	Real estate activities	3
71t74	Renting of mac&eqpt and other business activities	20
H	Hotels and restaurants	4
N	Health and social work	13

Table 2: Evolution of compensation shares over 2003-2005

	(1) HS	(2) MS	(3) LS	(4) ICT
Average value	27.955***	54.982***	17.064***	19.070***
	(1.420)	(1.412)	(1.064)	(1.317)
Average value non-FBS	21.866***	58.246***	19.888***	13.669***
	(1.291)	(1.527)	(1.282)	(0.937)
Average value FBS	43.467***	46.665***	9.869***	32.830***
	(2.352)	(2.621)	(1.483)	(2.910)
Average yearly change	0.613***	-0.125	-0.488***	-0.094
	(0.107)	(0.102)	(0.051)	(0.142)
Average yearly change non-FBS	0.585***	-0.013	-0.572***	-0.156
	(0.071)	(0.076)	(0.064)	(0.212)
Average yearly change FBS	0.358	-0.054	-0.304***	-0.556*
	(0.441)	(0.422)	(0.103)	(0.315)

Notes: *** $p<0.01$ ** $p<0.05$ * $p<0.10$. Cluster-robust standard errors in parentheses. 'HS': High-Skilled, 'MS': Medium-skilled; 'LS': Low-Skilled workers. FBS: Financial and Business Services. Averages and standard errors have been obtained by regressing the variable of interest on a constant and reporting the coefficient on the latter, along with the standard errors.

Table 3: Outward GFDI flows normalised by sectoral value added (2003-2005), by function and destination countries

	BS (1)	SS (2)	KS (3)	IS (4)	MAN (5)	RET (6)	**ALL** (7)
All							
Average value	0.071***	0.100***	0.194***	1.857**	2.515***	0.559**	5.296***
	(0.023)	(0.030)	(0.034)	(0.885)	(0.678)	(0.231)	(1.312)
Average value non-FBS	0.006**	0.110***	0.229***	2.556**	3.495***	0.777**	7.173***
	(0.002)	(0.041)	(0.045)	(1.223)	(0.930)	(0.319)	(1.791)
Average value *MAN* in non-FBS	0.010**	0.220***	0.455***	4.599*	7.031***	0.708***	13.023***
	(0.005)	(0.081)	(0.081)	(2.475)	(1.847)	(0.218)	(3.467)
Average value FBS	0.238***	0.076***	0.104***	0.077**	0.017***	0.004	0.515***
	(0.083)	(0.012)	(0.023)	(0.031)	(0.006)	(0.002)	(0.101)
Developing world							
Average value	0.037**	0.056**	0.092***	1.336	1.812***	0.279**	3.611***
	(0.017)	(0.026)	(0.019)	(0.848)	(0.535)	(0.125)	(1.124)
Average value non-FBS	0.001***	0.063*	0.105***	1.849	2.521***	0.388**	4.929***
	(0.000)	(0.036)	(0.026)	(1.175)	(0.737)	(0.173)	(1.544)
Average value *MAN* in non-FBS	0.002***	0.127*	0.212***	3.392	5.106***	0.392**	9.230***
	(0.001)	(0.073)	(0.049)	(2.396)	(1.476)	(0.176)	(3.064)
Average value FBS	0.126**	0.036***	0.057***	0.030**	0.004*	0.001	0.254***
	(0.062)	(0.008)	(0.016)	(0.014)	(0.002)	(0.001)	(0.069)
Developed world							
Average value	0.035***	0.044***	0.102***	0.521**	0.703***	0.280**	1.685***
	(0.008)	(0.013)	(0.019)	(0.254)	(0.162)	(0.117)	(0.335)
Average value non-FBS	0.005**	0.046***	0.124***	0.708**	0.973***	0.389**	2.245***
	(0.002)	(0.018)	(0.026)	(0.352)	(0.220)	(0.162)	(0.455)
Average value *MAN* in non-FBS	0.009*	0.093***	0.243***	1.207*	1.926***	0.316***	3.793***
	(0.004)	(0.035)	(0.048)	(0.717)	(0.426)	(0.112)	(0.825)
Average value FBS	0.111***	0.040***	0.047***	0.047**	0.013**	0.003	0.260***
	(0.026)	(0.006)	(0.011)	(0.020)	(0.006)	(0.002)	(0.041)

BS: Business services; SS: Support Services; KS: Knowledge Services; IS: Infrastructure Services; MAN: Manufacturing; RET: Retail. FBS: Financial and Business Services. Averages and standard errors have been obtained by regressing the variable of interest on a constant and reporting the coefficient on the latter, along with the standard errors.

Table 4: Impact of outbound GFDI on compensation shares

	F-DIFF (1)	D-DIFF (2)	D-DIFF (3)	D-DIFF (4)	D-DIFF (5)	F-DIFF GFDI in $t-2$ (6)	F-DIFF GFDI in $t-2$ (7)
High skilled							
BUSINESS S.	0.147***	0.110	4.544*	3.964	0.111	0.299	0.287
	(0.055)	(0.196)	(2.746)	(2.449)	(0.196)	(0.251)	(0.254)
SUPPORT S.	0.161***	0.386***	0.387***	0.405***	0.433***	1.221*	1.287**
	(0.051)	(0.143)	(0.143)	(0.098)	(0.106)	(0.646)	(0.646)
KNOWLEDGE S.	0.191***	0.096	-0.010	0.052	0.095	0.098	0.106
	(0.063)	(0.096)	(0.107)	(0.112)	(0.097)	(0.077)	(0.081)
INFRASTRUCTURE S.	0.000	0.001	0.001	0.001	0.001	-0.003	-0.004
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.016)	(0.019)
MANUFACTURING	-0.000	-0.002	0.085	-0.002	-0.002	-0.001	-0.001
	(0.001)	(0.002)	(0.201)	(0.002)	(0.002)	(0.002)	(0.002)
RETAIL	-0.003	0.012	0.010	-0.001	0.011	-0.060***	-0.059***
	(0.004)	(0.012)	(0.012)	(0.007)	(0.012)	(0.013)	(0.013)
BS X FBS sector			-4.491				
			(2.749)				
MAN X MAN sector			-0.088				
			(0.201)				
IMPORTS MAN				-0.054***			
				(0.016)			
IMPORTS ALL					-0.049***		0.113
					(0.014)		(0.192)
IMPORTS ALL in $t-2$							-0.074
							(0.229)
Medium skilled							
BUSINESS S.	-0.185***	-0.136	-3.706	-3.612*	-0.136	-0.206	-0.188
	(0.065)	(0.148)	(2.468)	(2.048)	(0.148)	(0.169)	(0.177)
SUPPORT S.	-0.137***	-0.330***	-0.331***	-0.343***	-0.364***	-0.941*	-1.111**
	(0.035)	(0.117)	(0.117)	(0.084)	(0.089)	(0.540)	(0.527)
KNOWLEDGE S.	-0.086	-0.096	-0.010	0.035	-0.095	0.045	0.011
	(0.060)	(0.070)	(0.081)	(0.091)	(0.070)	(0.072)	(0.073)
INFRASTRUCTURE S.	-0.001	-0.001	-0.001	-0.001	-0.001	-0.006	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.020)	(0.025)
MANUFACTURING	0.001	0.002	0.022	0.002	0.002	-0.000	-0.000
	(0.001)	(0.002)	(0.279)	(0.002)	(0.001)	(0.001)	(0.001)
RETAIL	0.003	-0.018**	-0.016**	-0.012**	-0.017**	0.032***	0.030***
	(0.005)	(0.009)	(0.008)	(0.006)	(0.009)	(0.009)	(0.009)
BS X FBS sector			3.616				
			(2.470)				
MAN X MAN sector			-0.019				
			(0.279)				
IMPORTS MAN				0.041***			
				(0.014)			
IMPORTS ALL					0.036**		-0.291
					(0.014)		(0.180)
IMPORTS ALL in $t-2$							0.332
							(0.219)
Low skilled							
BUSINESS S.	0.037	0.026	-0.838	-0.351	0.026	-0.093	-0.098
	(0.040)	(0.062)	(0.559)	(0.617)	(0.062)	(0.141)	(0.139)
SUPPORT S.	-0.024	-0.056**	-0.056**	-0.062***	-0.069***	-0.280	-0.176
	(0.023)	(0.027)	(0.027)	(0.016)	(0.020)	(0.213)	(0.255)
KNOWLEDGE S.	-0.104***	0.000	0.020	-0.087	0.000	-0.143***	-0.116***
	(0.036)	(0.058)	(0.065)	(0.073)	(0.059)	(0.043)	(0.040)
INFRASTRUCTURE S.	0.001**	0.000	0.000	0.000	0.000	0.009	0.004
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.006)	(0.009)
MANUFACTURING	0.000	0.000	-0.107	0.001	0.000	0.002**	0.001*
	(0.001)	(0.001)	(0.117)	(0.001)	(0.000)	(0.001)	(0.001)
RETAIL	0.000	0.006	0.006	0.013	0.006	0.027***	0.030***
	(0.004)	(0.012)	(0.012)	(0.010)	(0.012)	(0.009)	(0.008)
BS X FBS sector			0.875				
			(0.563)				
MAN X MAN sector			0.107				
			(0.117)				
IMPORTS MAN				0.013***			
				(0.005)			
IMPORTS ALL					0.014**		0.178*
					(0.007)		(0.100)
IMPORTS ALL in $t-2$							-0.257**
							(0.118)
Observations	852	567	567	335	567	284	284

Notes: ***p<0.01 **p<0.05 *p<0.10. Cluster-robust standard errors in parentheses. F-DIFF: first-difference estimator. D-DIFF: double-difference estimator. S: services. Time fixed effects are included in all regressions. Country fixed effects are included in regressions (1), (6) and (7).

Table 5: Control variables

	F-DIFF	D-DIFF	D-DIFF	D-DIFF	D-DIFF	F-DIFF GFDI in $t-2$	F-DIFF GFDI in $t-2$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
High skilled							
ICT	-0.011***	-0.007**	-0.007**	-0.018	-0.007**	-0.035***	-0.035***
	(0.004)	(0.003)	(0.003)	(0.027)	(0.003)	(0.008)	(0.008)
$\ln(\frac{w^{HS}}{w^{LS}})$	20.884***	21.052***	21.063***	15.229***	21.086***	21.914***	21.889***
	(2.357)	(2.067)	(2.076)	(2.315)	(2.063)	(4.279)	(4.270)
$\ln(\frac{w^{MS}}{w^{LS}})$	-25.016***	-30.401***	-30.498***	-11.900*	-30.417***	-19.548***	-19.477***
	(6.519)	(4.999)	(4.985)	(6.991)	(5.004)	(5.258)	(5.279)
ln(Y)	-0.107	-1.558	-1.662	-0.225	-1.412	-1.124	-1.251
	(0.808)	(1.361)	(1.361)	(1.843)	(1.382)	(1.359)	(1.483)
ln(K)	0.010	0.021	0.030	-0.159	0.065	-0.120	-0.114
	(0.175)	(0.338)	(0.338)	(0.622)	(0.339)	(0.154)	(0.156)
Medium skilled							
ICT	0.005	0.004	0.004	-0.045	0.004	0.025***	0.026***
	(0.004)	(0.003)	(0.003)	(0.030)	(0.003)	(0.005)	(0.005)
$\ln(\frac{w^{HS}}{w^{LS}})$	-19.107***	-18.181***	-18.199***	-8.807***	-18.205***	-22.591***	-22.453***
	(2.153)	(2.476)	(2.478)	(2.734)	(2.472)	(3.762)	(3.689)
$\ln(\frac{w^{MS}}{w^{LS}})$	26.364***	30.326***	30.393***	10.409*	30.338***	20.032***	19.731***
	(5.572)	(4.543)	(4.539)	(5.938)	(4.546)	(4.827)	(4.807)
ln(Y)	-0.481	0.726	0.831	-0.934	0.620	-0.085	0.758
	(0.719)	(1.124)	(1.112)	(1.638)	(1.142)	(1.121)	(1.190)
ln(K)	0.073	0.125	0.115	-0.048	0.093	0.045	0.014
	(0.205)	(0.332)	(0.330)	(0.595)	(0.335)	(0.129)	(0.131)
Low skilled							
ICT	0.007**	0.003	0.003	0.063***	0.003	0.009*	0.009
	(0.003)	(0.002)	(0.002)	(0.019)	(0.002)	(0.005)	(0.005)
$\ln(\frac{w^{HS}}{w^{LS}})$	-1.777***	-2.871***	-2.864***	-6.422***	-2.881***	0.677	0.564
	(0.641)	(0.636)	(0.628)	(1.669)	(0.637)	(2.615)	(2.592)
$\ln(\frac{w^{MS}}{w^{LS}})$	-1.348	0.075	0.105	1.491	0.080	-0.483	-0.254
	(1.462)	(1.145)	(1.131)	(2.102)	(1.147)	(3.574)	(3.565)
ln(Y)	0.588	0.833	0.831	1.159	0.793	1.209**	0.493
	(0.503)	(0.679)	(0.677)	(0.907)	(0.686)	(0.609)	(0.693)
ln(K)	-0.083	-0.146	-0.145	0.207	-0.159	0.075	0.100
	(0.098)	(0.125)	(0.125)	(0.284)	(0.125)	(0.064)	(0.067)
Observations	852	567	567	335	567	284	284

Notes: ***p<0.01 **p<0.05 *p<0.10. Cluster-robust standard errors in parentheses. F-DIFF: first-difference estimator. D-DIFF: double-difference estimator. S: services. Time fixed effects are included in all regressions. Country fixed effects are included in regressions (1), (6) and (7).

Table 6: HS workers: Impact of outbound GFDI on compensation shares, by destination

	F-DIFF (1)	D-DIFF (2)	D-DIFF (3)	D-DIFF (4)	D-DIFF (5)	F-DIFF GFDI in $t-2$ (6)	F-DIFF GFDI in $t-2$ (7)
Developing countries							
BUSINESS S.	0.118	0.070	13.242	8.342	0.070	0.134	0.042
	(0.091)	(0.101)	(8.495)	(10.351)	(0.101)	(0.333)	(0.333)
SUPPORT S.	0.211***	0.526***	0.525***	0.481***	0.526***	2.596***	2.962***
	(0.016)	(0.018)	(0.018)	(0.017)	(0.018)	(0.837)	(0.845)
KNOWLEDGE S.	0.145	0.033	-0.114	-0.071	0.033	-0.128	-0.131
	(0.093)	(0.157)	(0.240)	(0.261)	(0.157)	(0.119)	(0.119)
INFRASTRUCTURE S.	-0.000	-0.001	-0.001	-0.000	-0.001	0.067**	0.082***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.026)	(0.026)
MANUFACTURING	-0.001	-0.001	0.177	-0.001	-0.001	-0.002	-0.002
	(0.001)	(0.001)	(0.193)	(0.001)	(0.001)	(0.001)	(0.001)
RETAIL	0.002	0.013*	0.014*	0.009	0.013*	0.078	0.083
	(0.006)	(0.008)	(0.008)	(0.006)	(0.008)	(0.089)	(0.092)
BS X FBS sector			-13.222				
			(8.497)				
MAN X MAN sector			-0.178				
			(0.193)				
Developed countries							
BUSINESS S.	0.254	1.416	4.144	4.190	1.418	0.533	0.585
	(0.445)	(1.078)	(2.621)	(2.576)	(1.078)	(0.636)	(0.636)
SUPPORT S.	0.063	0.105*	0.111	0.137	0.124	-0.646	-0.636
	(0.043)	(0.063)	(0.070)	(0.087)	(0.083)	(0.973)	(0.862)
KNOWLEDGE S.	0.223**	0.085	0.081	0.110	0.084	0.333**	0.404***
	(0.101)	(0.119)	(0.119)	(0.143)	(0.119)	(0.145)	(0.139)
INFRASTRUCTURE S.	0.005**	0.017***	0.015***	0.019***	0.017***	-0.025**	-0.038***
	(0.002)	(0.003)	(0.005)	(0.003)	(0.004)	(0.010)	(0.013)
MANUFACTURING	0.008	0.001	0.021	-0.005	0.001	0.028*	0.038**
	(0.005)	(0.009)	(0.263)	(0.010)	(0.009)	(0.016)	(0.016)
RETAIL	-0.011	0.005	-0.004	-0.040**	0.005	-0.170**	-0.169**
	(0.008)	(0.041)	(0.039)	(0.020)	(0.041)	(0.068)	(0.071)
BS X FBS sector			-3.121				
			(3.013)				
MAN X MAN sector			-0.021				
			(0.263)				
IMPORTS MAN				-0.019			
				(0.015)			
IMPORTS ALL					-0.007		0.371**
					(0.016)		(0.189)
IMPORTS ALL in t - 2							-0.382*
							(0.219)
Observations	852	567	567	335	567	284	284

Notes: ***p<0.01 **p<0.05 *p<0.10. Cluster-robust standard errors in parentheses. F-DIFF: first-difference estimator. D-DIFF: double-difference estimator. S: services. Time fixed effects and control variables (see Table 5) are included in all regressions. Country fixed effects are included in regressions (1), (6) and (7).

Table 7: MS workers: Impact of outbound GFDI on compensation shares, by destination

	F-DIFF	D-DIFF	D-DIFF	D-DIFF	D-DIFF	F-DIFF GFDI in $t-2$	F-DIFF GFDI in $t-2$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Developing countries							
BUSINESS S.	-0.182**	-0.123	-10.655	-2.713	-0.123	-0.057	0.096
	(0.086)	(0.105)	(7.748)	(9.130)	(0.105)	(0.195)	(0.188)
SUPPORT S.	-0.162***	-0.443***	-0.442***	-0.409***	-0.443***	-2.514***	-3.074***
	(0.019)	(0.018)	(0.018)	(0.016)	(0.018)	(0.791)	(0.784)
KNOWLEDGE S.	-0.052	-0.080	0.069	0.080	-0.080	0.221**	0.221**
	(0.094)	(0.154)	(0.228)	(0.250)	(0.154)	(0.094)	(0.092)
INFRASTRUCTURE S.	-0.000	0.000	0.000	-0.000	0.000	-0.089***	-0.115***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.033)	(0.027)
MANUFACTURING	0.001	0.001	-0.027	0.001	0.001	0.000	0.000
	(0.001)	(0.001)	(0.288)	(0.001)	(0.001)	(0.001)	(0.001)
RETAIL	-0.003	-0.012**	-0.012**	-0.011**	-0.012**	0.017	0.009
	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.097)	(0.107)
BS X FBS sector			10.577				
			(7.751)				
MAN X MAN sector			0.029				
			(0.288)				
Developed countries							
BUSINESS S.	-0.207	-0.477	-3.217	-3.663	-0.477	-0.275	-0.384
	(0.434)	(0.873)	(2.366)	(2.363)	(0.874)	(0.341)	(0.338)
SUPPORT S.	-0.086*	-0.098**	-0.103*	-0.108	-0.092*	0.983	0.970
	(0.044)	(0.050)	(0.054)	(0.068)	(0.054)	(0.862)	(0.734)
KNOWLEDGE S.	-0.112	-0.075	-0.071	0.027	-0.075	-0.101	-0.220*
	(0.124)	(0.118)	(0.117)	(0.114)	(0.118)	(0.149)	(0.126)
INFRASTRUCTURE S.	-0.004	-0.018***	-0.016**	-0.019***	-0.018***	0.019**	0.042***
	(0.003)	(0.005)	(0.006)	(0.003)	(0.005)	(0.009)	(0.011)
MANUFACTURING	-0.006	-0.003	0.063	-0.001	-0.003	0.008	-0.008
	(0.004)	(0.007)	(0.323)	(0.008)	(0.007)	(0.014)	(0.017)
RETAIL	0.013	-0.036*	-0.029*	-0.018	-0.036*	0.047	0.044
	(0.009)	(0.019)	(0.018)	(0.014)	(0.019)	(0.075)	(0.084)
BS X FBS sector			3.132				
			(2.645)				
MAN X MAN sector			-0.066				
			(0.323)				
IMPORTS MAN				0.010			
				(0.013)			
IMPORTS ALL					-0.002		-0.569***
					(0.015)		(0.164)
IMPORTS ALL in t - 2							0.665***
							(0.193)
Observations	852	567	567	335	567	284	284

Notes: $^{***}p<0.01$ $^{**}p<0.05$ $^{*}p<0.10$. Cluster-robust standard errors in parentheses. F-DIFF: first-difference estimator. D-DIFF: double-difference estimator. S: services. Time fixed effects and control variables (see Table 5) are included in all regressions. Country fixed effects are included in regressions (1), (6) and (7).

Table 8: LS workers: Impact of outbound GFDI on compensation shares, by destination

	F-DIFF	D-DIFF	D-DIFF	D-DIFF	D-DIFF	F-DIFF GFDI in $t-2$	F-DIFF GFDI in $t-2$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Developing countries							
BUSINESS S.	0.063	0.054	-2.587	-5.629**	0.054	-0.077	-0.138
	(0.049)	(0.070)	(2.036)	(2.717)	(0.069)	(0.218)	(0.223)
SUPPORT S.	-0.049**	-0.083***	-0.083***	-0.072***	-0.083***	-0.082	0.112
	(0.020)	(0.009)	(0.009)	(0.010)	(0.009)	(0.296)	(0.305)
KNOWLEDGE S.	-0.093	0.047	0.045	-0.009	0.047	-0.093	-0.090
	(0.073)	(0.073)	(0.109)	(0.076)	(0.073)	(0.105)	(0.104)
INFRASTRUCTURE S.	0.001	0.000	0.000	0.000	0.000	0.022	0.033
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.024)	(0.021)
MANUFACTURING	-0.001	0.000	-0.150	0.000	0.000	0.002***	0.002***
	(0.001)	(0.000)	(0.183)	(0.001)	(0.000)	(0.001)	(0.001)
RETAIL	0.001	-0.002	-0.002	0.002	-0.002	-0.094	-0.092
	(0.004)	(0.004)	(0.003)	(0.002)	(0.004)	(0.075)	(0.079)
BS X FBS sector			2.645				
			(2.034)				
MAN X MAN sector			0.150				
			(0.961)				
Developed countries							
BUSINESS S.	-0.047	-0.939**	-0.928	-0.527	-0.941**	-0.258	-0.201
	(0.185)	(0.368)	(0.769)	(0.512)	(0.367)	(0.401)	(0.404)
SUPPORT S.	0.022	-0.006	-0.008	-0.028	-0.032	-0.337	-0.333
	(0.017)	(0.020)	(0.021)	(0.030)	(0.047)	(0.482)	(0.536)
KNOWLEDGE S.	-0.111	-0.010	-0.009	-0.137	-0.010	-0.233***	-0.184**
	(0.068)	(0.083)	(0.083)	(0.100)	(0.083)	(0.078)	(0.078)
INFRASTRUCTURE S.	0.000	0.001	0.001	0.000	0.001	0.006**	-0.004
	(0.001)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.005)
MANUFACTURING	-0.001	0.002	-0.083	0.006	0.002	-0.036***	-0.030*
	(0.004)	(0.004)	(0.096)	(0.004)	(0.004)	(0.014)	(0.015)
RETAIL	-0.002	0.032	0.034	0.058***	0.032	0.123**	0.126*
	(0.009)	(0.038)	(0.037)	(0.015)	(0.038)	(0.062)	(0.064)
BS X FBS sector			-0.011				
			(0.183)				
MAN X MAN sector			0.086				
			(0.096)				
IMPORTS MAN				0.009			
				(0.007)			
IMPORTS ALL					0.009		0.197*
					(0.012)		(0.101)
IMPORTS ALL in t - 2							-0.283**
							(0.117)
Observations	852	567	567	335	567	284	284

Notes: ***p<0.01 **p<0.05 *p<0.10. Cluster-robust standard errors in parentheses. F-DIFF: first-difference estimator. D-DIFF: double-difference estimator. S: services. Time fixed effects and control variables (see Table 5) are included in all regressions. Country fixed effects are included in regressions (1), (6) and (7).

Table 9: IV estimations

	HS			MS			LS		
	IV	D-DIFF	IV	IV	D-DIFF	IV	IV	D-DIFF	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
All countries									
BUSINESS S.	0.095	0.154	-0.054	-0.211	-0.195	-0.254*	0.111*	0.042	0.094
	(0.313)	(0.167)	(0.202)	(0.187)	(0.128)	(0.152)	(0.066)	(0.069)	(0.103)
SUPPORT S.	0.440***	0.336***	0.446***	-0.390***	-0.278***	-0.331***	-0.057***	-0.057**	-0.096***
	(0.044)	(0.117)	(0.067)	(0.040)	(0.095)	(0.067)	(0.019)	(0.024)	(0.018)
KNOWLEDGE S.	0.210***	0.136	0.088	-0.177***	-0.134	0.050	-0.059	-0.002	-0.098**
	(0.079)	(0.115)	(0.074)	(0.068)	(0.107)	(0.089)	(0.036)	(0.057)	(0.049)
INFRASTRUCTURE S.	0.001	-0.001	0.001	-0.000	0.001	-0.002	-0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.000)	(0.001)
MANUFACTURING	-0.000	-0.003	-0.002	0.001	0.003	0.002***	0.000	-0.000	0.000
	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
RETAIL	0.013	0.009	0.007	-0.015	-0.015	-0.015	-0.002	0.006	-0.006
	(0.012)	(0.007)	(0.009)	(0.010)	(0.010)	(0.009)	(0.007)	(0.012)	(0.008)
Sargan-Hansen test p-value	0.123		0.220	0.0206		0.410	0.23		0.61
Endogeneity test p-value	0.553		0.71	0.4216		0.5244	0.07		0.80
AP weak id. p-value									
BUSINESS S.							14.03		7.82
SUPPORT S.							167.21		79.81
KNOWLEDGE S.							16.06		8.66
INFRASTRUCTURE S.							163.36		194.14
MANUFACTURING							614.54		539.72
RETAIL							5.99		8.41
Developing countries									
BUSINESS S.		0.154	0.142		-0.232	-0.140		0.077	0.091
		(0.154)	(0.115)		(0.204)	(0.098)		(0.108)	(0.062)
SUPPORT S.		0.435***	0.495***		-0.355***	-0.416***		-0.080***	-0.074***
		(0.027)	(0.061)		(0.030)	(0.050)		(0.010)	(0.015)
KNOWLEDGE S.		0.283	0.100		-0.324	-0.283		0.041	-0.075
		(0.257)	(0.206)		(0.241)	(0.216)		(0.074)	(0.097)
INFRASTRUCTURE S.		-0.003	-0.002		0.002	0.001		0.001*	0.001*
		(0.002)	(0.002)		(0.002)	(0.002)		(0.000)	(0.001)
MANUFACTURING		-0.002	-0.002*		0.002	0.002**		-0.000	-0.000
		(0.002)	(0.001)		(0.002)	(0.001)		(0.000)	(0.000)
RETAIL		0.013**	0.010**		-0.010*	-0.009***		-0.003	-0.002
		(0.005)	(0.004)		(0.005)	(0.003)		(0.004)	(0.004)
Developed countries									
BUSINESS S.		0.415	1.978*		0.909	-1.191*		-1.324***	-1.137***
		(2.124)	(1.062)		(2.148)	(0.689)		(0.402)	(0.401)
SUPPORT S.		0.130	0.024		-0.115	-0.034		-0.015	-0.010
		(0.091)	(0.074		(0.073)	(0.064)		(0.023)	(0.016)
KNOWLEDGE S.		-0.005	0.116		0.005	-0.007		-0.000	0.014
		(0.093)	(0.118)		(0.114)	(0.219)		(0.079)	(0.039)
INFRASTRUCTURE S.		0.011	0.009		-0.014	-0.024		0.002	0.007
		(0.009)	(0.042)		(0.010)	(0.033)		(0.002)	(0.010)
MANUFACTURING		-0.006	-0.004		0.004	0.002		0.001	-0.000
		(0.012)	(0.012)		(0.011)	(0.010)		(0.004)	(0.003)
RETAIL		-0.004	-0.033		-0.034	-0.016		0.037	0.055***
		(0.027)	(0.020)		(0.027)	(0.034)		(0.037)	(0.021)
Observations	567	567	567	567	567	567	567	567	567
Relative wages included	Y	N	N	Y	N	N	Y	N	N
Sargan-Hansen test p-value			0.660			0.591			0.39
Endogeneity test p-value			0.877			0.5244			0.85
AP weak id. p-value									
BUSINESS S.									32.74; 20.42
SUPPORT S.									11.23; 2376.09
KNOWLEDGE S.									6.97; 76.07
INFRASTRUCTURE S.									46.65; 56.02
MANUFACTURING									3914.27; 258.96
RETAIL									136.69; 73.95

Notes: ***$p<0.01$ **$p<0.05$ *$p<0.10$. Cluster-robust standard errors in parentheses. IV: instrumental variable double-difference estimator. D-DIFF: double-difference estimator. S: Services. Time fixed effects and control variables (see Table 5) are included in all regressions.

Table 10: Impact of aggregate outbound GFDI on compensation shares

	F-DIFF	D-DIFF	F-DIFF GFDI in $t-2$	F-DIFF	D-DIFF	F-DIFF GFDI in $t-2$
	(1)	(2)	(3)	(4)	(5)	(6)
High skilled						
All countries	0.000	-0.000	-0.002			
	(0.001)	(0.001)	(0.002)			
Developing				-0.000	-0.000	-0.001
				(0.001)	(0.001)	(0.002)
Developed				0.006***	0.011*	-0.017
				(0.002)	(0.006)	(0.017)
Medium skilled						
All countries	-0.000	0.000	0.000			
	(0.001)	(0.001)	(0.001)			
Developing				0.000	0.000	-0.001
				(0.001)	(0.001)	(0.001)
Developed				-0.005*	-0.013**	0.015
				(0.003)	(0.006)	(0.009)
Low skilled						
All countries	0.000	0.000	0.002**			
	(0.000)	(0.000)	(0.001)			
Developing				0.000	0.000	0.002
				(0.000)	(0.000)	(0.001)
Developed				-0.002	0.002	0.002
				(0.002)	(0.003)	(0.009)

Notes: ***p<0.01 **p<0.05 *p<0.10. Cluster-robust standard errors in parentheses. F-DIFF: first-difference estimator. D-DIFF: double-difference estimator. S: services. Time fixed effects and control variables (see Table 5) are included in all regressions. Country fixed effects are included in regressions (1), (3) ,(4) and (6).