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Drivers of Foreign Direct Investment in the EU: Regulatory Distance and Revealed Technological Advantage

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Abstract:

This study examines the interplay between trade policy, in particular non-tariff measures (NTMs), and revealed technological comparative advantage (RTA) at the NUTS2 level as drivers of foreign direct investment (FDI) over time. Combining data from the Orbis database (Bureau Van Dijk), the NTMs database (WTO I-TIP) and the European Patent Office (EPO PATStat), we construct a comprehensive panel database of European firms owned by foreign EU and non-EU firms. This database includes financial information for both parent companies and subsidiaries, as well as detailed country and sector-specific trade barriers from the perspective of both the home and host economies. Furthermore, this database allows us to compute tailored RTA variables reflecting firm-specific technological interests proxied by firms' patent production across technology classes. Using a Poisson Pseudo Maximum Likelihood (PPML) estimator, our analysis reveals a heterogeneous impact of NTMs and RTAs on FDI investment in the EU regions. Specifically, while increasing regulatory distance Technical Barriers to Trade (TBT) and Sanitary and Phytosanitary Standards (SPS) measures hampers FDI investment from extra-EU companies, the results on tariffs support the regulatory jumping motive. Furthermore, local technological capabilities significantly support FDI, especially when RTAs reflect the technological interests of the foreign-owned subsidiary, while the effect is reversed when accounting for the innovation portfolio of the parent company.

Keywords: FDI, tariff and non-tariff measures, revealed technological advantage

JEL Code: F23, O24, O34, R58

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1. Introduction

Understanding the determinants of foreign direct investment (FDI) is crucial for fostering economic integration and technological development, especially within the European Union (EU), where regional disparities in innovation and regulatory regimes persist. Multinational enterprises (MNEs) base their investment decisions not only on market access and cost efficiency, but increasingly on the strategic alignment between host regions' technological capacities and their own innovation portfolios. At the same time, regulatory heterogeneity – particularly in the form of non-tariff measures (NTMs) such as Technical Barriers to Trade (TBTs) and Sanitary and Phytosanitary Standards (SPS) – can impose additional compliance burdens on foreign investors. These regulatory frictions may deter investment or reshape its geography, especially when regulatory frameworks between the home and host countries diverge significantly. This paper explores how the combination of regulatory distance and technological complementarity between parent MNEs and EU regions affects the location and intensity of FDI. By leveraging firm-level data on financial performance, ownership structure, and innovation activity, we empirically assess how regulatory costs and revealed technological advantages (RTAs) interact in shaping the asset distribution of foreign subsidiaries across EU regions.

FDI has emerged as a potential driver of economic growth in both developed and developing countries, primarily due to its ability to transfer know-how and diffuse advanced technologies from MNEs to other regions (Balasubramanyam et al., 1996; Gao, 2005; Mottaleb, 2007; Iamsiraroj, 2016). Nevertheless, the growth impact of FDI can vary significantly across different sectors (Alfaro, 2003). The primary mechanisms through which FDI fosters long-term growth in host economies are technological upgrading and knowledge spillovers (De Mello, 1999). According to the Organisation for Economic Cooperation and Development (OECD, 2021), FDI can substantially advance the UN Sustainable Development Goals (SDGs) by actively promoting innovation and productivity, enhancing job quality and skills, fostering gender equality in the labour market, and reducing CO_2 emissions to meet global climate objectives. This potential for transformation is attributed to the extensive knowledge and expertise that MNEs have accumulated in their specialised sectors. Additionally, MNEs' ownership networks contribute to the sourcing of intermediate inputs by integrating into global value chains (GVCs), diversifying managerial techniques across various markets, and ensuring better access to financial resources in multiple countries (Javorcik, 2020). In developed economies, FDI is crucial for stimulating growth (Alfaro et al., 2010). Precisely because of their productive nature, MNEs base their investment decisions on factors that enhance their productivity and technological capabilities. They may select regions where they can improve cost efficiency and technological advantage, especially in environments with fewer regulatory constraints.

Prominent research studies have developed theories and models to explain the factors driving FDI. Dunning (1977, 1981) emphasises ownership advantages and industrial organizations, while Markusen (1984, 1997) and Ethier (1986) focus on agglomeration economics and market size. Further research by Helpman (1984, 1985, 2006) and Markusen and Venables (1998, 2000) highlights the importance of various country characteristics. In addition, Carr et al. (2001) and Melitz et al. (2004) discuss cost factors, wage differentials, and transport costs. Other significant determinants include wealth and asset protection, risk factors, industrial and labour disputes, and policy variables, as explored by Yang et al. (2000), Resmini (2000), Braconier and Ekholm (2002), Faeth (2009), and Kumari and Sharma (2017).

Besides, accessing resource-abundant countries to utilise factors of production at lower costs is another major driver of FDI. Technology, as another important factor of production, can also be sourced and its diffusion utilised in locations where such technologies are abundant. To compete in global markets and generate profits, MNEs acquire newer technologies to enhance production efficiency. However, the heterogeneity of technologies and knowledge across borders and sectors drives MNEs to seek new varieties of first-hand knowledge and information through local spillovers by positioning their subsidiaries in locations specialised in certain technologies. This is mainly because they can only gain market share in the global economy if their technologies outperform those of competitors, enabling them to suppress costs and consequently increase markups. This allows MNEs to access and apply localised dimensions of knowledge (Pearce, 1999; Nachum and Zaheer, 2005) and expand their production technologies into new fields.

However, various markets are regulated by numerous regulations within heterogeneous regulatory frameworks. The regulatory distance between countries could act as an additional sunk cost for an MNE investing in a new market. The home headquarters of an MNE must always comply with regulations in its home country. However, new regulatory frameworks and regulations with different objectives in other countries increase the regulatory distance between the two. Compliance with such new regulations could be costly. These costs could take the form of fixed sunk costs for acquiring new technologies and production facilities to produce the final product in line with regulations. Alternatively, they could manifest as ad valorem or variable costs, such as adding additional components or ingredients to final goods. Therefore, compliance with regulations could be closely related to the technological positioning of the MNE.

Thus, this paper contributes to the literature on the determinants of FDI by focusing on two co-founding drivers: regulatory costs and technological positioning. More specifically, the role of regulatory distance (RD) in NTMs, namely SPS measures and TBT, as well as the influence of RTAs are tested as drivers of FDI. By exploring these dimensions, this study sheds light on how regulatory distance in NTMs between the host of a foreign-owned subsidiary and the home of the foreign MNE parent may impact investment decisions by foreign MNEs, particularly focusing on heterogeneity across different sectors and regions using a novel firm-level database. In fact, we are interested to find out whether regulatory distance in NTMs, and technological matching of the MNE with that of the European regions in terms of innovation and patenting activities would affect the FDI in foreign-owned subsidiaries.

Focusing on these firm-specific dynamics implies the construction of a comprehensive dataset that includes detailed financial, patent, and ownership information from the Orbis Bureau Van Dijk database. This data is further enriched by integrating sector-specific tariffs and regulatory distance in NTMs. Additionally, sub-national patent data from the European Patent Office (EPO PATStat) provides insight into regional technological capabilities at the NUTS2 level. Our dataset spans from 2000 to 2018, offering an unbalanced panel of European firms owned by both EU and non-EU entities. Our empirical methodology relies on the estimation of the total assets of subsidiaries using a Pseudo-Poisson Maximum Likelihood (PPML) estimator, which is robust against heteroscedasticity and zero values in the dependent variables, following the literature (Correia, Guimarães, and Zylkin 2020; Santos Silva and Tenreyro 2006; Head and Ries, 2008; Head and Mayer, 2014; Larch et al., 2019). This approach allows us to assess the effects of regulatory distance between the home and host countries of FDI in a dyadic relationship that varies over time. We control for multilateral resistance effects of trade policies using multidimensional fixed effects, following the gravity literature (Yotov et al., 2016). Additionally, we incorporate a comprehensive set of fixed effects to account for unobserved heterogeneity at various levels, including firm-specific, sectoral, and regional factors, ensuring robust and reliable results. The analysis distinguishes between two models: one focusing on the subsidiary's sector of activity and the other on the parent company's sector. Other key variables include employment size, labour productivity, liabilities, and innovation capabilities, measured through patent activity. These firm-specific factors are complemented by sector-level trade policies (WTO I-TIP), including tariffs and regulatory distance in NTMs, which are calculated at a granular level using Harmonized System (HS) product classifications at the six-digit level.

To measure the impact of regulatory distance in TBTs and SPS measures, we construct an index that captures the extent of divergence between trading partners based on the objectives of NTMs cited in the TBT and SPS notifications to the World Trade Organisation (WTO). The divergence index reflects the difference in regulatory objectives between the importing and exporting countries, with higher values indicating greater distance. Furthermore, we calculate the Revealed Technological Advantage (RTA) for each each four-digit technology class matching the subsidiary's patenting activity, but at the four-digit Cooperative Patent Classification (CPC) technological classes and regional NUTS2 level where the subsidiary is located. This RTA index helps us understand the technological positioning of firms in relation to their regional environment, which is crucial for analysing the impact of regulatory policies on firm performance.

Our findings indicate that increasing RD through TBTs and SPS measures may hamper FDI investment from extra-EU companies, reinforcing previous studies (Cieślik and Ghodsi, 2024). In addition, technological capabilities and the technological interests of the foreign-owned subsidiary matching the RTA the host region significantly support FDI . Interestingly, this positive effect is the opposite when considering the innovation portfolio of the parent company. Thus, this phenomenon shows that while subsidiaries benefit from local technological strengths, parent companies might be reluctant to invest in regions where their core technologies are already established, potentially due to concerns about competition or market saturation.

The remainder of the paper is organised as follows. The next section provides a brief review of the literature. Section three describes the data and methodology. Section four presents the estimation results, and section five concludes.

2. Literature review

The literature on the theoretical and empirical determinants of FDI has been expanded over decades. Both macroeconomic and microeconomic factors have been studied in the literature. Using the Orbis database and machine-learning techniques, Arel-Bundock (2017) finds that political factors are not significantly related to MNEs' decisions to invest abroad; rather, traditional gravity variables play a more critical role. Likewise, Bénassy-Quéré et al. (2007) emphasize that the quality of institutions, including bureaucracy, corruption, and transparency of information, as well as the banking sector and legal framework of the host economy, are crucial determinants of inward FDI, independent of GDP per capita. Moreover, while the institutional quality of the home economy does not significantly impact FDI, the convergence of the institutions in the host country to those of the home country can foster bilateral FDI. Nevertheless, the stability of both political and economic environments significantly influences FDI inflows into a country (Schneider and Frey, 1985).

The role of gravity variables in influencing FDI flows cannot be overstated. Factors including cultural distance, language proximity, colonial ties, trade agreements, as well as additional determinants like relative labour endowments and economic sentiment indicators significantly affect bilateral FDI flows (Bevan and Estrin, 2004; Blonigen and Piger, 2014; Ghodsi, 2020; Cieślik and Ghodsi, 2021, 2024). The ratification and implementation of bilateral investment treaties further enhance bilateral FDI outflows (Egger and Pfaffermayr, 2004). Furthermore, inflation rates, interest rates, and the availability of skilled labour are key determinants of FDI (Çeviş and Çamurdan, 2007; Hoang et al., 2021). Other determinants, such as regulatory reforms aimed at reducing FDI restrictiveness, can significantly boost FDI stocks (Mistura and Roulet, 2019). Similarly, introducing the euro has been shown to raise inward FDI flows within the euro area, with Intra-area flows being more strongly affected than those outside the euro area (Petroulas, 2007). While some studies find no significant impact of corporate tax variations on FDI in the EU (Hunady and Orviska, 2014), others address the possibility of a positive relationship between foreign ownership and tax burdens (Huizinga and Nicodème, 2006). Moreover, factors such as labour costs, firing costs, public debt, GDP per capita, and openness play significant roles in determining FDI (Janicki and Wunnava, 2004).

Several studies have examined the role of technological capabilities in attracting FDI. In fact, MNEs invest in regions and sectors that can allow them absorb a substantial technological spillover. Branstetter (2006) and Belderbos et al. (2013) provide empirical evidence that MNEs seek regions with strong technological ecosystems aligned with their innovation interests. Castellani and Zanfei (2006) argue that such matching facilitates productivity gains and knowledge spillovers, while Fosfuri et al. (2001) emphasise the role of skilled labour mobility in diffusing technological benefits from FDI. These studies underscore the importance of locating subsidiaries in regions that offer complementarities in innovation. Additionally, Noorbakhsh et al. (2001) find that countries with a strong human capital base attract more FDI, especially in technology-intensive sectors. Similarly, Haskel et al. (2007) and Coe et al. (2009) show that domestic firms benefit from foreign technological presence, but the extent of spillovers depends on absorptive capacity and institutional quality.

Trade and investment costs imposed by regulatory differences also influence MNEs' decisions. Fontagné et al. (2015) and De Sousa et al. (2012) show that product standards and regulatory divergence affect not only trade but also investment flows, as firms seek to avoid compliance costs. Disdier et al (2008) find that SPS measures can serve as barriers to trade in agri-food sectors, while Piermartini and Budetta (2009) and Cadot et al. (2015) note that divergent NTMs increase fixed and variable costs of entry. Chen and Moore (2010) further demonstrate that firm heterogeneity amplifies the role of regulatory frictions in FDI decisions. Chen and Novy (2012) contribute to the understanding of indirect trade and investment frictions, suggesting that regulatory distance should be considered as a composite cost factor.

Alongside the impact of technological advancements on FDI flows, tax competitiveness and government investment also play a prominent role. Hubert and Pain (2002) used data on FDI from German MNEs to identify tax competitiveness, government fixed investment expenditures in regions with lower needs for EU structural funds, and agglomeration externalities as major drivers of FDI inflows in the European Economic Area (EEA). Similarly, Kurtovic et al. (2016) demonstrated that FDI from Austria reshaped the industrial organization in Bosnia and Herzegovina, resulting in labour market changes and an increase in wages. Hence, higher wages offered by MNEs may raise average wages and enhance certain skills among employees in the host economy (Becker et al., 2020). In addition, Lin (2010) finds that network linkages, market expansion, and China's incentive policies positively affected the decision of MNEs to engage in FDI, particularly in the Taiwanese IT sector. To this extent, export-oriented firms also show a greater propensity to engage in FDI, highlighting the importance of market dynamics and policy incentives in shaping investment decisions.

To this end, many studies have examined the role of FDI in the EU, shedding light on several determinants influencing investment flows. A study by Bellak and Mayer (2010) shows that Austria's favourable economic environment and corporate tax policies have positioned it to attract more inward FDI following the recent global financial crisis. Additionally, Pfaffermayr and Bellak (2002) found that MNEs operating in Austria are significantly larger than domestic firms. These MNEs demonstrate higher productivity, greater investment-to-sales and investment-to-employment ratios, larger exports to both EU and non-EU countries, a greater market share within the EU, and higher annual growth in employment and sales. Although domestic Austrian firms exhibit slightly higher labour productivity growth than those owned by foreign MNEs, indicating a catch-up effect and spillover benefits from MNEs, the key takeaway is that being part of a foreign MNE's network significantly boosts the profitability and productivity of Austrian firms. This network membership provides access to specialized human capital, information exchange, technology transfer, and other benefits like transfer pricing, aligning well with previous literature (Desai et al., 2008; Alfaro and Chen, 2012). In line with these findings, Bellak (2004) notes that Austrian firms owned by MNEs perform more robustly compared to those simply owned by foreign entities. Gugler (1998) underscores that ownership concentration is a hallmark of 'bank-based' financial systems. Braconier and Ekholm (2002) carefully examine Swedish MNEs and their affiliates and find that German affiliates tend to be more R&D- and skill-intensive, with higher labour productivity than affiliates in other regions. Consequently, German affiliates are less integrated with their Swedish parent companies because they trade less with them and instead supply more products to the domestic German market. This behaviour indicates that Swedish MNEs are engaging in market-seeking FDI in Germany.

Brenton et al. (1999) explore the integration of Central, Eastern, and Southeastern European (CESEE) countries into the EU, finding that income growth is the primary driver of FDI from the EU to these regions. Noteworthy, FDI does not substitute exports from the home EU countries. Ghodsi (2020) examines the impact of technical barriers to trade (TBTs) on FDI stocks in CESEE countries. The findings suggest that restrictive TBTs in CESEE, which raise specific trade concerns (STCs) at the World Trade Organization (WTO), act as a tariff-jumping incentive, encouraging more FDI in these regions. In contrast, regular TBTs imposed by home countries can reduce FDI stocks by increasing trade costs and hindering potential vertical integration. Breuss et al. (2001) find that public expenditure in EU member states encourages FDI outflows to other countries.

Similarly, Katsaitis and Doulos (2009) reveal that European Structural Funds positively impact FDI inflows into EU member states with higher institutional quality, while they may negatively impact states with lower institutional quality due to resource misallocation. Bruno et al. (2016) report a strong negative impact of leaving the EU on FDI inflows. Cieślik and Ghodsi (2021) find that eurozone membership may reduce pledged investments by MNEs as the single currency removes trade frictions, making trade a substitute for FDI. Furthermore, the results suggest that better economic conditions in an EU host country and worse conditions in an EU home country, measured by economic sentiment indicators (ESIs), increase the number and capital amount of intra-EU investment projects pledged by MNEs. Furthermore, a more recent study by Cieślik and Ghodsi (2024) on global foreign-owned subsidiaries that are active in manufacturing sectors reveal that regulatory distance in TBTs between the host and home of FDI is negatively associated with the turnover and total assets of these firms.

This paper contributes to the literature by building on these strands, particularly by examining how regulatory distance in NTMs (TBTs and SPS) and regional technological advantage (measured by CPC-based RTA) jointly influence FDI at the firm and regional levels within the EU. By integrating both the subsidiaries' and parent's technological portfolios, this paper offers a novel perspective on how MNEs strategically locate investments to access technologies that complement rather than duplicate their core competencies. This paper contributes to the literature by extending the work of Cieślik and Ghodsi (2024), focusing on foreign-owned subsidiaries in the EU that operate across all sectors of the economy. The motivation for this extension is the inclusion of both the subsidiary's and the parent company's sectors to analyse the effects of regulatory distance on the total assets of subsidiaries. Consequently, there could be subsidiaries in the services sector whose parent companies are in the manufacturing sector, with regulatory distance calculated for the parent company's sector. Additionally, this paper explores the technological positioning of parent companies and their subsidiaries, particularly in terms of patenting, and examines their relationship with the RTA of the NUTS-2 region where the subsidiary is located. Furthermore, while Cieślik and Ghodsi (2024) measured regulatory distance at the subsidiary sector level and analysed its effects, this paper takes an additional step by identifying the parent company's sector to assess the impact of regulatory distance in NTMs within the parent company's sector on the total assets of the foreign-owned subsidiary.

3. Data Sources and Methodology

3.1. Data Sources

We construct a comprehensive database of multinational affiliates in Europe, including those owned by EU and non-EU parents. We start with information on firms' financials, patent activity and ownership from Orbis Bureau Van Dijk and matching it with country-sector specific tariffs and regulatory distance in non-tariff measures (NTMs), as well as sub-national NUTS2 patent production information from the European Patent Office (EPO PATStat). The final period of analysis goes from 2000 to 2018, with unbalanced panel information. Tariffs are compiled from the World Integrated Trade Solutions (WITS) of the World Bank. Tariffs in each sector and country is the simple average ad-valorem equivalents of all tariffs adjusted for tariff-quota rates that are imposed by a country on all six-digit products including zero trade flows. The priority of choice for tariffs is first the use of bilateral effectively applied rates. When these rates are missing in the data, the bilateral preferential rates are used. And when these types are missing, the unilateral most-favour nation (MFN) rates are used for a product line. The NTM data to measure the regulatory distance is collected from the Integrated Trade Intelligence Portal (I-TIP) of the World Trade Organization (WTO). The methodology to measure the regulatory distance in TBTs and SPS measures is described in the next sub-section.

3.2. Methodology

Our empirical strategy relies on the estimation of subsidiary's total assets by means of Pseudo-Poisson Maxium Likelihood estimator (PPML).[1] The interest in estimating the simultaneously effect of both home and host sectors trade regulations relies on the identification of two models.

Specifically, when focusing on the host sector of activity s (i.e. the sector of the subsidiary),[2] we can derive our first model as follows

$$Y_{fsrig\rho jt} = \exp[\alpha + Firm_{fsrt}\beta_1{}' + GUO_{g\rho jt}\,\beta_2{}' + TradePol_{sit}\beta_3{}' + TradePol_{sjt}\beta_4{}' + \tag{1}$$

$$+ RTA_{frit} + \gamma_f + \gamma_g + \gamma_{rit} + \gamma_{\rho t} + \gamma_{ist} + \gamma_{jst} + \gamma_{ijs}\,] \times v_{fsrig\rho jt}$$

where the dependent variable Y refers to the total assets of firm *f*, active in sector *s* and located in the NUTS2 region *r* of the EU country *i*, that belongs to the corporate group owned by a foreign Global Ultimate Owner (GUO) *g*, active in sector ρ of country *j*. On the right hand side of Eq. (1), our set of regressand includes the vector of subsidiary's characteristics $Firm_{fsrt}$, such as employment size (emp_{fct}), labour productivity (lp_{fct}), current and non-current liabilities (i.e. $curliab_{fct}$ and $nocurliab_{fct}$, respectively) and innovation capability, measured as yearly count of published granted patents (p_{fct}). The same

[1] More specifically, we implemented the command ppmlhdfe developed by Correia, Guimarães and Zylkin (2020). The Poisson Pseudo Maximum Likelihood with High Dimensional Fixed Effects allow us to achieve faster convergence and robustness.
[2] I.e., following the two-digit level of Statistical classification of economic activities (NACE) Revision 2.

characteristics are also considered at corporate group level by means of unconsolidated data for the parent's own activities in vector $GUO_{g\rho jt}$.[3] Vectors $TradePol_{sit}$ and $TradePol_{sjt}$ include regulatory distance in NTMs as well as the bilateral tariff simple average imposed by country *i* (*j*) to the imports of the six-digits products from country *j* (*i*) in sector *s* at time *t*. [4] Tariffs are bilateral, and calculated as the simple average of all tariffs lines (including zero trade flows) at the six-digit level of Harmonized System (HS, 1996) that exist within each NACE two-digit sector.

Specifically, regulatory distance within each bilateral two-digit NACE sector is assessed through the detailed objectives cited as keywords in NTM notifications targeting products at the six-digit HS level in the concordance tables, which link the six-digit HS products to two-digit NACE sector levels. Following the approach of Cadot et al. (2015), a variable for regulatory distance is measured for each type of NTM. To measure the distance in regulatory NTMs at the NACE two-digit sector s, which includes six-digit HS products h, a binary variable $I^{\tau o}_{kht}$ is defined. This variable indicates whether importing country k has a regulatory NTM of type τ (i.e., $\tau \in \{TBT\ ,SPS\}$) on product h in year t, in force with an objective o cited in the WTO notifications). The regulatory distance between two trading partners k and l in that regulatory measure τo is then defined as $RD^{\tau o}_{klh} \ = |I^{\tau o}_{kht} - I^{\tau o}_{lht}|$. Aggregating regulatory distance over all classes for a traded sector s between importing country k and exporting country l in year t, then yields the regulatory distance D^{τ}_{klst}, which is calculated as:

$$D^{\tau}_{klst} = \sum_{o=1}^{HO_{h,\tau}} \frac{RD^{\tau o}_{ijht}}{HO_{h,\tau}}, \ \ \tau \in \{TBT\ ,SPS\} \tag{2}$$

where $O_{h,\tau}$ represents the total number of NTM objective classes of type τ imposed globally on product h, and H denotes the total number of six-digit HS products in sector s. This index approaches unity when the two trading partners impose TBTs or SPS measures covering different NTM classes, indicating full divergence, and approaches zero when the TBTs and SPS measures fall within the same classes for both partners. Thus, regulatory NTMs' distance increases with this index. All trade flows, including those with zero trade values, in all six-digit tariff lines are considered to avoid bias towards available tariff lines, which presumably incur lower trade costs.

In addition, we compute variable RTA_{frit} as the Revealed Technological Advantage (RTA) that region *r* (in country *i*) has with respect to each firm-specific technological interest. This is done using the following equation

$$RTA_{frit} = \frac{1}{N_c}\sum_{c=1}^{N_c} w_{fc}\ RTA_{rict} \tag{3}$$

where we introduce subscript *c* to define the 4-digit technology class of the Cooperative Patent Classification (CPC). This implies that, for each firm *f*, we first identify the technological classes *c* in which it is active over the period by looking at its production history of granted patents. Then, once we identify the technological interest of the company, we can compute for each year the RTAs at the same CPC level (4-digit) in the region where it is located and match the two pieces of information though weight $\boldsymbol{w_{fc}}$, which is defined either as a dummy that switches on whenever technolgical class *c* is produced in firm *f*, so that our final index RTA_{frit} can be seen as a simple average of the RTAs across all technological classes $\boldsymbol{N_c}$ in which *f* is

[3] In order to include a larger number of observations, we present as the main results the specification with a limited set of financial information on the subsidiary and no financial information on the GUO. Nevertheless, we provide the full model specification in the Appendix as a robustness check (Tables A1.1 and A1.2), which confirms the results presented in Section 3.
[4] More specifically, we include both Technical Barriers to Trade (TBT) and Sanitary and Phytosanitary Standards (SPS) measures as NTMs.

active, or we can further refine our weighting system to account for the importance of each technology class by taking the technology share of total patenting output of firm *f*, previously defined in Eq.(1) as p_{fct}, so that RTA_{frit} can be seen as the weighted average of RTAs across all technology classes N_c in which *f* is active, weighted by their relative importance. In addition, we repeat the calculations of our innovation-weighted RTA indices with respect to the technological interest of the parent company.

Finally, following the FDI literature (Anderson and van Wincoop, 2003; Head and Mayer, 2014; Baier and Bergstrand, 2009), we include a set of fixed effects accounting for the unobserved individual characteristics at both subsidiary and GUO level (i.e. γ_f and γ_g, respectively), as well as bilateral host-sector γ_{ijs} (i.e. the sector of subsidiary), the home-sector-time $\gamma_{\rho t}$, the host-sector-time in both FDI origin and destination countries, namely γ_{jst} and γ_{ist} (i.e. the country of guo and of the subsidiary, respectively) and regional-time γ_{rit}.[5] It is also important to note that all continuous variables included on the right hand side of Eq. (1) are hyperbolic sine transformed, with the exception of the RTA variables, which are kept in levels.[6]

Similarly, when focusing on the home sector ρ (i.e. the sector of the GUO), we can derive our second model as

$$Y_{fsrig\rho jt} = \exp[\alpha + Firm_{fsrt}\beta_1' + GUO_{g\rho jt}\,\beta_2' + TradePol_{\rho it}\beta_3' + TradePol_{\rho jt}\beta_4' + \quad (4)$$

$$+ RTA_{frit} + \gamma_f + \gamma_g + \gamma_{rit} + \gamma_{st} + \gamma_{i\rho t} + \gamma_{j\rho t} + \gamma_{ij\rho}\ ] \times v_{fsrig\rho jt}$$

where we can notice a strong similarity with Eq. (1), although now both vectors $TradePol_{\rho it}$ and $TradePol_{\rho jt}$, as well as the set of fixed effects are referred to the GUO sector ρ.[7]

3.3. Stylised Facts: Investments and RTA

In this section, we provide a descriptive overview of foreign direct investment, measured by the total assets of foreign-owned subsidiaries across NACE two-digit sectors and NUTS-2 regions, using heatmaps. The regions are split alphabetically and presented in three figures, A1.1 to A1.3. Furthermore, we display the revealed technological advantage (RTA), based on the location of inventors across NUTS-2 regions and classified according to three-digit CPC classes. These are also split across regions and shown in three figures, A1.4 to A1.6.

Figures A1.1-A1.3 show the total assets held by foreign-owned subsidiaries averaged across years that are measured in millions of US dollars in logarithmic form, where rows represent the NACE 2-digit sectors and the columns the regions at NUTS-2 level). The colours are centred around zero: yellow to green shades indicate positive and higher log values, i.e. foreign direct investment exceeding $1 million, while orange to red shades denote negative log values, corresponding to foreign-owned total assets below $1 million. Figures A1.4–A1.6 follow the same layout, but represent the revealed technological advantage (RTA) of three-digit

[5] Additional inclusion of specifications with interaction terms between Trade Policy variables and firm-level characteristics were also accounted in the analysis, as will be better explained in Section 3.

[6] The reason for using the hyperbolic sine transformation of continuous variables is primarily because of the presence of zero values, as well as of their easiness in expressing results as asymptotic semi-elasticities, as done by the logarithmic transformation in linear regression (Bellemare and Wichman, 2020).

[7] As in done when focusing on the subsidiary sector, the main results presented in Section 3 with respect to Eq. (3) only consider information on the economic activity and country of origin of the GUO to include a larger sample size. The reader is once again invited to refer to the full model specification in the Appendix, Tables A3.1 and A3.2.

CPC classes in each NUTS-2 region, based on inventors' locations. The colours in heatmaps A1.4–A1.6 reflect the logarithmic degree of RTA within each three-digit technology class across the EU. An RTA greater than 1 suggests that the region is specialised in that technology class relative to other regions. Thus, yellow to green shades indicate RTAs above 1 (technological specialisation), while orange to red shades reflect RTAs below 1 (technological disadvantage).

If we look at the rows of Figure A1.1, we see that some sectors finance (64), real estate (68), and professional activities of head offices (70) contain the darkest green cells indicating highest amount of total assets by foreign-owned firms across regions. These sectors are also heavily invested in other regions as Figure A1.2 and Figure A1.3 demonstrated. Furthermore, when we look at the columns of Figure A1.1 we observe that regions such as AT13 (Wien), BE10 (Brussels), DE71 (Darmstadt), DE21 (Ober Bayern),DE30 (Berlin) exhibit dark green, especially in finance (NACE 64), wholesale (46) and motor vehicles (29). These cells present large total asset invested by foreign-owned firms. In contrast, some Belgian regions such as (BE31, BE34) and peripheral Bulgarian regions remain pale yellow, orange, red, or even without foreign investment across many sectors, highlighting the limited FDI in these regions.

However, the largest foreign investment is in finance in CY00 (Cyprus) – known to be a tax haven for MNEs, which stands at an average annual of $155.955 billion. The second largest foreign investment is again in finance in Brussels worth $156.494 billion and the third largest is in head office activities in Darmstadt – where Frankfurt is located – with $65.047 billion total assets owned by foreign-owned firms. Although some services are heavily invested by foreign MNEs, there are numerous empty cells in various services sectors and regions. In contrast, many manufacturing sectors, especially those with medium to high tech intensity (NACE 20 to NACE 29) are heavily invested by MNEs across regions. Tech-manufacturing (machinery 28, and fabricated metals 25) show very large investments across regions.

Commented [RD1]: Some of these were Capitalised but not all, I made them lower case

Figure A1.2 illustrates the second group of regions in our sample. Regions like DK01 (Capital Region, Hovedstaden), DK04 (Hovedstaden), ES30 (Comunidad de Madrid), ES51 (Barcelona), FR10 (Île-de-France), FRK2 (Rhône-Alpes), HR04 (Kontinentalna Hrvatska), and HU11 (Budapest) seem to have an outstanding amount of FDI across most sectors. Many Greek regions and few French regions are blank due to the prominent white gaps in the dataset. The largest amount of average annual total assets invested by foreign-owned rest in Finance in Île-de-France worth $313.866 billion, then in Comunidad de Madrid worth $186.138 billion, and then in Hovedstaden worth $93.041 billion.

Commented [RD2]: ?? Does this mean zero investment? Or something else?

Furthermore, Figure A1.3 shows the total assets of foreign-owned firms across sectors in the last set of regions. Regions such as Dublin in Ireland (IE04), Lombardia in Italy (ITC4), Luxembourg (LU00), Malta (MT00), Noord-Holland in the Netherlands (NL32), Warszawski stołeczny in Poland (PL91), Área Metropolitana de Lisboa in Portugal (PT17), București-Ilfov in Romania (RO32), Stockholm in Sweden (SE1), and Bratislavský kraj in Slovakia (SK01) stand out with large amounts of foreign investment. By contrast, a striking number of orange, red, and empty cells—indicating lower or negligible investment—are observed in many Polish and Romanian regions. Substantial heterogeneity is evident across different regions and industries, both within and between the three groups. Once again, the finance sector receives the largest total assets, with Luxembourg (LU00) leading at $5,365.201 billion, followed by Noord-Holland (NL32) with $2,337.156 billion, Zuid-Holland (NL33) with $950.171 billion, and Eastern and Midland in Ireland (IE06) with $474.943 billion.

Figures A1.4–A1.6 display the distribution of log RTA across European regions for each three-digit technology class. Since the RTA values are initially constructed at the four-digit level of CPC classes for each NUTS-3 region over time, and then averaged to produce one figure per three-digit technology class at the NUTS-2 level, the resulting graphs may be affected by aggregation bias. For example, if within a three-digit class there are many four-digit technologies in which a location has a comparative disadvantage but one where it has an advantage, the average can conceal this variation. Thus, even though by definition a region must have an RTA in some technology and a disadvantage in another this may not show up as such in the heatmap. Despite this limitation, the role of technology in our sample is evident: in advanced EU regions, inventors are active across many technology classes, while in many peripheral regions, several technology classes are not even the subject of innovation.

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4. Estimation Results

In this section, we present the results of the econometric analysis. In the first subsection, we analyse the results of all variables estimated from Equation (1), presented in Table 1, and those estimated from Equation (4), presented in Table 2. The second subsection discusses the estimation results of various measurements of the RTA variable in Equation (3), presented in Table 3.

4.1. Main results

We start our analysis from the results on trade policies that include tariffs and regulatory distance in TBTs and SPS measures. Tables 1 present the estimation results considering the subsidiary's primary sector as the sector of analysis for trade policy measures. Table 2 present the estimation results considering the parent's primary sector as the sector of trade policy measures. A first noteworthy result is with respect to NTMs. These trade policies seem to matter more for the subsidiary's sector in determining total assets of the subsidiary than the parent's sector. In fact, in Table 1, regulatory distance in TBTs receives negative and significant coefficients. In contrast, as Table 2 shows, the primary sector of the parent does not play a role in how regulatory distance measures affect investment behaviour at the subsidiary level, in a statistically significant manner.

In the case of host sector regulation, when there is a greater divergence in TBTs between the FDI destination country and the country of origin, there is a stronger discouraging effect on investment, mainly driven from the sample of analysis where the country of origin is outside the EU, as shown in Table 1. In fact, for extra-EU FDI, the coefficient for regulatory distance in TBTs in the sector of the subsidiary, column is negative and statistically significant at 1% level. This indicates when regulatory distance in TBTs increases by 1 percentage point, the total assets of subsidiary decreases roughly by 1.86%. This indicates that when the home and host countries proliferate TBTs with objectives that are not regulated by the other partner, the FDI in the EU decreases. This finding suggests that firms are highly sensitive to regulatory barriers, which can distort their ability to operate efficiently and compete in foreign markets. Moving on to the other policy variables, the negative impact of regulatory distance in SPS measures is not statistically significant in any of the models, except when we interact the SPS variable with a binary variable indicating the relationship when the two-digit primary sector of activity of the subsidiary is the same as that of the parent (see columns 3 and 4). Since vertical integration of FDI can also take place frequently within a two-digit sector, we cannot interpret it as a horizontal FDI.[8] However, this shows that when regulations with diverging objectives

[8] In our whole sample, horizontally integrated NACE 2-digit subsidiaries account for almost 11% of the observations.

targeted by SPS measures affect both parent's and subsidiary's sectors, their disturbing impact on the bilateral investment becomes statistically significant. In fact, the coefficient for SPS measures indicates that a 1 percentage point increase in the regulatory distance in SPS measures targeting sectors of activity of both parent and subsidiary would decrease the total assets of the subsidiary by 0.70%. This indicates a substantial detrimental effect on FDI from non-EU countries at a 5% significance level.

Table 1 – PPML estimation of subsidary‘s total assets with respect to trade policies in the FDI host sector

	No Interaction		Interaction	
	(1) Whole sample	**(2) Extra-EU GUOs**	**(3) Whole sample**	**(4) Extra-EU GUOs**
Trade policies host sector				
Reg Div TBT	-0.0000	-1.8558***	0.0161	-1.8421***
	(0.6477)	(0.4675)	(0.6462)	(0.4683)
Reg Div SPS	-0.2667	0.8950	-0.0395	1.1728
	(0.7394)	(0.7556)	(0.7416)	(0.7731)
Horiz. Integration x Reg Div SPS			-0.5664*	-0.7020**
			(0.3123)	(0.3243)
Tariff host country	0.0716	0.1698***	0.0633	0.1633***
	(0.0564)	(0.0496)	(0.0565)	(0.0495)
Tariff home country	0.0157	0.0182	0.0150	0.0178
	(0.0312)	(0.0354)	(0.0313)	(0.0354)
Subsidiary-level variables				
Employment	0.1359***	0.1365***	0.1359***	0.1365***
	(0.0128)	(0.0180)	(0.0128)	(0.0180)
Labour Productivity	0.0393***	0.0510***	0.0393***	0.0510***
	(0.0079)	(0.0122)	(0.0079)	(0.0122)
No. owned patents	-0.0040	0.0052	-0.0041	0.0051
	(0.0056)	(0.0106)	(0.0056)	(0.0106)
Subsidiary-level based RTA				
RTA (inventors) weighted	0.0026***	0.0015*	0.0026***	0.0015*
	(0.0010)	(0.0009)	(0.0010)	(0.0009)
Constant	20.1359***	19.7705***	20.1383***	19.7756***
	(0.1434)	(0.2271)	(0.1434)	(0.2273)
N	1345501	602225	1345501	602225
AIC	6.6181e+12	3.6799e+12	6.6178e+12	3.6796e+12
BIC	6.6181e+12	3.6799e+12	6.6178e+12	3.6796e+12
No groups	114385	51935	114385	51935
Time invariant FE: Firm, GUO, home-host country pair in host sector	Yes	Yes	Yes	Yes
Time variant FE: region NUTS2, host-country/ host-sector, home-country/host-sector	Yes	Yes	Yes	Yes
Time variant home-sector FE	No	No	No	No

Note: All regressors except the RTA variable have been arcsine-transformed. Robustness checks using different sample sizes and model specifications for columns 1 and 2 are available in Appendix Table A1.1 and A1.2, while additional estimation of columns 3 and 4 using other tarde policies is available in Appendix Table A2. Clustered standard error in parenthesis. * p < .10, ** p < .05 , *** p< .01

When it comes to tariffs, the primary findings support the hypothesis of tariff jumping when tariffs are imposed by the host country. Specifically, the coefficient for host country tariffs is positive and statistically significant at the 1% level for extra-EU FDI according to Table 1 when tariffs are imposed on the sector of the subsidiary, and for all types of FDI according to Table 2 when tariffs are imposed on the sector of the parent company. This suggests that higher tariffs imposed by the destination country encourage FDI as firms prefer to invest in the EU and produce within the EU rather than exporting to the EU at higher tariff costs. Since in Table 2 tariffs imposed on the sector of the parent company residing in the EU are positively correlated with its investment in another member state of the EU with the same level of bilateral tariffs on the same sector, one can argue that higher protectionism in terms of tariffs incentivises European GUOs to invest more within the EU. Furthermore, the tariff-juming impact is particularly stronger for innovative firms, as indicated by the significance of the interaction term with the number of patents owned by the subsidiary in columns 3 and 4 of Table 2. The interaction term shows that tariffs in the host country combined with the number of patents owned by the subsidiary positively affect FDI decisions. This suggests that when the subsidiary is innovating novel technologies that are worth receiving grants from patent offices, the tariff jumping motive is even stronger. Such a subsidiary can produce with its novel technologies in the host EU member state more independently of its parent, which can export its goods to this subsidiary as intermediate inputs of production at a higher cost induced by larger tariffs. The coefficients of tariffs imposed by the home country in Tables 1 and 2 appear to be statistically insignificant. This suggests that tariffs imposed by the home of FDI do not play a statistically significant role in cross-border investment in the EU. In other words, considering the global value chains (GVCs), the exports of goods from the subsidiary to the parent company are not affected by the tariffs imposed by the home country of the parent company.

The other firm characteristic included in the analysis, namely employment size and labour productivity confirm the existing literature and show positive and statistically significant coefficients on investment, [9] following existing literature (Adetunji and Owolabi, 2016; Yadav et al., 2022; Yousaf, 2022). Finally, the number of owned patents by the subsidiary does not receive statistically significant coefficients in Table 1 when we control for subsidiary sector. However, it becomes statistically signficant in Table 2 when we control for the sector of parent. One needs to also note that the sample size differs considerably in these two tables. Moreover, our regional RTA innovation-weighted measure shows a positive and significant coefficients throughout Tables 1 and 2 respectively, emphasizing the importance of matching locational innovation capabilities to the specific technological interest of the subsidiary, which holds strategic relevance for corporate groups, as will be further explored in the next subsection.

Table 2 – PPML estimation of subsidary's total assets with respect to trade policies in the FDI home sector

	No interaction		**Interaction**	
	(1) Whole sample	**(2) Extra-EU GUOs**	**(3) Whole sample**	**(4) Extra-EU GUOs**
Trade policies home sector				
Reg Div TBT	-0.3837	-1.5305	-0.4255	-1.6413
	(0.9902)	(1.4305)	(1.0002)	(1.4171)
Reg Div SPS	-0.0992	1.1367	-0.0091	1.2230
	(0.9905)	(1.7117)	(0.9983)	(1.6958)
Tariff host country	0.1332***	0.2022***	0.1276**	0.2035***
	(0.0517)	(0.0458)	(0.0521)	(0.0455)
Tariff home country	0.0689	0.0287	0.0632	0.0244
	(0.0487)	(0.0509)	(0.0496)	(0.0520)
Subsidiary-level variables				
Employment	0.1379***	0.1334***	0.1379***	0.1337***
	(0.0134)	(0.0186)	(0.0134)	(0.0186)
Labour Productivity	0.0369***	0.0454***	0.0370***	0.0454***
	(0.0106)	(0.0156)	(0.0106)	(0.0156)
No. owned patents	0.0014	0.0215*	0.1379***	0.1337***
	(0.0087)	(0.0124)	(0.0134)	(0.0186)
No. owned patents x Tariff host country			0.0251***	0.0247***
			(0.0090)	(0.0090)
Subsidiary-level based RTA				
RTA (inventors) weighted	0.0051***	0.0017	0.0052***	0.0015
	(0.0016)	(0.0026)	(0.0016)	(0.0026)
Constant	20.2992***	19.8886***	20.3038***	19.8961***

[9] As well as current and non-current liabilities, as reported in the Appendix, Tables A1.1 to A3.2.

	(0.2070)	(0.3062)	(0.2067)	(0.3060)
N	678859	276996	678859	276996
AIC	5.3029e+12	2.5760e+12	5.2989e+12	2.5739e+12
BIC	5.3029e+12	2.5760e+12	5.2989e+12	2.5739e+12
No groups	27123	9847	27123	9847
Time invariant FE: Firm, GUO, host-home country pair in home sector	Yes	Yes	Yes	Yes
Time variant FE: region NUTS2, host-country/home-sector, home-country/home-sector	Yes	Yes	Yes	Yes
Time variant host-sector FE	Yes	Yes	Yes	Yes

Note: All regressors except the RTA variable have been arcsine-transformed. Robustness checks using different sample sizes and model specifications for columns 1 and 2 are available in Appendix Table A3.1 and A3.2, while additional estimation of columns 3 and 4 using other tarde policies is available in Appendix Table A4. Clustered standard error in parenthesis. * p < .10, ** p < .05 , *** p< .01

4.2. Impact of different RTAs

To uncover the potential heterogeneities behind different types of regional RTA (i.e., inventor versus applicant co-authorship system) and to account for the potentially different role played by the technological interest of the subsidiary and of the parent company, we compute our RTA measures according to both innovation portfolios. The main findings are presented in Table 3.[10]

Examining the first four rows of Table 3, we observe an interesting result among the different RTA measures computed with respect to the technological interest of the subsidiary, as described in Eq. (3) of Section 2. Specifically, the largest and most significant coefficient is found when regional RTA is computed with respect to the location of the inventors and weighted by the relative importance of the technological classes in the subsidiary's patent production. For instance, the coefficient for this regional RTA measure is statistically significant at 1%, which indicate that a one unit increase in the regional RTA of technology classes in which the subsidiary patents, total assets of the subsidiary increases by 0.0026 percentage point. This is a robust and positive impact on FDI.

Moving on to the bottom four rows of Table 3, we examine the same indices computed with respect to the technological portfolio of the parent company. Interestingly, all regional RTA measures calculated either based on the basis of co-authorship by inventors or by applicants (i.e. ownership) exhibit negative signs. Specifically, the coefficient for the regional RTA measure based on the location of inventors in that region in the EU is negative and statistically significant at 5% level. Similarly, the coefficient remains negative for the regional RTA measure based on owners of patents residing in that region. This effect is particularly true for ownership-based regional RTAs and for extra-EU investors. These findings suggest, as a first indication, that headquarters are rather reluctant to outsource in-house innovation to regions where competitors (i.e. other patent owners) are active in the same technologies. In addition, the stronger effect registered for extra-EU groups indicates the potential presence of a distance decay effect of knowledge spillovers, which diminishes as the distance between subsidiaries and parent companies increases. To further support this hypothesis, we additionally estimate the same specification, including an interaction term between regional RTAs and the distance between source and destination countries, using information from the CEPII database. The results are presented in Appendix Table A5 and confirm the additive negative effect of distance, especially for groups with headquarters outside the EU. In fact, when the regional RTA variable is interacted with the geographical distance between the home and host of FDI, the main effect of RTA

[10] Specifically, we shall notice that these results are computed following Eq. (1), hence including trade policies with respect to the host sector. Results considering the GUO sector as in Eq. (3) are available upon request.

becomes statistically significant and positive across all models. However, the interaction term is negative and statistically significant. This means that when the parent company is more distant from the location of its subsidiary, the regional RTA calculated using the technologies of the parent company has a substantial negative impact on the total assets of the subsidiary located in that region. This result sheds light on the fact that foreign investors strategically locate their FDIs in regions with strong innovation capabilities in technologies that the parent company doesn't necessarily produce, but in which it is interested in developing within its production network.

Table 3 – PPML estimation of subsidary's total assets using different RTA variables computed w.r.t. subsidiary and GUO technological interest, respectively. Model specifications with respect to trade policies in the host sector

	(1) Whole sample	(2) Extra-EU GUOs	(3) Whole sample	(4) Extra-EU GUOs	(5) Whole sample	(6) Extra-EU GUOs	(7) Whole sample	(8) Extra-EU GUOs	(9) Whole sample	(10) Extra-EU GUOs	(11) Whole sample	(12) Extra-EU GUOs	(13) Whole sample	(14) Extra-EU GUOs	(15) Whole sample	(16) Extra-EU GUOs
Subsidiary-level based RTA																
RTA (inventors)	0.0011*	0.0007														
	(0.0007)	(0.0007)														
RTA (inventors) weighted			0.0026***	0.0015*												
			(0.0010)	(0.0009)												
RTA (owners)					0.0011*	0.0005										
					(0.0006)	(0.0005)										
RTA (inventors) weighted							0.0004	0.0003								
							(0.0004)	(0.0005)								
GUO-level based RTA																
RTA (inventors)									-0.0040	-0.0145*						
									(0.0038)	(0.0084)						
RTA (inventors) weighted											-0.0033	-0.0157				
											(0.0043)	(0.0105)				
RTA (owners)													-0.0038	-0.0195**		
													(0.0036)	(0.0095)		
RTA (owner) weighted															-0.0060*	-0.0205**
															(0.0036)	(0.0087)
N	1345501	602225	1345501	602225	1345501	602225	1345501	602225	1345501	602225	1345501	602225	1345501	602225	1345501	602225
No groups	114385	51935	114385	51935	114385	51935	114385	51935	114385	51935	114385	51935	114385	51935	114385	51935
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time invariant FE: Firm, GUO, host-home country pair in host sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time variant FE: region NUTS2, host-country/host -sector, home-country/host-sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time variant home-sector FE	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No

Note: All regressands except the RTA variable have been arcsine transformed. The corresponding specifications with focus on the home sector's trade policies are available upon request. Clustered standard error in parenthesis. * p < .10, ** p < .05 , *** p< .01

Table 4 – PPML estimation of subsidary's total assets on RTA ownership variable computed w.r.t. GUO technological interest, plus interaction with trade policies in the host stector and subsidiary innovation (i.e. number owned patents)

	(1) Whole sample	(2) Extra-EU GUOs	(3) Whole sample	(4) Extra-EU GUOs	(5) Whole sample	(6) Extra-EU GUOs	(7) Whole sample	(8) Extra-EU GUOs	(9) Whole sample	(10) Extra-EU GUOs	(11) Whole sample	(12) Extra-EU GUOs	(13) Whole sample	(14) Extra-EU GUOs	(15) Whole sample	(16) Extra-EU GUOs
GUO-level RTA																
RTA (owners) weighted	-0.0033	-0.0224*	-0.0038	-0.0228**	-0.0035	-0.0219*	-0.0036	-0.0213**	-0.0039	-0.0202**	-0.0038	-0.0198**	-0.0040	-0.0205**	-0.0038	-0.0197**
	(0.0039)	(0.0118)	(0.0037)	(0.0111)	(0.0037)	(0.0113)	(0.0036)	(0.0109)	(0.0036)	(0.0099)	(0.0036)	(0.0098)	(0.0036)	(0.0099)	(0.0036)	(0.0096)
Interaction RTA x Trade Policies																
RTA x Reg Div TBT	-0.0243	0.0577														
	(0.0457)	(0.0667)														
RTA x Reg Div SPS			0.0035	0.1029												
			(0.0685)	(0.0835)												
RTA x Tariff host country					-0.0021	0.0052										
					(0.0043)	(0.0058)										
RTA x Tariff home country							-0.0018	0.0040								
							(0.0037)	(0.0047)								
Interaction RTA x Trade Policies x No. owned patents																
RTA x Reg Div TBT x No. owned patents									0.0052	0.0189						
									(0.0202)	(0.0262)						
RTA x Reg Div SPS x No. owned patents											-0.0044	0.0163				
											(0.0544)	(0.0642)				
RTA x Tariff host country x No. owned patents													0.0020	0.0035		
													(0.0024)	(0.0030)		
RTA x Tariff home country x No. owned patents															0.0004	0.0007
															(0.0012)	(0.0015)
N	1345501	602225	1345501	602225	1345501	602225	1345501	602225	1345501	602225	1345501	602225	1345501	602225	1345501	602225
No groups	114385	51935	114385	51935	114385	51935	114385	51935	114385	51935	114385	51935	114385	51935	114385	51935
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tarde Policies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time invariant FE: Firm, GUO, host-home country pair in host sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time variant FE: region NUTS2, host-country/host -sector, home-country/host-sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time variant home-sector FE	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No

Note: All regressands except the RTA variable have been arcsine transformed. The full specification models are available upon request. Clustered standard error in parenthesis. * p < .10, ** p < .05 , *** p< .01

Table 5 – PPML estimation of subsidary's total assets on RTA variables computed w.r.t. GUO technological interest, plus interaction with trade policies in the home stector and subsidiary innovation (i.e. number owned patents)

	(1) Whole sample	(2) Extra-EU GUOs	(3) Whole sample	(4) Extra-EU GUOs	(5) Whole sample	(6) Extra-EU GUOs	(7) Whole sample	(8) Extra-EU GUOs	(9) Whole sample	(10) Extra-EU GUOs	(11) Whole sample	(12) Extra-EU GUOs	(13) Whole sample	(14) Extra-EU GUOs	(15) Whole sample	(16) Extra-EU GUOs
GUO-level RTA																
RTA (owners) weighted	-0.0007	-0.0292**	-0.0024	-0.0197**	-0.0023	-0.0195	-0.0030	-0.0232**	-0.0084**	-0.0260***	-0.0078**	-0.0250***	-0.0084**	-0.0261***	-0.0070**	-0.0224**
	(0.0026)	(0.0135)	(0.0023)	(0.0090)	(0.0025)	(0.0121)	(0.0026)	(0.0108)	(0.0034)	(0.0093)	(0.0034)	(0.0093)	(0.0033)	(0.0094)	(0.0031)	(0.0089)
Interaction RTA x Trade Policies																
RTA x Reg Div TBT	-0.1052*	0.0501														
	(0.0560)	(0.0809)														
RTA x Reg Div SPS			-0.1462*	-0.0222												
			(0.0792)	(0.0839)												
RTA x Tariff host country					-0.0098*	-0.0016										
					(0.0053)	(0.0076)										
RTA x Tariff home country							-0.0085*	0.0011								
							(0.0044)	(0.0053)								
Interaction RTA x Trade Policies x No. owned patents																
RTA x Reg Div TBT x No. owned patents									0.0506	0.0630**						
									(0.0322)	(0.0277)						
RTA x Reg Div SPS x No. owned patents											0.0779	0.1052*				
											(0.0709)	(0.0620)				
RTA x Tariff host country x No. owned patents													0.0057*	0.0064**		
													(0.0034)	(0.0033)		
RTA x Tariff home country x No. owned patents															0.0006	0.0011
															(0.0021)	(0.0018)
N	678859	276996	678859	276996	678859	276996	678859	276996	678859	276996	678859	276996	678859	276996	678859	276996
No groups	27123	9847	27123	9847	27123	9847	27123	9847	27123	9847	27123	9847	27123	9847	27123	9847
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tarde Policies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time invariant FE: Firm, GUO, host-home country pair in home sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time variant FE: region NUTS2, host-country/home -sector, home-country/home-sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time variant host-sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: All regressands except the RTA variable have been arcsine transformed. The full specification models are available upon request. Clustered standard error in parenthesis. * p < .10, ** p < .05 , *** p< .01

5. Summary and Concluding Remarks

This paper analyses the role of regulatory distance and technological positioning of activities of multinational enterprises (MNEs) across the NUTS-2 regions of the European Union over the period 2000-2018. Our analysis shows that regulatory distance in TBTs discourages investment in subsidiaries owned by extra-EU parent companies. Besides, while larger tariffs imposed by the EU encourage tariff-jumping motives behind FDI in the EU by extra-EU parent MNEs, the effect of regulatory distance in SPS measures seems to mainly hamper the total assets of subsidiaries that are active in the same NACE two-digit sectors as their parent companies.

While NTMs are not necessarily hampering trade, as shown in many papers in the literature (Bao and Qiu, 2012; Ghodsi, 2023), regulatory distance and the imposition of rules with diverse objectives at home and host FDI counteparts would increase the compliance costs, bureaucratic hurdles, and transactional costs (Piermartini and Budetta, 2009; Cadot et al., 2015; Cadot and Ing, 2015; Knebel and Peters, 2019; Nabeshima and Obashi, 2021; Inui et al., 2021). These results show that such regulatory distance increases the costs of investment too.

Furthermore, regional revealed technological advantage (RTA) seems to enhance FDI for the technologies in which the subsidiaries are actively patenting rather than the parent company. In fact, the parent company prefers to locate its subsidiary and increase its investment where it seeks to benefit from regional technological spillovers, to improve its technological capabilities in innovation areas of its interest, rather than seek technological spillovers in technologies directly produced at the headquarter. This implies that the technologies produced in the subsidiary might have higher technological quality due to spillovers from other inventors and owners of patents (firms) in the region who are specialized in the production of those technologies as indicated by their RTA.

These results are important for policymakers in several aspects. As regulatory distance in technical standards discourages FDI in the EU, policymakers in the EU need to find ways to reduce regulatory distances with important trading partners, such as the extra-EU advanced economies, which are potential sources of technological spillovers to the EU. By initiating trade negotiations with advanced economies, the EU can harmonise its technical standards, such as TBTs and SPS measures, to pursue similar objectives as these trading partners. This would necessitate imposing new regulations with similar objectives as trading partners and also encourage trading partners to reciprocate and impose regulatory NTMs with similar objectives as the EU. Reducing regulatory distance and increasing regulatory convergence would substantially increase cross-border FDI, as evidenced here.

Furthermore, technological spillovers are the main positive sources of FDI that induce policymakers to attract high-tech FDI. The results indicate that such technological spillovers are very important for MNEs, as they aim to acquire new technologies when investing in specific regions in the EU with significant specialisation. Therefore, a good way to encourage such technological FDI in the EU, benefiting both sides, would be to implement a patent box. This can be achieved by giving tax credits to firms investing and patenting in the EU.

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Appendix

Table A1.1 – Robustness check Table 1, column (1) using 'all variables' sample – i.e. complete financial information of subsidiary and guo, as well as 'no liab' sample – i.e. no liability information of subsidiary and GUO

	(1) Table1	Sample1 'all vars'	Sample1 cgsg	Sample1 no guo	Sample2 'no liab'	Sample2 cgsg	Sample no guo	Sample3 cgsg	Sample4 no guo
Trade policies host sector									
Reg Div TBT	-0.0000	1.0833	0.8483	0.4988	0.8361	0.7165	0.4880	-0.0697	-0.0000
	(0.6477)	(0.7415)	(0.7466)	(0.8375)	(0.7301)	(0.7538)	(0.8331)	(0.9439)	(0.6477)
Reg Div SPS	-0.2667	2.0119	2.4909	1.9062	2.2241	2.4771	1.8367	0.3273	-0.2667
	(0.7394)	(1.6812)	(1.8384)	(1.6187)	(1.6992)	(1.7825)	(1.5770)	(1.1628)	(0.7394)
Tariff host country	0.0716	0.1159	0.1323	0.1248	0.1385	0.1399	0.1279	0.1022	0.0716
	(0.0564)	(0.0777)	(0.0877)	(0.0829)	(0.0872)	(0.0880)	(0.0833)	(0.0763)	(0.0564)
Tariff home country	0.0157	-0.0049	-0.0101	-0.0095	-0.0103	-0.0117	-0.0129	0.0034	0.0157
	(0.0312)	(0.0388)	(0.0435)	(0.0430)	(0.0414)	(0.0413)	(0.0407)	(0.0366)	(0.0312)
Subsidiary-level variables									
Employment	0.1359***	0.1135***	0.1635***	0.1590***	0.1618***	0.1635***	0.1598***	0.1349***	0.1359***
	(0.0128)	(0.0136)	(0.0158)	(0.0165)	(0.0150)	(0.0150)	(0.0158)	(0.0135)	(0.0128)
Labour Productivity	0.0393***	0.0323***	0.0418***	0.0382***	0.0407***	0.0406***	0.0369***	0.0365***	0.0393***
	(0.0079)	(0.0089)	(0.0124)	(0.0114)	(0.0113)	(0.0113)	(0.0104)	(0.0079)	(0.0079)
No. owned patents	-0.0040	0.0008	0.0023	-0.0038	0.0021	0.0013	-0.0049	-0.0015	-0.0040
	(0.0056)	(0.0066)	(0.0070)	(0.0080)	(0.0072)	(0.0072)	(0.0081)	(0.0056)	(0.0056)
Current Liabilities		0.0819***							
		(0.0073)							
Non-current Liabilities		0.0209***							
		(0.0019)							
GUO-level variables									
Employment		0.0270***			0.0363***				
		(0.0056)			(0.0066)				
Labour Productivity		0.0036			0.0030				
		(0.0045)			(0.0046)				
No. owned patents		-0.0003			-0.0006				
		(0.0046)			(0.0051)				
Current Liabilities		0.0092***							
		(0.0033)							
Non-current Liabilities		-0.0014							
		(0.0032)							
Subsidiary-level based RTA									
RTA (inventors) weighted	0.0026***	0.0030*	0.0032*	0.0034**	0.0034**	0.0032*	0.0035**	0.0042***	0.0026***
	(0.0010)	(0.0016)	(0.0017)	(0.0017)	(0.0017)	(0.0017)	(0.0016)	(0.0013)	(0.0010)
Constant	20.1359 ***	17.6799***	19.7607***	19.8664***	19.6661***	20.0560***	20.1530***	20.3475***	20.1359***
	(0.1434)	(0.3194)	(0.2520)	(0.2338)	(0.2643)	(0.2305)	(0.2146)	(0.1524)	(0.1434)
N	1345501	313808	313808	313808	328330	328330	328330	675843	1345501
AIC	6.6181e+12	1.9805e+12	2.2159e+12	2.3781e+12	2.3070e+12	2.3138e+12	2.4813e+12	4.9124e+12	6.6181e+12
BIC	6.6181e+12	1.9805e+12	2.2159e+12	2.3781e+12	2.3070e+12	2.3138e+12	2.4813e+12	4.9124e+12	6.6181e+12
No groups	114385	10652	10652	10652	11570	11570	11570	27389	114385
(Continues)									
Time invariant FE: Firm, GUO, home-host country pair in host sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Time variant FE: region NUTS2, host-country/ host-sector, home-country/host-sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time variant home-sector FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No

Note: Clustered standard error in parenthesis. * p < .10, ** p < .05 , *** p< .01

Table A1.2 – Robustness check Table 1, column (2) using 'all variables' sample – i.e. complete financial information of subsidiary and and guo, and 'no liab' sample – i.e. no liability information of subsidiary and GUO

	(2) Table1	Sample1 'all vars'	Sample1 cgsg	Sample1 no guo	Sample2 'no liab'	Sample2 cgsg	Sample no guo	Sample3 cgsg	Sample4 no guo
Trade policies host sector									
Reg Div TBT	-1.8558***	-2.6739**	-2.3089*	-2.1283*	-2.3710*	-2.3424*	-2.1047*	-2.6265***	-1.8558***
	(0.4675)	(1.2015)	(1.3009)	(1.1966)	(1.2966)	(1.2923)	(1.1916)	(0.8912)	(0.4675)
Reg Div SPS	0.8950	2.4412*	2.4441	1.7289	2.5582	2.5380	1.7309	2.6782**	0.8950
	(0.7556)	(1.3870)	(1.7101)	(1.4215)	(1.7294)	(1.7249)	(1.4313)	(1.2409)	(0.7556)
Tariff host country	0.1698***	0.2189**	0.1837	0.2378**	0.1805	0.1770	0.2295**	0.2850***	0.1698***
	(0.0496)	(0.1063)	(0.1149)	(0.1147)	(0.1147)	(0.1136)	(0.1126)	(0.0673)	(0.0496)
Tariff home country	0.0182	0.0090	-0.0054	-0.0124	0.0022	-0.0026	-0.0094	0.0109	0.0182
	-1.8558***	-2.6739**	-2.3089*	-2.1283*	-2.3710*	-2.3424*	-2.1047*	-2.6265***	-1.8558***
	(0.0354)	(0.0413)	(0.0456)	(0.0495)	(0.0441)	(0.0443)	(0.0483)	(0.0409)	(0.0354)
Subsidiary-level variables									
Employment	0.1365***	0.1262***	0.1817***	0.1794***	0.1787***	0.1832***	0.1812***	0.1328***	0.1365***
	(0.0180)	(0.0191)	(0.0244)	(0.0258)	(0.0236)	(0.0240)	(0.0255)	(0.0194)	(0.0180)
Labour Productivity	0.0510***	0.0288***	0.0382**	0.0350**	0.0384**	0.0383**	0.0353**	0.0489***	0.0510***
	(0.0122)	(0.0109)	(0.0160)	(0.0143)	(0.0157)	(0.0159)	(0.0144)	(0.0151)	(0.0122)
No. owned patents	0.0052	0.0166*	0.0201*	0.0101	0.0178	0.0169	0.0072	0.0131	0.0052
	(0.0106)	(0.0097)	(0.0103)	(0.0129)	(0.0111)	(0.0112)	(0.0132)	(0.0087)	(0.0106)
Current Liabilities		0.0857***							
		(0.0100)							
Non-current Liabilities		0.0210***							
		(0.0026)							
GUO-level variables									
Employment		0.0745***			0.0725***				
		(0.0205)			(0.0252)				
Labour Productivity		0.0105			-0.0016				
		(0.0124)			(0.0167)				
No. owned patents		-0.0064			-0.0070				
		(0.0055)			(0.0059)				
Current Liabilities		0.0290							
		(0.0184)							
Non-current Liabilities		-0.0165*							
		(0.0092)							
Subsidiary-level based RTA									
RTA (inventors) weighted	0.0015*	0.0021	0.0020	0.0040	0.0026	0.0024	0.0043	0.0020	0.0015*
	(0.0009)	(0.0031)	(0.0033)	(0.0031)	(0.0032)	(0.0032)	(0.0031)	(0.0018)	(0.0009)
(Continues)									
Constant	19.7705***	16.8769***	19.7492***	19.8079***	19.0055***	19.7423***	19.7970***	19.8783***	19.7705***
	(0.2271)	(0.6525)	(0.3432)	(0.3156)	(0.6238)	(0.3375)	(0.3121)	(0.2932)	(0.2271)

N	602225	151217	151217	151217	157777	157777	157777	275639	602225
AIC	3.6799e+12	1.2570e+12	1.4067e+12	1.5166e+12	1.4219e+12	1.4290e+12	1.5378e+12	2.5403e+12	3.6799e+12
BIC	3.6799e+12	1.2570e+12	1.4067e+12	1.5166e+12	1.4219e+12	1.4290e+12	1.5378e+12	2.5403e+12	3.6799e+12
No groups	51935	4085	4085	4085	4655	4655	4655	10009	51935
Time invariant FE: Firm, GUO, home-host country pair in host sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time variant FE: region NUTS2, host-country/ host-sector, home-country/host-sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time variant home-sector FE	No	No	No	No	No	No	No	No	No

Note: Clustered standard error in parenthesis. * p < .10, ** p < .05 , *** p< .01

Table A2 – Interaction between trade policies in host sector and horizontal integration (i.e. GUO and subsidiary in the same NACE 2-digit sector)

	Original model		Exclusion certain GUO activities							
	(1) Whole sample	(2) Extra-EU GUOs	(3) Whole sample	(4) Extra-EU GUOs	(3) Whole sample	(4) Extra-EU GUOs	(3) Whole sample	(4) Extra-EU GUOs	(3) Whole sample	(4) Extra-EU GUOs
Trade policies host sector										
Reg Div TBT	-0.0000	-1.8558***	0.0153	-1.7358***	0.0161	-1.8421***	-0.0005	-1.8356***	0.0006	-1.8547***
	(0.6477)	(0.4675)	(0.6501)	(0.4874)	(0.6462)	(0.4683)	(0.6474)	(0.4642)	(0.6477)	(0.4674)
Reg Div SPS	-0.2667	0.8950	-0.2665	0.9602	-0.0395	1.1728	-0.2629	0.9037	-0.2775	0.8944
	(0.7394)	(0.7556)	(0.7421)	(0.7640)	(0.7416)	(0.7731)	(0.7381)	(0.7501)	(0.7396)	(0.7559)
Tariff host country	0.0716	0.1698***	0.0707	0.1653***	0.0633	0.1633***	0.0678	0.1565***	0.0714	0.1698***
	(0.0564)	(0.0496)	(0.0562)	(0.0493)	(0.0565)	(0.0495)	(0.0566)	(0.0494)	(0.0564)	(0.0496)
Tariff home country	0.0157	0.0182	0.0157	0.0190	0.0150	0.0178	0.0158	0.0182	0.0269	0.0159
	(0.0312)	(0.0354)	(0.0312)	(0.0354)	(0.0313)	(0.0354)	(0.0312)	(0.0354)	(0.0333)	(0.0352)
Interaction with horizotal integration										
Horiz integration X Reg Div TBT			-0.1093	-0.5030						
			(0.3208)	(0.3260)						
Horiz integration X Reg Div SPS					-0.5664*	-0.7020**				
					(0.3123)	(0.3243)				
Horiz integration X Tariff host country							0.0117	0.0330		
							(0.0335)	(0.0361)		
Horiz integration X Tariff home country									-0.0220	0.0049
									(0.0253)	(0.0218)
N	1345501	602225	1345501	602225	1345501	602225	1345501	602225	1345501	602225
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time invariant FE: Firm, GUO, home-host country pair in host sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time variant FE: region NUTS2, host-country/ host-sector, home-country/host-sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time variant home-sector FE	No	No	No	No	No	No	No	No	No	No

Note: Clustered standard error in parenthesis. * p < .10, ** p < .05 , *** p< .01. Results are robust to the additional exclusion of groups where the GUO is active in either financial or head-office and managerial activities (i.e. NACE K64-K66 and M70). These results are avilable upon request.

Table A3.1 – Robustness check Table 2, column (1) using 'all variables' sample – i.e. complete financial information of subsidiary and and guo, and 'no liab' sample – i.e. no liability information of subsidiary and GUO

	(1) Table2	Sample1 'all vars'	Sample1 cgsg	Sample2 'no liab'	Sample2 cgsg	Sample3 cgsg
Trade policies home sector						
Reg Div TBT	-0.3837	-0.5843	-0.3313	-0.2759	-0.3085	-0.3837
	(0.9902)	(0.7724)	(0.7955)	(0.7913)	(0.7933)	(0.9902)
Reg Div SPS	-0.0992	0.3698	0.3899	0.3288	0.3860	-0.0992
	(0.9905)	(0.7802)	(0.8260)	(0.8251)	(0.8263)	(0.9905)
Tariff host country	0.1332***	0.0996**	0.0732	0.0734	0.0694	0.1332***
	(0.0517)	(0.0492)	(0.0508)	(0.0502)	(0.0504)	(0.0517)
Tariff home country	0.0689	-0.0011	0.0179	0.0082	0.0074	0.0689
	(0.0487)	(0.0474)	(0.0513)	(0.0511)	(0.0514)	(0.0487)
Subsidiary-level variables						
Employment	0.1379***	0.1306***	0.1707***	0.1674***	0.1689***	0.1379***
	(0.0134)	(0.0139)	(0.0166)	(0.0157)	(0.0158)	(0.0134)
Labour Productivity		0.0431***		0.0464***		
		(0.0073)		(0.0094)		
No. owned patents	0.0369***	0.0320***	0.0394***	0.0382***	0.0380***	0.0369***
	(0.0106)	(0.0094)	(0.0125)	(0.0112)	(0.0113)	(0.0106)
Current Liabilities		0.0770***				
		(0.0083)				
Non-current Liabilities		0.0213***				
		(0.0018)				
GUO-level variables						
Employment		0.0431***		0.0464***		
		(0.0073)		(0.0094)		
Labour Productivity	0.0369***	0.0320***	0.0394***	0.0382***	0.0380***	0.0369***
	(0.0106)	(0.0094)	(0.0125)	(0.0112)	(0.0113)	(0.0106)
No. owned patents		0.0013		0.0048		
		(0.0056)		(0.0067)		
Current Liabilities		0.0060				
		(0.0052)				
Non-current Liabilities		-0.0006				
		(0.0045)				
Subsidiary-level based RTA						
RTA (inventors) weighted	0.0051***	0.0043**	0.0051***	0.0053***	0.0052***	0.0051***
	(0.0016)	(0.0017)	(0.0019)	(0.0020)	(0.0020)	(0.0016)
Constant	20.2992***	17.6677***	19.8145***	19.5889***	20.1123***	20.2992***
	(0.2070)	(0.4040)	(0.2542)	(0.3062)	(0.2321)	(0.2070)
N	678859	315656	315656	330107	330107	678859
AIC	5.3029e+12	2.1037e+12	2.3446e+12	2.4541e+12	2.4605e+12	5.3029e+12
BIC	5.3029e+12	2.1037e+12	2.3446e+12	2.4541e+12	2.4605e+12	5.3029e+12
No groups	27123	10488	10488	11400	11400	27123
Time invariant FE: Firm, GUO, host-home country pair in home sector	Yes	Yes	Yes	Yes	Yes	Yes
Time variant FE: region NUTS2, host-country/home-sector, home-country/home-sector	Yes	Yes	Yes	Yes	Yes	Yes
Time variant host-sector FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: Clustered standard error in parenthesis. * p < .10, ** p < .05 , *** p< .01

Table A3.2 – Robustness check Table 2, column (2) using 'all variables' sample – i.e. complete financial information of subsidiary and and guo, and 'no liab' sample – i.e. no liability information of subsidiary and GUO

	(2) Table2	Sample1 'all vars'	Sample1 cgsg	Sample2 'no liab'	Sample2 cgsg	Sample3 cgsg
Trade policies home sector						
Reg Div TBT	-1.5305	-1.7562	-0.8009	-0.9098	-0.8036	-1.5305
	(1.4305)	(1.4125)	(1.5514)	(1.5693)	(1.5774)	(1.4305)
Reg Div SPS	1.1367	1.5803	0.7906	0.9101	0.7992	1.1367
	(1.7117)	(1.7969)	(1.9758)	(1.9980)	(2.0001)	(1.7117)
Tariff host country	0.2022***	0.1953***	0.1431**	0.1475**	0.1400**	0.2022***
	(0.0458)	(0.0603)	(0.0601)	(0.0593)	(0.0595)	(0.0458)
Tariff home country	0.0287	-0.0776**	-0.0729*	-0.0695	-0.0713*	0.0287
	(0.0509)	(0.0390)	(0.0421)	(0.0423)	(0.0418)	(0.0509)
Subsidiary-level variables						
Employment	0.1334***	0.1435***	0.1926***	0.1891***	0.1939***	0.1334***
	(0.0186)	(0.0189)	(0.0247)	(0.0239)	(0.0241)	(0.0186)
Labour Productivity	0.0454***	0.0284**	0.0377**	0.0380**	0.0379**	0.0454***
	(0.0156)	(0.0114)	(0.0164)	(0.0162)	(0.0164)	(0.0156)
No. owned patents	0.0215*	0.0184	0.0236*	0.0214	0.0213	0.0215*
	(0.0124)	(0.0113)	(0.0126)	(0.0134)	(0.0134)	(0.0124)
Current Liabilities		0.0804***				
		(0.0110)				
Non-current Liabilities		0.0221***				
		(0.0023)				
GUO-level variables						
Employment		0.0895***		0.0758**		
		(0.0203)		(0.0297)		
Labour Productivity	0.0454***	0.0284**	0.0377**	0.0380**	0.0379**	0.0454***
	(0.0156)	(0.0114)	(0.0164)	(0.0162)	(0.0164)	(0.0156)
No. owned patents		-0.0054		-0.0076		
		(0.0054)		(0.0058)		
Current Liabilities		0.0202				
		(0.0195)				
Non-current Liabilities		-0.0169				
		(0.0121)				
Subsidiary-level based RTA						
RTA (inventors) weighted	0.0017	-0.0013	-0.0014	-0.0007	-0.0010	0.0017
	(0.0026)	(0.0034)	(0.0036)	(0.0035)	(0.0035)	(0.0026)
Constant	19.8886***	16.7723***	19.6570***	18.7760***	19.6570***	19.8886***
	(0.3062)	(0.7667)	(0.3582)	(0.7919)	(0.3519)	(0.3062)
N	276996	152348	152348	158872	158872	276996
AIC	2.5760e+12	1.2713e+12	1.4214e+12	1.4329e+12	1.4392e+12	2.5760e+12
BIC	2.5760e+12	1.2713e+12	1.4214e+12	1.4329e+12	1.4392e+12	2.5760e+12
No groups	9847	3983	3983	4543	4543	9847
Time invariant FE: Firm, GUO, host-home country pair in home sector	Yes	Yes	Yes	Yes	Yes	Yes

Time variant FE: region NUTS2, host-country/home-sector, home-country/home-sector	Yes	Yes	Yes	Yes	Yes	Yes
Time variant host-sector FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: Clustered standard error in parenthesis. * p < .10, ** p < .05 , *** p< .01

Table A4 – Interaction between trade policies in the home sector and the number of owned patents by the subsidiary

	Original model		Interaction with no. owned patents							
	(1) Whole sample	**(2) Extra-EU GUOs**	**(3) Whole sample**	**(4) Extra-EU GUOs**	**(3) Whole sample**	**(4) Extra-EU GUOs**	**(3) Whole sample**	**(4) Extra-EU GUOs**	**(3) Whole sample**	**(4) Extra-EU GUOs**
Trade policies host sector										
Reg Div TBT	-0.3837	-1.5305	-0.4178	-1.6854	-0.3992	-1.5611	-0.4255	-1.6413	-0.3930	-1.5519
	(0.9902)	(1.4305)	(0.9982)	(1.4143)	(0.9937)	(1.4305)	(1.0002)	(1.4171)	(0.9931)	(1.4277)
Reg Div SPS	-0.0992	1.1367	-0.0850	1.2430	-0.1061	1.1243	-0.0091	1.2230	-0.0700	1.1611
	(0.9905)	(1.7117)	(1.0009)	(1.7006)	(0.9981)	(1.7129)	(0.9983)	(1.6958)	(0.9931)	(1.7077)
Tariff host country	0.1332***	0.2022***	0.1361***	0.2111***	0.1334**	0.2045***	0.1276**	0.2035***	0.1317**	0.2021***
	(0.0517)	(0.0458)	(0.0522)	(0.0470)	(0.0519)	(0.0461)	(0.0521)	(0.0455)	(0.0519)	(0.0457)
Tariff home country	0.0689	0.0287	0.0650	0.0258	0.0679	0.0289	0.0632	0.0244	0.0637	0.0262
	(0.0487)	(0.0509)	(0.0493)	(0.0514)	(0.0489)	(0.0510)	(0.0496)	(0.0520)	(0.0495)	(0.0514)
Interaction with no. owned patents										
No. owned patents X Reg Div TBT			0.1344	0.1576*						
			(0.0873)	(0.0868)						
No. owned patents X Reg Div SPS					0.1646	0.1541				
					(0.1651)	(0.1799)				
No. owned patents X Tariff host country							0.0251***	0.0247***		
							(0.0090)	(0.0090)		
No. owned patents X Tariff host country									0.0170*	0.0100
									(0.0087)	(0.0079)
N	678859	276996	678859	276996	678859	276996	678859	276996	678859	276996
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time invariant FE: Firm, GUO, host-home country pair in home sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time variant FE: region NUTS2, host-country/home-sector, home-country/home-sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time variant host-sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Clustered standard error in parenthesis. * p < .10, ** p < .05 , *** p< .01.

Table A5 – Interaction between RTA computed wrt to the technological interest of the GUO, interacted by the distance between FDI origin and destination countries. Model specification on host sector

	(1) Whole sample	(2) Extra-EU GUOs	(1) Whole sample	(2) Extra-EU GUOs	(1) Whole sample	(2) Extra-EU GUOs	(1) Whole sample	(2) Extra-EU GUOs
GUO-level based RTA								
RTA (inventors)	0.0602***	0.1888***						
	(0.0232)	(0.0436)						
RTA (inventor) x Distance	-0.0088***	-0.0243***						
	(0.0034)	(0.0056)						
RTA (inventors) weighted			0.0719**	0.1919***				
			(0.0296)	(0.0432)				
RTA (inventors) weighted x Distance			-0.0106**	-0.0251***				
			(0.0044)	(0.0058)				
RTA (owners)					0.0561***	0.1854***		
					(0.0212)	(0.0395)		
RTA (owners) x Distance					-0.0088***	-0.0251***		
					(0.0032)	(0.0054)		
RTA (inventors) weighted							0.0681**	0.1745***
							(0.0276)	(0.0419)
RTA (inventors) weighted x Distance							-0.0103**	-0.0240***
							(0.0041)	(0.0058)
N	1117290	508150	1117290	508150	1117290	508150	1117290	508150
No. group	114385	51935	114385	51935	114385	51935	114385	51935
AIC	6.4616e+12	3.5961e+12	6.4611e+12	3.5959e+12	6.4617e+12	3.5961e+12	6.4614e+12	3.5961e+12
BIC	6.4616e+12	3.5961e+12	6.4611e+12	3.5959e+12	6.4617e+12	3.5961e+12	6.4614e+12	3.5961e+12
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Trade Policies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time invariant FE:								
Firm, GUO, host-home country pair in host sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time variant FE:								
region NUTS2, host-country/host -sector, home-country/host -sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time variant home-sector FE	No	No	No	No	No	No	No	No

Note: Clustered standard error in parenthesis. * p < .10, ** p < .05 , *** p< .01

Figure A1.1 Total Assets of Foreign – owned Firms by NUTS 2 Rev-2.0: Group 1

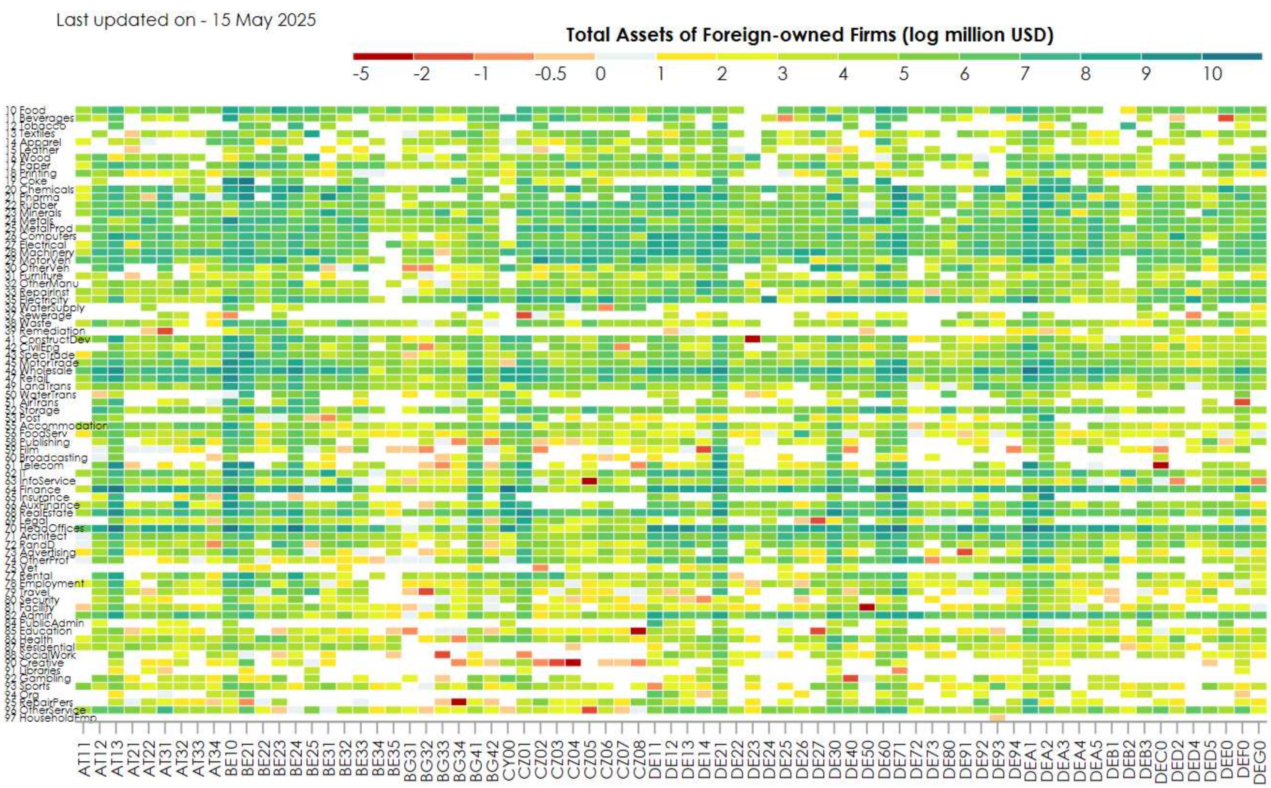


Figure A1.2 Total Assets of Foreign – owned Firms by NUTS 2 Rev-2.0: Group 2

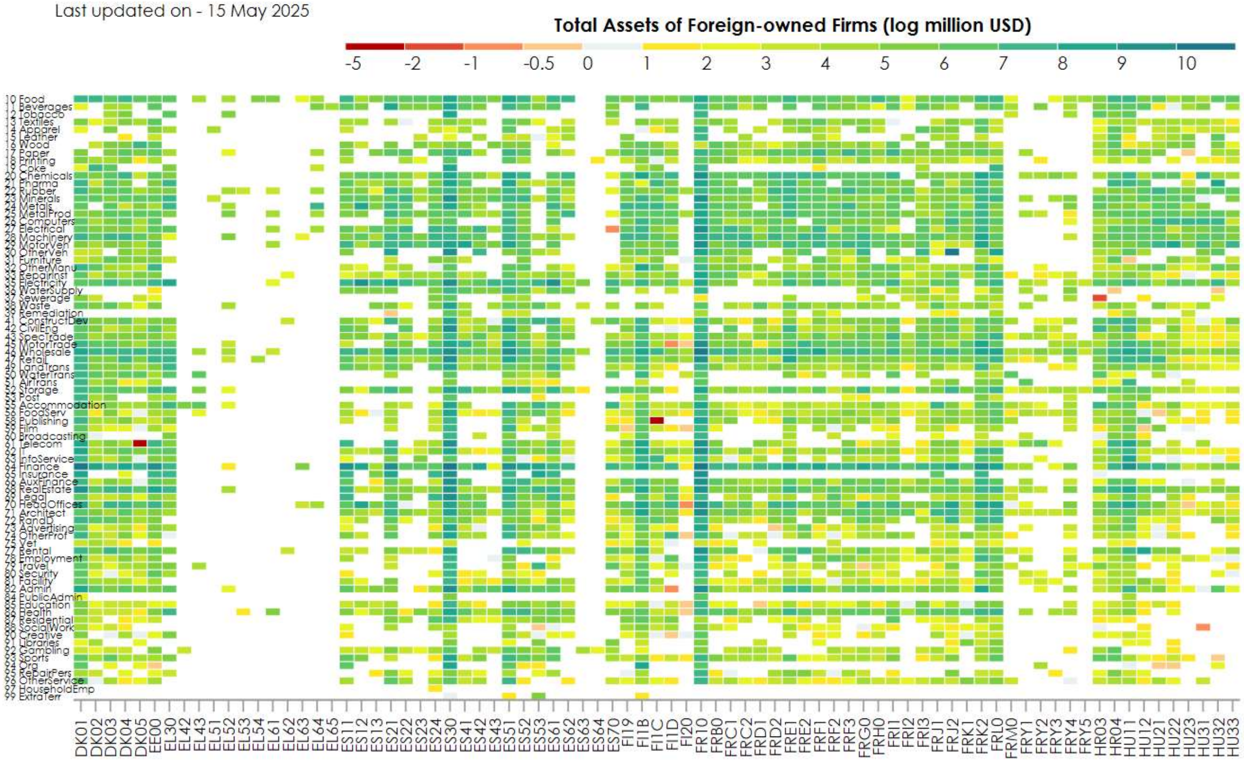


Figure A1.3 Total Assets of Foreign – owned Firms by NUTS 2 Rev-2.0: Group 3

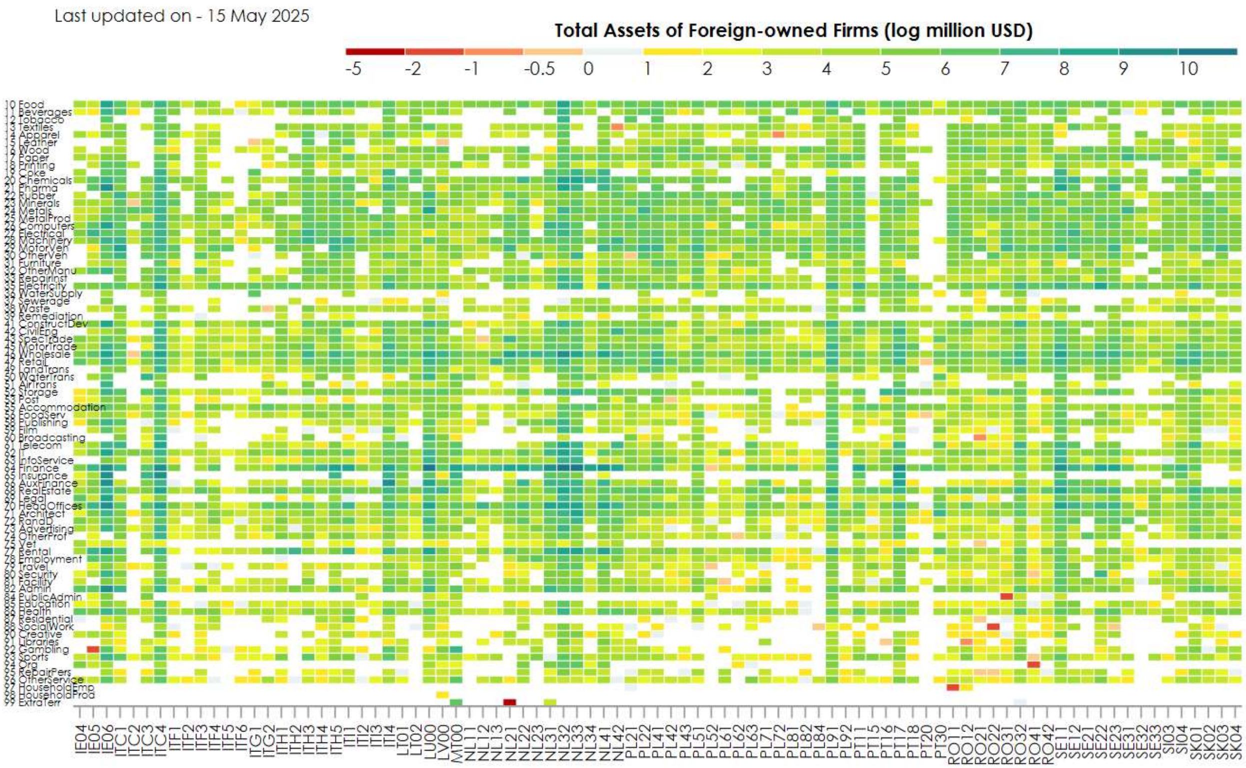
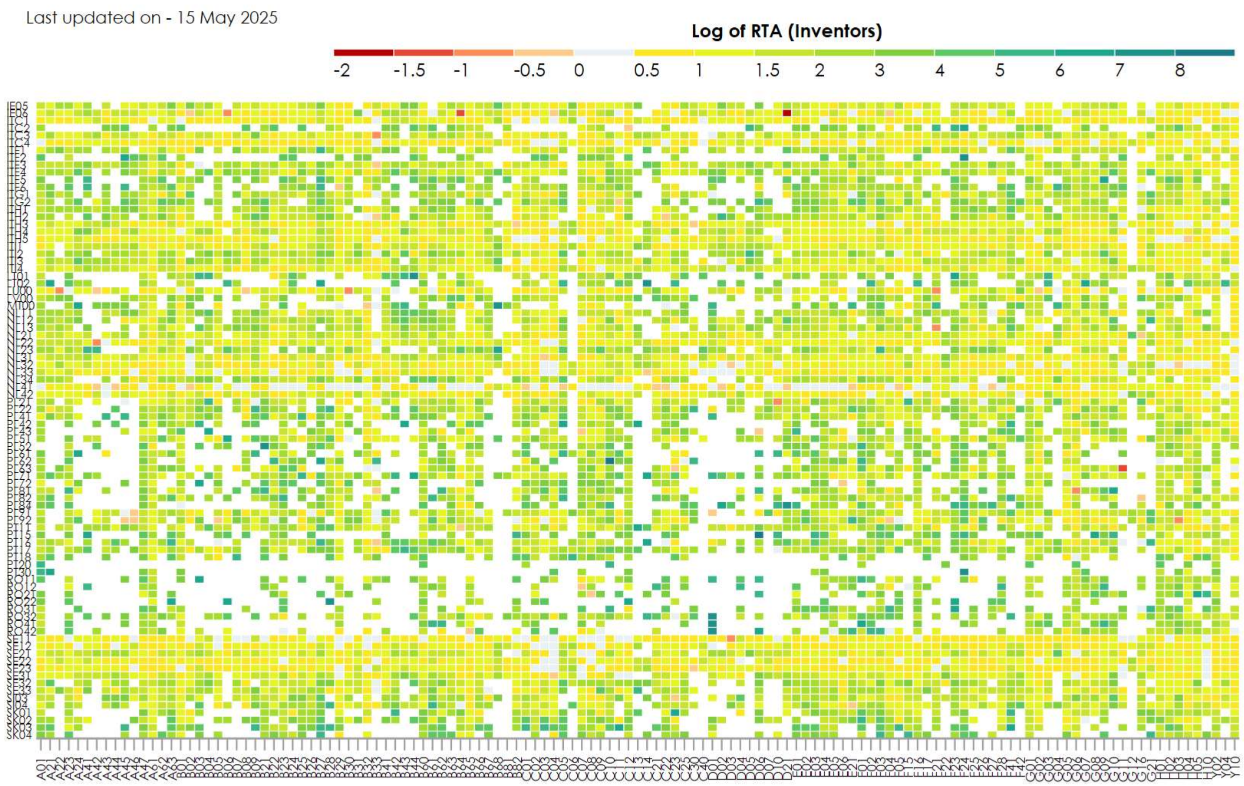


Figure A1.4 RTA (Inventors) by CPC3 : Group 1

Figure A1.5 RTA (Inventors) by CPC3 : Group 2

Figure A1.6 RTA (Inventors) by CPC3 : Group 3



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