The impact of skill endowments and trade unions on R&D greenfield FDI

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The paper distinguishes among three types of greenfield FDI, namely FDI in research activities, development and testing activities, and manufacturing activities, and brings forward the hypothesis that the characteristics of the domestic labour market influence the heterogeneity of greenfield FDI inflows. More specifically, we argue that along with country and industry specific factors, different types of greenfield FDI inflows are determined by the quality of labour and the labour market regulation, in terms of trade union density, wage dispersion and non-wage labour costs.

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1 Introduction

The long-term benefits of foreign direct investments (FDI) on productivity growth and employment awakened the interest of policy makers in the mechanisms and factors that could help a country to be an attractive location for multinational enterprises (MNEs) investments. Much of this attention has been dedicated to the role of labour skills and domestic labour market institutions. On the one hand, the knowledge capital models of the MNE (Carr et al., 2001; Yeaple, 2003) point at two main motives for firms to engage in FDI. First, as knowledge-intensive activities such as R&D can be geographically separated from production, the firms locate their R&D activities where skilled labour force is cheap and/or abundant. The role of high-level human capital as a key determinant of innovation-related foreign investments has also been highlighted by the R&D internationalisation literature (Narula and Zanfei, 2005; Dunning and Lundan, 2009; Moncada-Paternò-Castello et al., 2011; Rilla and Squicciarini, 2011, among others). Second, MNEs produce in multiple countries to avoid costs associated with international trade. In this respect, market size plays a critical role in determining the distribution of FDI, since

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international trade costs are proportional to the size of the market and to the scale of sales. On the other hand, a strand of international economics literature dealing with labour markets (Zhao, 2001; Naylor and Santoni, 2003; Aloi et al., 2009) suggests that a strong trade unionisation could render a country less attractive for FDI, due to the unions' rent-extraction activities that would limit a firm's profitability. Empirical evidence on this issue is scarce, and both theoretical predictions and empirical findings are often inconclusive (Krzywdzinski, 2014).

In this paper, we advance the hypothesis that the impact of labour skills and labour market characteristics on the propensity to attract FDI may be not homogenous across different types of FDI activities. This heterogeneity might in part explain the different results found in the literature.

Accordingly, this paper distinguishes among three types of gFDI, namely gFDI in a) research and headquarter activities, b) development and testing activities, and c) manufacturing activities, and brings forward the hypothesis that the characteristics of the domestic labour market influence the heterogeneity of gFDI inflows. More specifically, we argue that along with country and industry-specific factors, different types of gFDI inflows are determined by the skills of the domestic workforce and by the presence of trade unions.

Therefore, this study contributes to the literature by investigating the heterogeneous impact of the domestic labour market features, due to the existence of different rationales behind the companies decisions of locating R&D and manufacturing activities. The paper employs project-level information on greenfield FDI (gFDI). Such investments, as compared to mergers and acquisitions, are more likely to yield positive returns in terms of economic growth, employment, productivity, as well as to favour technological spillovers (Falk, 2012). To the best of our knowledge, the very few works that have investigated the determinants of greenfield FDI using project-level data include those of Castellani et al. (2011) and Falk (2012). Building on these studies, our paper provides further empirical evidence on the R&D-related greenfield foreign projects determinants, and it departs from them in three respects. First, the study of Falk (2012) does not focus on the contrast of determinants of FDI among R&D-intensive and non R&D-intensive activities. Second, while the the work of Castellani et al. (2011) reports evidence on the heterogeneity of determinants among the types of gFDI, it does not uncover the effects that different labour market features (e.g. labour skills, wage rigidities and labour market institutions) have on a country's ability to attract gFDI. Lastly, our study considers only the host countries characteristics. Indeed, even though the location of R&D-intensive FDI is driven by the interplay of host country characteristics and parent company strategies, it needs to be acknowledged that the technological strategies of foreign MNEs are outside the scope of influence of national policies.

We use a novel firm-level dataset on Greenfield FDIs from the Financial Times, aggregated at the industry level to match data on production, wages and skills from the Organization for Economic Cooperation and Development (OECD) and the International Labor Organization (ILO), respectively.

The next section presents a brief review of the literature. Section 3 describes the data and the methodological approach. Section 4 discusses the results of the econometric estimations. Section 5 concludes.

2 Review of the existing literature

The economic literature has extensively investigated the factors that may render a country more attractive for international investments. Several studies offer critical discussions of the main factors that influence the magnitude and directions of FDIs in general (Blonigen, 2005; Bénassy-Quéré et al., 2007), or innovation-related FDIs in particular (Narula and Zanfei, 2005; OECD, 2008, 2011). Such factors include the industry- (factor intensity, scale economies, differentiation), technology-,[1] and firm-specific characteristics (e.g. managerial and marketing capabilities, technologies, know-how skills, etc.), the economic and institutional conditions prevailing in the home and host countries (e.g. market size and growth, productivity, science and ICT resources and infrastructure, taxation, legal environment, labour market regulation, etc.) as well as, the international institutions reflecting the terms of exchanges between countries.[2]

Within this literature, much of the discussion has been dedicated to the characteristics of domestic labour market and the market size in explaining the FDI location decisions. On the one hand, MNEs will engage into FDI for market access motives or to minimize the

[1]See Franco (2012) for a dedicated empirical study.

[2]See for instance Kahouli and Maktouf (2015), for an empirical analysis of the impact of regional trade agreements on FDIs.

costs associated with international trade and/or, for comparative advantage motives or to benefit from relatively cheaper and/or abundant skilled-labour (Carr et al., 2001; Yeaple, 2003). Building upon the knowledge capital model (Markusen, 1997, 2004) and US affiliates data, Carr et al. (2001), and later on Yeaple (2003) on industry level data, find support for the key role of market size in determining the distribution of FDI. In the frame of the knowledge capital model, this is interpreted as a validation of the market access motive. However, evidence on the positive impact of skilled-labour abundance is less straightforward. As pointed out by Yeaple, much of the variance in the level of US affiliates sales is explained by the industry skilled-labour intensity in the host country. On the other hand, a strand of international economics literature dealing with the labour market (Zhao, 2001; Naylor and Santoni, 2003; Leahy and Montagna, 2005; Aloi et al., 2009) suggests that a strong trade unionisation could render a country less attractive for FDI, due to the unions' rent-extraction activities that would limit the potential gains of firms. Relying on different theoretical settings, these works suggest that the presence of unions may affect MNEs' internationalization decisions and patterns. In a monopolistic setting, Zhao (2001), discusses how the horizontal and/or vertical integration decision of MNEs may be influenced by the presence and preferences of industry unions, which may lead to reduced (expected) payoffs. Particularly, the author briefly considers the possibility of a MNE which bargains with unions located in two countries. Naylor and Santoni (2003) suggest that FDI is less likely to occur, *ceteris paribus*, the greater is union bargaining power, the stronger the weight the union attaches to wages and, the more substitutable are firms products in the potential host country. Leahy and Montagna (2005) adopt a host country policy perspective and address the use of restrictive regulations on unions to attract FDI in an oligopolistic framework. Their paper suggests the existence of threshold effects in the influence of union power on the host country welfare, so that under certain circumstances governments may favour strong unions.

Some scholars have attempted to assess the effects of labour market characteristics on FDI flows, relying on country or industry studies (Cooke, 1997; Gross and Ryan, 2008; Krzywdzinski, 2014). Cooke (1997) and Gross and Ryan (2008) show that employment protection legislation affects negatively the inflows of FDI from the US and Japan, respectively. In other words, companies are more likely to locate in countries with weaker employment protection. Evidence from German FDI to European countries, in the automotive and chemicals industries, points to less clear results for most of the industrial relations and labour market variables (union density, coordination of wage bargaining, government intervention, working hours, etc.). However, as for the studies of Cooke (1997) and Gross and Ryan (2008), a negative significant effect of the employment protection seems to emerge (Krzywdzinski, 2014). Nevertheless, both theoretical predictions and empirical findings regarding the effects of labour market characteristics appear still inconclusive.

Taking stance from these studies, this paper assesses the contribution of skilled-labour and labour market conditions on the ability to attract specific types of FDI. It adds to previous literature by accounting for their simultaneous effects across different types of greenfield FDI. To the best of our knowledge, only two studies have investigated the determinants of R&D and knowledge-intensive greenfield FDI relying on project level data. Castellani et al.'s (2011) estimate a gravity model for the number of bilateral investments projects, reporting evidence of heterogeneity in the impact of the key explanatory variable (i.e. geographical distance) across R&D, manufacturing, and other activities. Their gravity model also controls for a number of variables facilitating trade and investments between countries, such as sharing a common frontier, a common language, a colonial relationship, being part of the same Free Trade Area. Falk's (2012) study, building on the greenfield FDI gravity model of Castellani et al. (2011), considers a wider range of determinants to assess the impact of different types of knowledge-intensive FDI activities. Even though Falk's study assesses the impact of an encompassing set of variables (market size, cost based factors, such as labour costs, corporate and labour taxes, skills, ICT infrastructure and FDI restrictions), it does not contrast these effects to those of other, non knowledge-intensive activities.

Our study distinguishes three types of gFDI, namely gFDI in research activities (R&D), design, development and testing activities (DD&T), and manufacturing activities, and brings forward the hypothesis that in knowledge- and skill-intensive activities, the characteristics of the domestic labour market are the ones that matter in attracting these types of investment. We test this hypothesis controlling for a wide range of labour market features, such as the trade union concentration, the wage dispersion around the minimum wage, the non-wage labour costs, and labour cost competitiveness. Also, we control for country-level characteristics such as GDP per capita and corporate taxes.

3 Empirical strategy

3.1 Data

To investigate the role of labour market conditions (regulations, cost and quality of labour) in attracting FDIs in knowledge-intensive activities such as research and development and testing, we matched data from three different data sources. Data on cross-border (greenfield) investment projects announced and validated during the period from January 2003 till December 2012, comes from the *fDi Markets* database.[3] The database contains information on flows of people and capital classified by the investment activities (e.g. R&D, design, development and testing, sales and marketing, etc.). It contains clear information on the source and destination countries, states, regions, and cities, the number of jobs created by the specific project. The database is an ongoing collection of information on the announcements of corporate investment projects from 2003 to date, however, for the purpose of this study we collected data on the destinations of greenfield investments in R&D, manufacturing and DD&T from 2003 to 2012. The data are at project level, however we aggregate the total value of the projects per sector and year, as the other data sources are aggregated at sector- or country-level.

Data on labour skills are extracted from ILOstat annual indicator on employment by economic activity and occupation. The International Standard Classification of Occupations 2008 provides a system for classifying and aggregating occupational information, and to group occupations into skill levels. A skill level is defined as a function of the complexity of tasks to be performed in the corresponding occupation. Given the international character of the classification, the ten major occupational groups are categorised in four broad skill levels. Therefore, occupations range from skill level 1, which corresponds to simple and routine physical or manual tasks, to skill level 4 which matches occupations that require extensive knowledge and involve complex problem-solving, creativity and decision-making. The annual data on employment by skills is collected for each country and organised by main aggregate economic activity.[4]

Data on trade union concentration and on reservation wages are from OECD and J.Visser, ICTWSS database[5], and are available at country level. All the other variables such as total factor productivity, unit labour cost, wages, cost of labour, R&D intensity, percentage of tertiary education, GDP per capita are extracted from the OECD Stan database.

A summary of the averages across countries, years and sectors and the number of observations per year are reported in Table 1. The variables q, l, m and k are the logs of deflated production value, number of employees, deflated intermediate inputs and deflated fixed capital formation values, respectively. To measure the capital intensity, we take the ratio between the log deflated gross fixed capital formation and the log number of employees, k/l. Total factor productivity (tfp) is expressed in logs and is computed as the residual term from a production function using the GMM estimator. The production function for sector j in country i at time t is as follows:

$$\begin{aligned} Q_{ijt} &= A_{ijt} F_{ijt}(K, L, M) \\ q_{ijt} &= \theta_0 + \theta_K k_{ijt} + \theta_L l_{ijt} + \theta_M m_{ijt} + \omega_{ijt} + u_{ijt} \end{aligned}$$

where $A_{ijt} \equiv \exp(\omega_{ijt} + u_{ijt})$ corresponds to the TFP, ω_{ijt}, and the error term u_{ijt}. To identify the coefficient of the production function, and retrieve a measure of TFP, we assume the following moment conditions:

$$E[x_{ijt-s} u_{ijt}] = 0 \quad \text{for} \quad s = 1, 2$$

where x_{ijt-s} are the lagged factors of production, l, m, k. Unit labour cost (ULC) is measured as the ratio of wages and benefits to value added. Unit labour cost shows how much output (in value added in this case) an economy receives relative to wages, and it represents the labour cost competitiveness: a direct link between productivity and the cost of labour used in generating output. The higher the ULC, the lower the labour cost competitiveness. To help the interpretation of the variable, as ULC takes values between 0 and 1, we take $1 - ULC$ as a proxy for

[3] *fDi Markets* is an on-line database maintained by fDi Intelligence, a division of the Financial Times Ltd. fDi Intelligence collects available information on investments since 2003 and monitors cross-border investments covering all sectors and countries worldwide, relying on company data and media sources. The database is used as the data source in UNCTAD's World Investment Report, in publications by the Economist Intelligence Unit and in recent academic research (Castellani et al., 2011; Falk, 2012).

[4] ISIC Rev.4 at 1 digit, e.g. A - Agriculture, forestry and fishing, B - Mining and quarrying, C - Manufacturing, and so on.

[5] Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts, 1960-2010.

[6] OECD, 2007, OECD System of Unit Labour Cost Indicators, OECD, Paris.

labour cost competitiveness.[6] A rise in an economy's unit labour costs represents an increased reward for labour's contribution to output. *R&D intensity* is the ratio of R&D expenditure to sales, *Skill index* is the index of occupational skills weighted by the relative employment in sector j of country i. The variable *Skill distance* is computed as the difference between *Skill index* and the average of *Skill index* across OECD countries, while *skillD* takes value one if the sector of a country has a positive *Skill distance*, zero otherwise. Other control variables are the total number of triadic patents and the number of triadic patents in ICT per country, expressed in logs, the percentage of tertiary education of the labour force. Control variables describing the labour market regulation are the trade union density, *union*, calculated as the ratio of wage and salary earners that are trade union members and the total number of wage and salary earners, *non-wage labour costs*, which correspond to the difference between labour costs and wages and refer to social insurance expenditure and other labour taxes, and wage dispersion, $\frac{W_{ijt}-\overline{W}_{ijt}}{W_{ijt}}$ defined as the relative gap between wages and minimum wages. Using the minimum relative to average wages of full-time workers ($\overline{W}_{it}/W_{it}$), the minimum wage per country and sector is approximated as $\overline{W}_{ijt} \simeq \frac{\overline{W}_{it}}{W_{it}} W_{ijt}$. Additionally, we control for the GDP per capita, *gdp* and for the total taxes on commercial profits, *tax*.

Table 1 also reports the number of observations for the countries and sectors recipient of gFDI. gFDI in manufacturing are reaching more sectors and countries than those in R&D and in DD&T. In terms of percentage of total value of investments in manufacturing, research and development, FDI in manufacturing represents more than 90% of capital inflow in the OECD countries, development and research only 5% and 3% respectively. Tables 9 and 10 report the average capital investments and the number of observations per group of sectors and per country. A big volume of investment goes to the sectors of mining and quarrying (05T09), motor vehicles and other transport equipment (29T30), computer electronics, electrical and optical equipment (26T28), basic metal (24T25) and chemical, rubber and plastic products (19T22). As for the countries, United States, Mexico and Australia are the three top countries in terms of volume of gFDI.

To test the proposed heterogeneity of cost, quality and other characteristics of the labour markets across the three different types of gFDI, we first present a table comparing the means and testing the differences, we then adopt a multinomial logistic regression framework.

3.2 Methodology

In Table 3 we compare and test the differences[7] of the set of regressors across gFDI types. The table groups the variables in three sections. The upper part tests the equality of means of the variables concerning the quality of labour (skills and percentage of tertiary education) and potentially related variables (R&D intensity, number of ICT patents, and labour cost competitiveness). The middle part reports the tests for the market regulation variables (union density, wage markups and non-wage labour costs), while the bottom part refers to the differences in GDP per capita, tax rates on profits and TFP.

In addition to the tests, we also investigate the possibility of a causal relation between the heterogeneity in the labour market characteristics and a country's probability to attract gFDI in knowledge intensive activities. To do so, first we run separate logistic regressions for each type of gFDI (Tables 4, 5, and 6). Then, as we are interested in the contrast between the factors that make a country more attractive for R&D intensive investments rather than for non-R&D activities (i.e. manufacturing), we adopt a multinomial logistic regression framework. In this case, the probability that country i in sector j will receive gFDI is given by:

$$
\begin{aligned}
& f(ijt) = Pr(U^{k}_{ijt} > U^{k'}_{ijt}), \\
& \quad \text{for } k \neq k', \; k = R\&D, DD\&T, M \\
& \quad U_{ijt} = \beta_{k,0} + \beta'_{k,1} x_{ijt} + \beta'_{k,2} z_{ijt} + \delta_t + \gamma_j + \tau_i + \epsilon_{ijt}.
\end{aligned}
$$

U_{ijt} is the return or utility attainable from the k^{th} type of gFDI and it depends on labour market characteristics, x_{ijt}, control variables, z_{ijt}, time, δ_t, industry, γ_j, and country fixed effects, τ_i and an error term, ϵ_{ijt}.

Labour market characteristics, x_{ijt}, include trade union density, wage markup, non-wage labour costs, a dummy for skills above or below the OECD average, labour cost competitiveness. Control variables, z_{ijt}, are taxes on commercial profits, GDP per capita, number of patents or number of patents in ICT, expressed in logs, R&D intensity. Many of the independent variables, especially GDP per capita, but also taxes, union density and R&D, are subject to endogenenity due to omitted or unobserved variables, such as institutional factors (e.g.

[7] t-tests with unequal variances.

stability, corruption, security and so on; Blonigen, 2005; Yu and Walsh, 2010).

To handle the endogeneity of these variables, we adopt a two-stage residual inclusion (2SRI) (Terza et al., 2008) that takes into account the heteroskedatic/autocorrelated structure of the error term. The 2SRI approach consists in first estimating the model of endogenous regressors as a function of instruments, like the first-stage of 2SLS (two-stage least squares), and then using the predicted errors from this model as an additional regressor in the main model.

4 Results and discussion

Testing the differences in the skills across different gFDI types, we find that country-sector pairs that had received foreign investment in R&D or in DD&T have higher relative skilled labour than those that received investment in manufacturing activities. More in detail, Table 3 shows that this difference in skills is even more accentuated when taking the skill dummy, *skillD*. In this case, not only the differences between knowledge-intensive and manufacturing investments are positive and strongly significant (0.064 and 0.105 for R&D and DD&T, respectively), but the difference in relative skilled labour force between R&D and DD&T is negative and significant. This means that, on average gFDI in DD&T flows into countries and sectors where workers are more skilled compared to the OECD-level.

As for the percentage of tertiary education, R&D intensity, and patents, we find that the differences are positive and significant when comparing R&D and DD&T to manufacturing investments, while we do not find any sign of divergence between the two knowledge intensive activities. This exploratory analysis supports the key role of high-quality human capital and the research and technological capabilities to attract knowledge intensive investments (OECD, 2008, 2011; Franco, 2012). Moreover, this is consistent with the asset/knowledge-seeking motive Dunning and Lundan (2009); Cantwell (2009), i.e. MNEs locating abroad in order to access foreign pools of knowledge and technologies.

Cost-based factors such as the labour cost competitiveness, LCC, play an important role, in particular for efficiency seeking investments. In fact, competitiveness is not only determined by productivity, but also by the cost of inputs in the production process. A well-known measure of international competitiveness is the unit labour cost (van Ark et al., 2005), which combines labour cost and productivity into a single measure of labour cost per unit output.[8] Differences in LCC are more accentuated between R&D/DD&T and manufacturing, pointing at an higher cost competitiveness and labour productivity of countries where the R&D gFDI are located.

One less explored institutional determinant of FDI inflows is the labour market flexibility. Labour market regulations and standards on employment impose additional costs on firms. Most likely, any firm would want to locate in countries with more flexible labour markets. We test the differences in three measures of labour market flexibility, namely the wage markups, the non-wage labour costs and the trade union density. When looking to wage dispersion and its difference among different types of foreign investments, we find that, compared to R&D, wage dispersion is higher in those countries/sectors with inflows of manufacturing and DD&T gFDI. A larger wage markup (higher sectoral wage dispersion) implies that the labour market is more flexible and there is more room for MNEs to hire at a lower cost, given the larger range of wages within the sector. This is confirmed also by the the pairwise correlation coefficients reported in Table 2 (negative correlation between $(W - \overline{W})/W$ and gFDI in R&D and positive with investment in manufacturing). Moreover, the constructed measure of wage markup is significantly inversely correlated with union density, endorsing the expectations about the trade unions' objective of regulating the structure of wages.

Labour taxes, the social security and insurance contribution create a wedge between the cost of a worker to an employer and the wage received. This wedge is measured by the non-wage labour costs, *nwlc*. The positive difference between knowledge-intensive investments and manufacturing confirms that manufacturing activities are located in countries and sectors where costs associated to labour are lower.

Lastly, we do not find any significant difference in the possible rigidities created by the trade unions density averages, and no correlation with the different types of gFDI.

While we do not find any significant difference in the averages of taxes on profits and of TFP, countries with higher GDP per capita had received more gFDI in R&D and DD&T than in manufacturing.

[8] By taking, for example the ratio between the cost of labour and the value of the output produced, $\frac{wL}{pQ}$, it is easy to see how this measure contains the inverse of labour productivity Q/L.

When considering the impact of labour market quality and flexibility on the probability to attract gFDI, most of the results are consistent with the the correlation table and with the tests of differences in means. Tables 4, 5, and 6 report the estimated coefficients of logistic regressions under different specifications, used to test the robustness of the results. Consistently with previous evidence gFDI in knowledge-intensive activities is not driven by low labour costs, but it depends on the availability and quality of the knowledge base in the host country, such as skilled workers (Rilla and Squicciarini, 2011; Falk, 2012). In line with Falk (2012), we find that skilled human capital increases the probability of attracting R&D-intensive gFDI,[9] and plays a negative role in the probability to receive manufacturing gFDI.

Similarly to Demirbag and Glaister (2010), we find that the host country knowledge infrastructure, here measured by R&D intensity is a relevant determinant of R&D activities location. More specifically, we find evidence of heterogeneity between R&D and DD&T activities, where only for the latter R&D intensity is an important attracting factor. Moreover, as with skilled employment, also R&D intensity has a negative impact on the manufacturing gFDI inflow. We also controlled for the number of patents in ICT, but did not find any significant impact.

The measure of competitiveness, given by $(VA - wL)/VA$, can be interpreted as short-run profits weighted by the value added and it is found to be positively related to both R&D and DD&T (although significantly more for R&D) and negatively related to manufacturing activities. These results indicate that a more productive and competitive cost base enhances a country's ability to attract and retain gFDI in R&D-related activities.

The presence of trade unions does not seem to have an impact on gFDI in DD&T and manufacturing, and has a negative impact on gFDI in R&D. However, the related coefficient is no longer significant when controlling for sectoral wage markups (column (3) of Table 4). Altogether, the results suggest that unionization in the OECD countries are not particularly important in determining where and in what MNEs invest.

Confirming previous studies, gFDI activities are located in countries and sectors where costs associated to labour are lower and there is more dispersion of wages around the minimum. However this result holds only for investment in manufacturing. In fact, differently from previous literature (Carr et al., 2001; Yeaple, 2003; Falk, 2012), we find that the non-wage labour costs (and wage markups) are positively (negatively) related to the probability of attracting knowledge-intensive foreign investment, especially R&D activities. Indeed, while the common argument is that a highly regulated labour market imposes additional cost on firms, deterring FDI inflows, another strand of the literature (Cooke and Noble, 1998; Daude et al., 2003) has claimed that a highly regulated labour market may help enhance labour relations providing job security, labour market standards and regulations can add to social stability. These factors attract FDI inflows.

Finally, we do not find any significant impact of GDP per capita and corporate taxes on the probability to attract any type of gFDI.

In Tables 7 and 8, we report the estimated coefficients of multinomial logistic regressions, where the base outcome is gFDI in manufacturing. When contrasting the probability to attract knowledge-intensive gFDI to the the probability of attracting non R&D-intensive investments, we find and confirm the heterogeneity identified by the logistic regressions estimates. High labour market standards are an attracting factor for skill-intensive activities compared to manufacturing ones, as they might facilitate human capital development and enhance political and social stability, which encourage FDI inflows. Skilled employment, R&D intensity, and competitiveness are also determinants of R&D-intensive gFDI. When taking into account endogeneity issues by instrumenting the tax variable with the TFP and the percentage of tertiary education, we find that trade union density increases the odds of attracting gFDI in DD&T rather than manufacturing (odds ratio equal 2.5). Additionally, GDP per capita and tax rate on commercial profits are found to be positive factors that attract skill-intensive (DD&T) investment. The same result can be read with respect to manufacturing activities, where countries with higher GDP per capita and higher tax rate discourage the location of non-R&D related investment, compared to gFDI in DD&T.

5 Conclusions

This study contributes to previous literature by accounting for the simultaneous effects of skilled-labour and labour market conditions across different types of green-

[9] Falk (2012) uses the percentage of tertiary education as a proxy for skills. In other specification, we also controlled for the education, but the results, not reported in the paper, were not significant.

field FDI. In order to address this issue, this paper has relied on project-level data over the period 2003-2012. The findings confirm the heterogeneity in the impact of the factors influencing the MNCs location in a given country. Results also support the view that MNCs do grant attention to the skills endowments and, to different extent, to the labour market features when making the decision to invest in foreign economies.

In line with the majority of the studies (Gross and Ryan, 2008; Cooke, 1997; Krzywdzinski, 2014), we do not a significant impact of the presence of trade unions on FDI attractiveness. However, when distinguishing between gFDI in research, development, and manufacturing activities, results vary significantly. When taking into account endogeneity, using a 2SRI multinomial logistic regression model, we find that trade union density increases the odds of attracting gFDI in DD&T rather than in manufacturing.

Consistently with the literature, we find evidence for the market access motive, i.e. larger countries are more likely to attract FDI (Dunning, 2001; Carr et al., 2001; Yeaple, 2003; Kahouli and Maktouf, 2015). Our results also confirm the role of skilled labour as a key attractiveness factor for greenfield FDI in knowledge-related activities.

In this context, to efficiently promote and attract R&D-intensive investments, a closer coordination between innovation policies (e.g. human capital development policies) and inward investment promotion is needed, which are two policy areas that have typically operated rather independently. Indeed, to target R&D-intensive gFDI, it is necessary to build the image of the country as an R&D location, and at the same time to restructure the scope of the aftercare services (i.e. post-investment services that an investment promotion agency can offer to existing investors), to maximise the positive evolutionary knowledge spillovers. Indeed, the accumulated knowledge and framework conditions constitute fundamental prerequisites to attract greenfield foreign direct investment, but also signal that enterprise and public-policy strategies should take well into account what is the specific FDI activity they would like to implement or be able to attract in a given region in order to better tailor their possible strategic intents.

References

Aloi, M., Leite-Monteiro, M., and Lloyd-Braga, T. (2009). Unionized labor markets and globalized capital markets. *Journal of International Economics*, 78(1):149 – 153.

Bénassy-Quéré, A., Coupet, M., and Mayer, T. (2007). Institutional determinants of foreign direct investment. *The World Economy*, 30(5):764–782.

Blonigen, B. A. (2005). A review of the empirical literature on fdi determinants. *Atlantic Economic Journal*, 33(4):383–403.

Cantwell, J. (2009). Location and the multinational enterprise. *Journal of International Business Studies*, 40(1):35–41.

Carr, D. L., Markusen, J. R., and Maskus, K. E. (2001). Estimating the knowledge-capital model of the multinational enterprise. *American Economic Review*, 91(3):693.

Castellani, D., Palmero, A. J., and Zanfei, A. (2011). The Gravity of R&D FDIs. Technical report.

Cooke, W. N. (1997). The Influence of industrial relations factors on U.S. foreign direct investment abroad. *Industrial and Labor Relations Review*, 51(1):3–17.

Cooke, W. N. and Noble, D. S. (1998). Industrial Relations Systems and US Foreign Direct Investment Abroad. *British Journal of Industrial Relations*, 36(4):581–609.

Daude, C., Mazza, J., and Morrison, A. (2003). Core Labor Standards and Foreign Direct Investment in Latin America and the Caribbean: Does Lax Enforcement of Labor Standards Attract Investors? Technical report, Inter-American Development Bank.

Demirbag, M. and Glaister, K. W. (2010). Factors Determining Offshore Location Choice for R&D Projects: A Comparative Study of Developed and Emerging Regions. *Journal of Management Studies*, 47(8):1534–1560.

Dunning, J. H. (2001). The eclectic (OLI) paradigm of international production: past, present and future. *International Journal of the Economics of Business*, 8(2):173–190.

Dunning, J. H. and Lundan, S. M. (2009). The internationalization of corporate R&D: a review of the evidence and some policy implications for home countries. *Review of Policy Research*, 26(1-2):13–33.

Falk, M. (2012). Determinants of Greenfield Investment in Knowledge Intensive Business Services. FIW Research Reports series IV-002, FIW.

Franco, C. (2012). Horizontal and vertical fdi: an analysis of technological determinants. *International Journal of Technology and Globalisation*, 6(3):225–254.

Gross, D. M. and Ryan, M. J. (2008). Fdi location and size: Does employment protection legislation matter? *Regional Science and Urban Economics*, 38(6):590–605.

Kahouli, B. and Maktouf, S. (2015). The determinants of FDI and the impact of the economic crisis on the implementation of RTAs: A static and dynamic gravity model. *International Business Review*, 24(3):518 – 529.

Krzywdzinski, M. (2014). Do investors avoid strong trade unions and labour regulation? social dumping in the european automotive and chemical industries. *Work, Employment & Society*, 28(6):926–945.

Leahy, D. and Montagna, C. (2005). Union legislation and export platform fdi. *The Journal of International Trade & Economic Development*, 14(4):437–452.

Markusen, J. R. (1997). Trade versus Investment Liberalization. NBER Working Papers 6231, National Bureau of Economic Research, Inc.

Markusen, J. R. (2004). *Multinational firms and the theory of international trade.* MIT press.

Moncada-Paternò-Castello, P., Vivarelli, M., and Voigt, P. (2011). Drivers and impacts in the globalization of corporate R&D: an introduction based on the European experience. *Industrial and Corporate Change*, 20(2):585–603.

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Narula, R. and Zanfei, A. (2005). *Globalisation of innovation.* Oxford: Oxford University Press.

Naylor, R. and Santoni, M. (2003). Foreign direct investment and wage bargaining. *J. Int. Trade & Economic Development*, 12(1):1–18.

OECD (2008). Locations factors in the activities related to innovation of multinationals: a literature review. Oecd publishing, OECD.

OECD (2011). Attractiveness for innovation: Location factors for international investment. Oecd publishing, OECD.

Rilla, N. and Squicciarini, M. (2011). R&D (Re)location and Offshore Outsourcing: A Management Perspective. *International Journal of Management Reviews*, 13(4):393–413.

Terza, J. V., Basu, A., and Rathouz, P. J. (2008). Two-stage residual inclusion estimation: addressing endogeneity in health econometric modeling. *Journal of health economics*, 27(3):531–543.

van Ark, B., Stuivenwold, E., and Ypma, G. (2005). Unit labour costs, productivity and international competitiveness. GGDC Research Memorandum 200580, Groningen Growth and Development Centre, University of Groningen.

Yeaple, S. R. (2003). The role of skill endowments in the structure of us outward foreign direct investment. *Review of Economics and Statistics*, 85(3):726–734.

Yu, J. and Walsh, J. P. (2010). Determinants of Foreign Direct Investment; A Sectoral and Institutional Approach. IMF Working Papers 10/187, International Monetary Fund.

Zhao, L. (2001). Unionization, vertical markets, and the outsourcing of multinationals. *Journal of International Economics*, 55(1):187–202.

Table 1: Summary statistics

	mean	sd	N
q_{ijt}	25.50	2.20	1917
l_{ijt}	12.28	1.58	2013
m_{ijt}	25.05	2.18	1917
k_{ijt}	22.34	1.93	1706
k/l_{ijt}	0.40	0.36	1603
tfp_{ijt}	1.12	0.23	1524
LCC_{ijt}	0.56	0.13	1560
$R\&D_{ijt}$	0.86	0.21	1511
$Skill\ index_{ijt}$	2.37	0.13	1393
$Skill\ distance_{ijt}$	0.01	0.05	1393
$skillD_{ijt}$	0.81	0.39	3283
$N.\ triadic\ patents_{it}$	6.1	2.4	2210
$patICT_{it}$	4.7	2.6	2203
$\%TerEdu_{it}$	25.59	6.58	2104
$union_{it}$	0.26	0.18	2124
$nwlc_{ijt}$	21.83	2.07	1555
$\left[(W-\overline{W})/W\right]_{ijt}$	0.64	0.08	1003
$\overline{W}_{it}/W_{it}$	0.36	0.09	1566
gdp_{it}	10.28	0.36	2210
tax_{it}	0.50	0.11	1637

N/year	R&D	DD&T	M
2003	50	50	218
2004	59	52	223
2005	66	51	211
2006	77	65	216
2007	48	79	211
2008	55	95	223
2009	44	84	186
2010	37	91	188
2011	32	93	187
2012	34	97	161
Total	502	757	2024

Table 2: Cross-correlation table

Variables	$FDI_{R\&D}$	$FDI_{DD\&T}$	FDI_M	$union$	$\left(W-\overline{W}\right)/W$	$nwlc$	tax	gdp	$R\&D$	$patICT$	$skillD$	LCC	$\%TerEdu$	tfp
$FDI_{R\&D}$	1.00													
$FDI_{DD\&T}$	-0.23*	1.00												
FDI_M	-0.54*	-0.69*	1.00											
$union$	-0.01	-0.01	0.01	1.00										
$\left(W-\overline{W}\right)/W$	-0.08*	-0.01	0.07*	-0.33*	1.00									
$nwlc$	0.07*	0.11*	-0.15*	-0.18*	0.33*	1.00								
tax	0.00	-0.01	0.00	-0.09*	-0.23*	0.29*	1.00							
gdp	0.09*	0.08*	-0.14*	0.24*	0.02	0.00	-0.20*	1.00						
$R\&D$	0.03	0.07*	-0.08*	0.08*	-0.06	-0.17*	0.04	0.20*	1.00					
$patICT$	0.11*	0.10*	-0.17*	-0.06*	0.09*	0.42*	0.15*	0.70*	0.14*	1.00				
$skillD$	0.03	0.10*	-0.11*	0.13*	-0.19*	0.00	-0.25*	0.38*	0.01	0.43*	1.00			
LCC	0.08*	0.03	-0.09*	-0.10*	0.02	-0.00	0.08*	-0.13*	-0.27*	-0.15*	-0.04	1.00		
$\%TerEdu$	0.03	0.04*	-0.06*	0.29*	-0.38*	-0.31*	-0.21*	0.41*	0.10*	0.23*	0.43*	0.09*	1.00	
tfp	-0.03	0.01	0.02	0.37*	-0.10*	0.06*	-0.27*	-0.14*	-0.30*	-0.37*	0.05*	0.82*	0.08*	1.00

Table 3: Tests of differences in mean

	R&D vs M	DD&T vs M	R&D vs DD&T
$Skill\ distance_{ijt}$	0.006**	0.006**	-0.001
	(0.003)	(0.003)	(0.005)
$skillD_{ijt}$	0.064***	0.105***	-0.040**
	(0.019)	(0.015)	(0.020)
$\%TerEdu_{it}$	0.792**	0.880***	-0.088
	(0.368)	(0.352)	(0.432)
$R\&D_{ijt}$	0.027**	0.044***	-0.017
	(0.013)	(0.014)	(0.016)
$N.\ ICT\ patents_{it}$	0.950***	0.863***	0.087
	(0.136)	(0.134)	(0.160)
LCC_{ijt}	0.032**	0.017***	0.015*
	(0.009)	(0.008)	(0.010)
$\left[(W-\overline{W})/W\right]_{ijt}$	-0.017***	-0.005	-0.012*
	(0.007)	(0.007)	(0.008)
$nwlc_{ijt}$	0.575***	0.666***	-0.091
	(0.129)	(0.123)	(0.148)
$union_{it}$	-0.042	-0.042	-0.001
	(0.104)	(0.099)	(0.124)
tax_{it}	0.017	-0.160	0.176
	(0.811)	(0.671)	(0.931)
gdp_{it}	0.113***	0.098***	0.015
	(0.018)	(0.018)	(0.021)
tfp_{ijt}	-0.020	0.001	-0.021
	(0.016)	(0.016)	(0.020)

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 4: Logit estimations: gFDI in R&D

	(1)	(2)	(3)	(4)	(5)	(6)
$union_{it-1}$	-0.260**	-0.160***	-0.086	-0.011	-0.085	-0.171
	(0.114)	(0.057)	(0.126)	(0.160)	(0.166)	(0.258)
$\left[(W-\overline{W})/W\right]_{ijt-1}$	-0.978		-4.218**	-5.720**	-5.448**	-5.155
	(1.303)		(1.670)	(2.488)	(2.593)	(3.732)
$nwlc_{ijt-1}$		0.167**	0.415***	0.492***	0.585***	0.804***
		(0.067)	(0.131)	(0.174)	(0.190)	(0.282)
gdp_{it-1}						1.687
						(2.989)
tax_{it-1}						-0.031
						(0.036)
$skillD_{ijt-1}$	1.406***	0.999***	1.778***	1.794***	1.440**	1.727**
	(0.438)	(0.322)	(0.464)	(0.569)	(0.593)	(0.835)
$R\&D_{ijt-1}$				0.319	1.019	0.994
				(0.811)	(0.865)	(1.099)
$patICT_{it-1}$				0.146	-0.032	-0.017
				(0.232)	(0.248)	(0.426)
LCC_{ijt-1}					4.934***	5.179***
					(1.388)	(1.702)
N.	675	1,003	675	588	588	392
Country FE	✓	✓	✓	✓	✓	✓
Sector FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 5: Logit estimations: gFDI in DD&T

	(1)	(2)	(3)	(4)	(5)	(6)
$union_{it-1}$	-0.010	0.074*	0.030	-0.021	-0.073	-0.010
	(0.084)	(0.043)	(0.087)	(0.124)	(0.127)	(0.157)
$\left[(W-\overline{W})/W\right]_{ijt-1}$	-0.038		-1.058	-0.937	-0.631	-3.466
	(1.187)		(1.321)	(1.987)	(2.031)	(3.087)
$nwlc_{ijt-1}$		0.107**	0.126*	0.270**	0.313**	0.278*
		(0.052)	(0.073)	(0.116)	(0.122)	(0.157)
gdp_{it-1}						1.594
						(1.885)
tax_{it-1}						0.003
						(0.028)
$skillD_{ijt-1}$	1.311***	0.709***	1.498***	1.731***	1.686***	1.206**
	(0.412)	(0.268)	(0.432)	(0.498)	(0.512)	(0.611)
$R\&D_{ijt-1}$				2.636***	3.250***	3.302***
				(0.670)	(0.726)	(0.868)
$patICT_{it-1}$				-0.120	-0.221	-0.182
				(0.206)	(0.214)	(0.278)
LCC_{ijt-1}					3.551***	3.298**
					(1.204)	(1.371)
N.	675	1,003	675	588	588	392
Country FE	✓	✓	✓	✓	✓	✓
Sector FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 6: Logit estimations: gFDI in Manufacturing

	(1)	(2)	(3)	(4)	(5)	(6)
$union_{it-1}$	0.134*	0.027	0.050	0.044	0.133	0.117
	(0.074)	(0.038)	(0.078)	(0.105)	(0.109)	(0.144)
$\left[(W-\overline{W})/W\right]_{ijt-1}$	0.630		2.627**	3.265*	2.635	4.163*
	(1.021)		(1.164)	(1.701)	(1.771)	(2.373)
$nwlc_{ijt-1}$		-0.161***	-0.253***	-0.377***	-0.437***	-0.489***
		(0.046)	(0.069)	(0.104)	(0.111)	(0.153)
gdp_{it-1}						-0.677
						(1.687)
tax_{it-1}						-0.004
						(0.024)
$skillD_{ijt-1}$	-1.508***	-0.919***	-1.866***	-2.154***	-1.949***	-1.701***
	(0.323)	(0.221)	(0.349)	(0.422)	(0.435)	(0.753)
$R\&D_{ijt-1}$				-2.062***	-2.829***	-2.995***
				(0.569)	(0.611)	(0.753)
$patICT_{it-1}$				0.004	0.160	0.223
				(0.206)	(0.178)	(0.252)
LCC_{ijt-1}					-5.338***	-5.282***
					(1.071)	(1.954)
N.	675	1,003	675	588	588	392
Country FE	✓	✓	✓	✓	✓	✓
Sector FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 7: Multinomial logit

Baseline category: $gFDI_M$	$gFDI_{R\&D}$	$gFDI_{DD\&T}$
$union_{it-1}$	-0.108	0.024
	(0.200)	(0.112)
$\left[(W-\overline{W})/W\right]_{ijt-1}$	-6.555*	-4.936*
	(3.766)	(2.975)
$nwlc_{ijt-1}$	0.817***	0.311**
	(0.257)	(0.138)
gdp_{it-1}	2.171	1.045
	(2.424)	(1.927)
tax_{it-1}	-0.035	-0.001
	(0.035)	(0.029
$skillD_{ijt-1}$	1.968**	1.587**
	(0.865)	(0.641)
$R\&D_{ijt-1}$	1.866*	3.647***
	(1.130)	(0.884)
$patICT_{it-1}$	-0.202	-0.208
	(0.438)	(0.291)
LCC_{ijt-1}	6.432***	4.648***
	(1.774)	(1.470)
Country FE	✓	✓
Sector FE	✓	✓
Year FE	✓	✓

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 8: 2SRI Multinomial logit

Baseline category: $gFDI_M$	$gFDI_{R\&D}$	$gFDI_{DD\&T}$
$union_{it-1}$	0.392	0.916***
	(0.327)	(0.327)
$\left[(W-\overline{W})/W\right]_{ijt-1}$	-11.098*	-27.070***
	(6.215)	(8.703)
$nwlc_{ijt-1}$	1.075***	0.962***
	(0.401)	(0.350)
gdp_{it-1}	3.036	24.236***
	(5.314)	(7.396)
tax_{it-1}	0.198	0.500***
	(0.141)	(0.173)
$skillD_{ijt-1}$	3.673*	3.819***
	(1.889)	(1.070)
$R\&D_{ijt-1}$	0.787	3.565***
	(1.602)	(1.362)
$patICT_{it-1}$	-0.184	-0.254
	(0.921)	(0.699)
LCC_{ijt-1}	5.420***	5.106***
	2.089)	(1.938)
Country FE	✓	✓
Sector FE	✓	✓
Year FE	✓	✓

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 9: gFDI inflows by sector and by investment type

Sector	avg *Capex*	N. obs.
05T09	1125.58	112
10T12	130.50	296
13T15	29.81	106
16	90.96	111
17T18	118.25	154
19T22	268.22	518
23	146.32	164
24T25	272.22	237
26T28	272.74	507
29T30	475.91	389
45T47	42.97	151
49T53	121.18	84
55T56	6.27	1
58T63	58.39	391
64T66	20.22	13
68T82	28.35	15
84T99	22.71	34
Development	52.91	757
Manufacturing	357.09	2024
Research	50.17	502

Note: Capex is capital inflow expressed in million Euro.

Table 10: gFDI inflows by Country

Country	avg *Capex*	N. obs
Australia	469.52	129
Austria	99.77	92
Belgium	128.70	108
Canada	335.24	154
Chile	100.16	72
Czech Republic	150.70	120
Denmark	43.90	57
Estonia	29.31	76
Finland	35.60	57
France	151.14	193
Germany	240.69	195
Greece	25.60	19
Hungary	158.13	137
Iceland	292.62	6
Ireland	134.62	129
Italy	161.28	113
Japan	136.19	110
Latvia	58.21	51
Lithuania	39.51	64
Luxembourg	31.45	15
Mexico	510.70	147
Netherlands	97.17	93
New Zealand	44	38
Norway	56.14	32
Poland	267.09	156
Portugal	134.56	67
Romania	209.41	138
Slovenia	43.20	34
Spain	243.56	163
Sweden	72.92	97
Switzerland	64.35	69
Turkey	367.39	105
United States	832.74	247

Note: Capex is capital inflow expressed in million Euro.