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Foreign Versus Local Ownership and Performance in Eastern Versus Western EU: A Random Forest Application

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Our paper proposes the machine learning Random Forest algorithm for classifying economic activity within the European Union, building on the relevance of a reduced set of variables alongside location and industry of origin for the differences in performance between foreign versus locally-owned companies. We find a diverse landscape of business performance within the European Union that does not indicate a clear-cut dominance of foreign-owned companies against their locally-owned peers. Locally-owned companies from the Eastern European Union have been more dynamic than their foreign-owned peers in the region, which suggests a process of learning from foreign competitors and business partners. The Random Forests model performs surprisingly well given the low number of predictors and indicates that personnel costs per employee is the most important variable that discriminates between foreign and locally-owned companies. The importance of the rest of the variables, including the regional location and the industry, has a relatively uniform distribution.

Keywords: *Performance; European Union; Eastern Europe; Ownership; Random forests; Location; Foreign Direct Investments.*

Introduction

The investigation of firms' heterogeneity in terms of their performance and competitive positions is a regular topic in the international economics and business literature for almost a century now. The theoretical framework examining business performance originates in the paradigm of industrial organization developed during 1940-1950 by Bain and Mason (Porter, 1981) which was further improved by Porter (1979), Schmalensee (1985) and Rumelt (1991). In their works, profitability is depicted in terms of industry-specific features and strategic decisions regarding the allocation of resources, the efficiency in cost minimization or the adoption of innovation and new technologies. The theory was further shaped by the emergence of multinational enterprises and international production theories, ownership and location becoming hot topics in debates discussing factors that impact profitability. Consequently, the performance comparison between multinational and domestic companies was a deeply explored issue during 1970–1987 (Grant, 1987; Qian *et al.,* 2008). The topic gained importance on the background of endowing multinationals and foreign direct investments (FDI) in general with the attribute of transferring technology and knowledge from the parent company to the subsidiaries in the host country and then to the host country domestic companies. FDI is seen as one of the most important sources for technology transfer (Damijan *et al*., 2013), foreign-owned firms possessing superior knowledge and know-how (Stojcic & Orlic, 2019; Crespo & Fontoura, 2007; Castellani & Zanfei, 2006) and, therefore, having strong ownership advantages, which make them able to compete in an international environment. It is, thus, expected the presence of multinational companies in host countries to improve the technological level and to enhance the transfer of knowledge towards local companies. The success of such endeavour resides, however, on the absorptive capacity of the local companies (Cohen & Lenvinthal, 1990). Therefore, the links between multinationality and foreign ownership, on the one hand, and performance, on the other hand, were eagerly examined, but findings in the literature are still mixed and inconclusive (Hult, 2011).

The European Union (EU) is an interesting and fertile area for researching the relevance of determinants of business performance, given the diversity in terms of geographical location and the consistent trend towards economic integration in the past 70 years. The transition process experienced by the countries in Central and Eastern Europe once with the fall of the communism in 1990 also allows for empirical testing on divergence in the behaviour of foreign versus domestic (local) companies. One of the important shortcomings of the literature in the field refers to the analysis of the disparities in performance and competitiveness between companies operating in different sectors and industries within the EU. Generally, the studies were conducted at national or sector level, without necessarily proposing a comparative analysis against other countries and/or sectors. Moreover, investigations on the impact that foreign ownership has on business performance are also limited at country or sector level.

We propose in this paper a better understanding of business performance in the two parts of the EU, i.e., a more developed West and a less developed East, using a classification methodology that is part of machine learning models. The ability to categorize units or observations is extremely valuable particularly in frameworks of high data heterogeneity. The Random Forest classifier is based on the "wisdom of crowds", in the sense that its implementation allows for a large number of models (or trees) that are relatively uncorrelated to outperform any of the constituent models, thus, producing predictions or classifications that are more accurate than those provided by individual models.

Equipped with this methodology, our paper investigates the relevance of several attributes for the performance of foreign versus locally-owned companies in the EU, alongside their location within the region and their industry of operation. The classification of the EU business activity allows us to understand the performance differences related to ownership across 20 countries and 27 industries from 9 sectors within the EU, and to identify the relevant determinants of the foreign versus locally-owned dichotomy. We organize the paper as follows: the next section highlights the most significant results in the literature on the topic of our research, we further present the data and the methodology, and then we highlight the most important results obtained. The final section of the paper concludes, explains the limits of our research and indicates future research directions.

Literature Review

Our investigation builds on the previous works related to the differences in companies' performance and aims to establish the relevance of companies' ownership, location, sector and industry of origin in explaining the performance of foreign versus locally-owned companies.

Internationalization is seen as a coin with two sides: generating benefits, such as scale economies, risk diversification and access to new markets, but also increasing costs, due to the liability of foreignness and dealing with differences between countries in managing and coordinating activities (Qian *et al.*, 2008). While multinationality affects the profitability of companies (Zaheer, 1995), it generates added value which further improves performance (Hult, 2011) or represents a "specific advantage", following the capacity to harness the network of foreign affiliates (Weche Gelubcke & Philipp, 2013; Barbosa & Louri, 2005) or to act in an environment with less competition (Bellak, 2004). The results of the empirical analyses aiming to determine significant differences in the performance of foreign versus domestic companies point to several elements which allow for their characterization. Foreign companies are better capitalized and operate with a lower level of systematic risk (Michel & Shaked, 1986; Notta & Vlachvei, 2008), have better productivity and higher export intensity in the manufacturing sector (Weche Gelübcke & Philipp, 2013), invest more in research and development (Notta & Vlachvei, 2008) and usually are larger and more profitable (Bentivogli & Mirenda, 2017). The foreign ownership of companies also seems to cause lower indebtedness (Grasseni, 2010) and higher commitment to long-term financing (Douma *et al.,* 2006). In addition, ownership seems to be significant for the performance of companies in technologically advanced industries in the services sector (Lopez-Gamero *et al*., 2009).

On the other hand, domestic companies deploy higher levels of profitability (Grasseni, 2010; Wagner & Weche Gelubcke, 2012; Chacar *et al*., 2010), have higher performance in terms of return on assets (Procházka, 2017) and are superior to the foreign ones due to a better-adjusted market-based performance (Ferreira *et al*., 2017). Domestic companies also act better in riskier environments, confronted with corruption and low protection for investors (Michel & Shaked, 1986).

We should also consider here the influence of multinationals in shaping local companies' performance. Due to the superior capabilities of foreign companies in terms of technology and knowledge, it is expected that foreign-owned companies generate positive spillovers which are reaped by companies in host locations and therefore assist to a generalized improvement of companies' tangible and intangible capital. Damijan *et al.* (2013) clearly state that "foreign ownership is believed to enhance firm performance through direct technology transfers" (p.906). However, Reyes (2018) proves that the learning and knowledge transfer intermediated by FDI is rather the apanage of high-growing companies in developing countries. Moreover, local companies have difficulties in absorbing the benefits of FDI presence firstly due to competition enhancement by multinationals and secondly due to a low absorptive capacity. In a similar vein, Blomstrom & Kokko (2003) do not advise for incentives offered only to foreign companies to locate in a certain region, as technology and skills spillovers are the result of the ability and motivation of local companies to internalize and invest in gaining the superior knowledge the foreign companies are supposed to possess.

Contrarily, Stojcic & Orlic (2019) point towards a negative spillover impact on local companies in the same sector, but a positive impact for the suppliers in both manufacturing and services sectors. The empirical analysis is undertaken at firm-level in the NUTS-3 regions of eight Central and Eastern European countries between 2006 and 2011. For Bekes *et al.* (2009) the benefits of multinationals' presence are reaped by more productive companies in the same sector in Hungary, while having a negative impact on those in less developed regions and industries. Schoors &

Van Der Tol (2002) reached a similar conclusion in an earlier study for companies in Hungary, showing that foreign companies have a better performance than domestic ones and sharing positive spillovers for both horizontally and vertically companies, although higher in the last case.

Literature agrees to a large extent that industry effects tend to significantly affect performance (Rumelt, 1991; Hawawini *et al.,* 2003; Qian *et al*., 2008; Fernandez *et al.,* 2018). In this context, the specific features of companies in tertiary sector or other branches requiring highly skilled human capital, advanced technology and innovation endowments, which are often characterized by a strong involvement of multinational companies, require an adequate attention (Lopez-Gamero *et al.,* 2003; Hawawini *et al.,* 2003; Liu, 2008). In fact, studies conclude that the sector of activity has an important role in determining performance. High-tech industries flourish in areas providing access to technology, knowledge or research and development (Cantwell and Piscitello, 2007; Ortega-Argiles *et al.*, 2011; Eickelpasch *et al.,* 2016; Belderbos & Goerzen, 2017) or are backed by favourable policies and investments (Varum *et al*., 2008). Horobet *et al.* (2020) also show that the competitiveness of high-tech sectors is more influenced by the industry-related factors than by those defining the characteristics of location. However, the results are less clear-cut for other types of industries.

There are fewer studies that investigate the regional distribution of foreign and domestic companies in terms of performance. Still, existing literature clearly indicates a tendency of regionalization. Rugman (2003, 2005) suggests that MNCs are rather regionally cantered than globally expanded, activities being conducted within the EU, North America and Asia. A similar result is reached by Qian *et al.* (2008) following an empirical investigation on the impact of regional diversification on firm performance. The results point to the fact that MNCs' strategy is to select closer regions for developing their businesses to maximize performance, which allows them to benefit from reduced costs of administration. The same study shows that performance is enhanced by acting in several regions in developed countries and a reduced number of developing countries. This could lead to an agglomeration of MNCs in developed countries and therefore to differences in performance indicators among countries, depending on their level of development. In the same vein, Brouthers (1998) noticed earlier that there are clusters of excellence which could be enhanced by the interaction between different characteristics of the host locations with that of companies. His conclusion emphasizes the importance of both country and industry as determinants of performance.

Other studies, such as Goldszmidt *et al.* (2011) and Karabag and Berggren (2014), support the significant impact of the host location's level of development on determining performance. The results of these and other similar studies suggest that there could be a difference in the distribution of foreign and local companies and their performance based on the characteristics of industries in different locations. In Europe, we tend to consider an East-West distinction given the advance of the economies in West and the poorer endowment with technology and skilled human capital of Eastern-located countries until the 1990s under the communist regime. Using an unsupervised learning algorithm under the form of self-organizing maps and considering different variables for the description of companies' performance and industry and location attributes, Horobet *et al.* (2020) found performance gaps between foreign and domestic companies on the East-West axis in the EU. In brief, better performance is observed for foreign companies located in Western EU than for domestic ones or those operating in Eastern Europe. The study also endorses previous research findings on the importance of ownership and location in explaining performance but does not fully support the contribution of the sector of activity for business performance.

Even recent literature indicates on the continuous presence of important disparities in the performance of foreign versus domestic ownership. Belascu *et al.* (2021) take a closer look to the manufacturing sector and observe that foreign-owned businesses tend to be larger, which leads to increased profits and heightened investment capacity. The tendency of multinationals is to locate labour intensive, but lower technological activities in eastern EU. Popescu *et al.* (2021) focus on the recovery of the manufacturing sector after the financial crisis in 2008, to establish differences in the performance of foreign versus local companies. While no clear-cut distinction between the two groups of companies is obtained, the authors reveal that some characteristics were vital for the recovery, among which the ownership, the size of the company and the technological intensity.

For Belascu *et al.* (2021), the performance is rather depending on ownership than on the industry's technological level when focusing on the manufacturing sector in 20 EU countries. Din *et al.* (2021) begin their analysis from the conclusion formulated based on the literature, indicating that usually foreign ownership led to better performance, especially for developing countries. However, the authors find no impact on firm performance in case of return on assets, market-to-book ratio and Tobin's Q for the Pakistani companies they analyse, as the foreign shareholdings are limited due to national regulations. This could be in accordance with Nakano and Nguyen (2013), who revealed that the effect of foreign ownership on firm financial performance is gradual. For Rashid (2020), there is a significant positive relationship between foreign and director ownership and accounting and market-based firm's performance.

Hsieh *et al.* (2018) recommend collaboration with foreign partners for companies focused on radical innovation, as benefits would be larger. A similar result is obtained by Kafouros *et al.* (2020) when focusing on collaborations in research and development between local firms and foreign partners. Un and Rodriguez (2018) indicates towards distinctive effects between domestic companies and multinationals' subsidiaries on the product innovation following R&D collaborations, due to their specific capacity of absorption. Bertrand *et al.* (2020) discover that local companies with foreign CEOs in developed countries tend to achieve higher corporate social performance than those in which the leadership is local.

Research Methodology

Our aim is to test the ability of a reduced set of variables to distinguish between the performance of foreign and local

companies in the EU and observe which are most important in making this distinction. We use Gross investment per turnover (GIturn), Gross operating rate (Gross operating surplus per turnover – GOR), Personnel cost per employee (PcostEmp), Simple wage adjusted labour productivity (gross value added per personnel cost – SWALP), Value added per turnover (VAturn), Location in the Eastern or Western part of the EU (E or W), and Industrial sector (IND) as variables (predictors). The first five variables are continuous (or numerical), while the latter two are categorical. Our dependent variable is the type of company, either foreign (F) or locally-owned (L).

We cover the period 2009–2016 and include 20 EU member countries with the highest data availability on company performance at industry level. The period selected for analysis maximizes the number of EU countries included in the research, given the new NUTS 2 classification available after 2008. We decided to leave outside the sample the year 2008 due to significant turbulences caused by the transmission of the Global financial crisis from the United States to Europe. Data are collected from the inward FATS - Foreign Affiliates Statistics Database of Eurostat, the most comprehensive database on the activities of affiliates of foreign companies that are residing in a country that offers information on various characteristics of these affiliates such as turnover, costs, profitability, productivity, etc. (for more details, see Foreign AffiliaTes Statistics (FATS) Recommendations Manual, 2012). It should be noted that FATS focuses on the control of the parent company over the affiliate, encapsulated in the ability of the former to significantly influence the activity of the latter; hence, the share of ownership of 50 % of ordinary shares or voting power is used as a proxy for control by FATS. Therefore, the data included in our investigation covers only FDI companies in whose case a share of at least 50 % foreign capital exists, which may be considered a limitation of our endeavour, given that the OECD Benchmark Definition of Foreign Direct Investment suggests a 10 % level of foreign ownership (OECD, 2015). At the same time, it should be noted that detailed data on companies' activities at industry level as provided by FATS is not available for any other definition of control and/or for any other percentage or ownership, hence FATS is the best data source for detailed investigations on the performance of foreign versus locally-owned companies at industry level.

We used data for companies from 27 industries and 9 NACE Rev.2 sectors, based on data availability that maximizes the geographical representation within EU, with the aim of increasing the location relevance. The sectors and industries covered are presented in Appendix 1. We consider the sample representative for the business economy in EU-28 (as of 2016), as it includes companies with local and foreign ownership that hold 62.34 % of enterprises, 67.69 % of EU-28 turnover, 63.40 % of EU-28 value added and 63.27 % of persons employed. The level of representativeness is above 60 % for all sectors in terms of number of enterprises and above 70 % in terms of turnover, value added, and number of persons employed (with levels above 90 % for sector L - Real estate activities). Only in the case of sector M - Professional, scientific and technical activities, the companies included in our research hold 25.2 % of EU-28 number of enterprises, and between 30 and 33 % of turnover, value added, and persons employed. The reduced representativeness of this sector in our sample is due to significant data gaps in Eurostat which prevented us from including more industries without the risk of drastically reducing the number of countries used. Appendix 2 shows the percentages of representativeness for all sectors in our sample.

To investigate the relevance of location for companies' performance we divided the 20 EU countries in Western-located (W) and Eastern-located (E), by considering their geographical position and development levels, but also their economic and political shared past. Consequently, 11 countries with developed market economies were considered for Western EU (Austria, Denmark, France, Germany, Greece, Italy, Netherlands, Portugal, Spain, Sweden, and the United Kingdom) and 9 countries with an emerging market economy for Eastern EU (Bulgaria, the Czech Republic, Hungary, Latvia, Lithuania, Poland, Romania, Slovenia, and Slovakia.

The independent variables are performance indicators for each type of company from an industry, which we designate as Business units (BU). Each BU is characterized by three attributes: ownership (Foreign versus Local), location (one of the 20 EU countries included in the analysis), and industry of origin (one out of 27). Each BU is described by 5 performance variables – GIturn, GOR, PcostEmp, SWALP, VAturn -, as well as by location (East or West) and ownership (Foreign or Local). For GOR and SWALP the values were collected directly from Eurostat, while we calculated the values for GIturn, VAturn and PcostEmp. Further, an average value of the variable was calculated for the period between 2009 and 2016, thus smoothing out inter-year inherent volatility. These average values were used in the Random Forest modelling. The independent variables are described in Table 1.

Table 1

Variable Definition and Brief Statistical Description

Variable	Description	Mean	Median	SD
Gross investments per turnover (GIturn)	The ratio between gross investments in tangible goods - includes the new and existing tangible capital goods, whether bought from third parties or produced for own use having a useful life of more than one year including non-produced tangible goods such as land – and turnover - the totals invoiced by the observation unit during the reference period, which corresponds to market sales of goods or services supplied to third parties.	0.0651	0.0934	0.0907
Gross operating rate (GOR)	Gross operating surplus to turnover. Percentage	11.91	9.74	8.72
Personnel cost per employee (PcostEmp)	The ratio between personnel cost - the total remuneration, in cash or in kind, provided by the employer to all employees - divided by the number of persons	0.0307	0.0253	0.0212

Variable	Description	Mean	Median	SD
	employed - the total number of persons who work in the observation unit, as well as persons who work outside the unit who belong to it and are paid by it.			
Simple wage adjusted labour productivity (SWALP)	Apparent labour productivity (or gross value added per person employed) by average personnel costs. Percentage	195.84	158.92	152.63
Value added per turnover (VAturn)	The ratio between value added at factor cost - gross income from operating activities after adjusting with operating subsidies and indirect taxes – and turnover.	0.3033	0.2903	0.1202

Source: Eurostat and authors' calculations. Note: Variable descriptions are from Eurostat – FATS Database

There are 1,080 BUs included in our investigation, with an expected unequal distribution across location, ownership and sectors. Turnover is split between Western and Eastern-located BUs in 90.98 % versus 9.02 % shares, respectively, and between foreign-owned and locally-owned BUs in 73.95 % versus 26.05 % shares, respectively. In terms of sector distribution, 43.27 % of the turnover in our sample is generated by BUs in sector G – Wholesale and retail and 23.19 % by BUs in sector C – Manufacturing. The other seven sectors hold shares in sample turnover below 10 %. For what concerns location and ownership, the BUs are equally distributed in the Western and Eastern parts of the EU, as well as between foreign and local ownership. When the model was implemented, the continuous/numeric variables were standardized.

Given the objective of our research, the issue is a classification problem for which the random forest methodology is among the best suited. The random forest is an ensemble model, meaning that it consists of a collection of models, in this case decision trees (Breiman, 1996 and 2001). Decision tree algorithms start at a root node containing all observations and recursively split the data into child nodes resulting in a structure resembling an up-side-down tree. The objective is to partition the data in a way which results in homogenous terminal nodes. This involves choosing the variable and the condition on which to perform the split. Any divergence measure can be used, but Gini impurity is among the most popular (Shih, 1999). This is the probability of misclassifying a random observation if it were randomly assigned a class based on the class distribution in the data. This is evaluated for each child node and a weighted sum is subtracted from the parent node. The resulting value is the purity gain, with a higher gain representing a better split. The minimum Gini impurity is zero indicating that all observations in a node belong to a single class.

The random forest algorithm is frequently employed in financial data applications (Jing *et al*., 2015; Krauss *et al*., 2017; Tan *et al.,* 2019). However, following the ability of handling large features for the subject of analysis and providing easy to interpret results based on decision-tree analysis, the algorithm is increasingly used for providing forecasts in different areas, such as country-specific default patterns (Behr and Weinblat, 2017) the insolvency of insurance firms (Kartasheva & Traskin, 2011), customer retention and profitability (Lariviere & Van den Poel, 2005), employee turnover (Gao *et al.*, 2019) or for constructing consumer credit risk models (Khandani *et al.,* 2010). Weinblat (2018) uses a similar approach for forecasting the fast-growing firms in several countries in the EU using structural and financial variables during 2004–2014. Jing et al. (2015) show that the random forests provided the best results for their studies among other machine learning techniques, a result which was previously supported by Kartasheva & Traskin (2011).

As in Breiman's original article, we use both bagging and random feature selection. On average around two thirds of observations are used for each tree for model building, with the rest kept out of bag. The out of bag data is used to compute the accuracy of the model (out of bag error rate) and give estimates of variable importance. The out of bag error rate is found to be quite accurate given enough trees (Liaw & Wiener, 2002).

Results and Discussion

Foreign Versus local Ownership: an Overview at EU Level

The high variety in business performance within EU is evidenced when looking at the descriptive statistics for the 1,080 BUs in terms of ownership, location and sector of origin. Foreign-owned BUs record higher means over the 2009-2016 period compared to locally-owned BUs for two numerical variables – Pcost_emp and SWALP – and lower means for the remaining three – GOR, GIturn and VAturn. At the same time, the distribution of numerical variables among BUs is higher for all variables for foreign against locally-owned companies, suggesting a higher heterogeneity of performance for foreign-owned businesses across EU countries.

The figures on means and medians of numerical variables based jointly on ownership and BUs' sector of activity illustrate a very diverse landscape of performance in EU (the results could be provided by request). Thus, Pcost_emp is the only variable in whose case foreign-owned companies record higher values compared to their locally-owned counterparts, regardless of the sector of activity. It is worth noticing that the difference between foreign and local companies increases as we move from manufacturing and construction towards services sectors, where higher-skilled labor is required. For what concerns the other variables, there are dissimilarities across sectors that generate difficulties in drawing a clear-cut conclusion. Thus, foreign-owned companies enjoy, on average compared to locally-owned companies, higher SWALP in sectors C, D, J and L, higher GOR only in sector C, higher GIturn only in sector L, and higher VAturn in sectors I, J and L. It should be noted, though, that for many sectors the gap between foreign and locally-owned companies is rather small, but there are some sectors where locally-owned companies seem to have an important edge against foreign ones – sectors F and M for GOR and sector H for GIturn and VAturn. These findings support previous findings by Belascu *et al.* (2021) and Popescu *et al.* (2021) that performance differences between EU-based foreign and locally-owned companies are less definite than expected, and sector of operation is not a clear source of differentiation in terms of performance

between the two types of companies. However, our findings are consistent with those of Oulton (2001) when it comes to the productivity of foreign affiliates; thus, the latter author demonstrates that foreign-owned companies in high-productivity sectors, such as manufacturing, have higher labor productivity than their domestic-owned counterparts. In our case, these differences can be seen in sectors D (Electricity), J (Information and Communication), and L (Real Estate), all of which have experienced rapid growth over the last two decades. Similar results on the higher productivity of foreign affiliates were obtained by Weche Gelubcke & Philipp (2013 for European countries or by Ge *et al*. (2015) for China. When the differences in profitability between the two types of companies are considered, we confirm the previous findings of Chacar *et al.* (2010), Grasseni (2010), and Weche Gelubcke (2013). Moreover, we substantiate the results of Lindemanis *et al*. (2019), who found that changes in ownership from domestic to foreign are associated with lower profitability in a sample of European companies.

A Closer Look at Performance in Eastern Versus Western EU

The previous "dominance" of foreign-owned companies in terms of Pcost_emp and SWALP is confirmed when location is considered (Table 2). Thus, foreign-owned BUs from Western EU pay higher personnel costs per employee compared to their locally-owned peers (even to 1.5 times higher) and the same is true for Eastern-located BUs; in the latter case, the personnel costs per employee paid by foreign-owned BUs are almost 1.7 times higher than the ones paid by locally-owned BUs. At the same time, foreign-owned companies enjoy higher SWALP compared to their locally-owned peers, regardless of business location, in the Eastern or Western part of the EU. The same results are obtained for all the other statistics accompanying the two numerical variables presented in Table 2, with very few exceptions. For the remaining three variables, the split between Western and Eastern-located BUs endorses the result mentioned above. As such, locally-owned companies in both Eastern and Western EU have better GOR (they enjoy higher profitability) and higher GIturn and VAturn ratios compared to foreign-owned companies, although when maximum values for GOR and VAturn are compared the results indicate that foreign-owned companies perform better. In the case of GOR, the results are not surprising, given that smaller entities (as locally-owned companies are) typically enjoy higher profitability ratios, as previously indicated by Ramezani *et al.* (2002) and Berk and deMarzo (2016). Overall, though, these findings are less supportive on the relevance of location for the performance of foreign versus locally-owned firms, at least for what concerns EU countries.

Table 2

Descriptive Statistics of Numerical Variables Based on Ownership and Location, 2009–2016

Variables	Statistics	Foreign		Local		All BUs	Ratios of performance			
		East	West	East	West		Foreign West to East	Local West to East	West Foreign to Local	East Foreign to Local
Pcost_emp	Mean	0.017	0.053	0.010	0.037	0.031	3.110	3.682	1.424	1.686
	Median	0.016	0.053	0.009	0.037	0.025	3.324	4.330	1.425	1.857
SWALP	Mean	221.574	193.278	193.978	178.878	195.842	0.872	0.922	1.081	1.142
	Median	178.000	146.975	174.225	146.413	158.925	0.826	0.840	1.004	1.022
GOR	Mean	11.726	10.918	12.658	12.430	11.907	0.931	0.982	0.878	0.926
	Median	9.888	8.163	11.638	9.700	9.738	0.826	0.834	0.841	0.850
GIturn	Mean	0.080	0.045	0.086	0.056	0.065	0.567	0.651	0.805	0.924
	Median	0.047	0.029	0.058	0.033	0.039	0.616	0.574	0.869	0.810
VAturn	Mean	0.270	0.310	0.286	0.338	0.303	1.149	1.183	0.915	0.942
	Median	0.251	0.291	0.283	0.341	0.290	1.160	1.206	0.853	0.887

Source: Authors' calculations

Delving deeper into the specific attributes of Eastern-located foreign versus locally-owned BUs, Table 3 shows the mean values of the five numerical variables included in our research for years 2009 and 2016, as accompanied by the percentage change between the two respective years. Of particular interest is to observe the performance dynamics for foreign versus locally-owned BUs located in the Eastern part of the EU, taking into account both mean values in 2009 and 2016, but also the ratios of performance for foreign versus locally-owned BUs between these mean values. We firstly present and discuss the results for all sectors and further detail them across sectors.

In terms of Pcost_emp, Eastern-located locally owned companies recorded the lowest values over the entire time span compared to Eastern-located foreign-owned companies. Also, Eastern-located companies paid lower salaries compared to their Western peers, regardless of ownership (foreign or local). It is worth noting that locally-owned Eastern companies recorded a significantly higher growth rate of personnel costs per employee (22.22 %), while their foreign-owned counterparts saw an average decline in personnel costs per employee of 25.93 % between 2009 and 2016. As a result, the ratio between personnel costs per employee paid by foreign versus locally-owned companies in Eastern-located countries has seen the highest decline between 2009 and 2016, against all the other groups; significantly, the same ratio increased by 63.13 % in Western EU countries. Another decline in the ratio between

foreign and locally owned companies in Eastern EU countries is observed for SWALP (5.81 %) and GOR (7.98 %), explained by a higher increase in SWALP of locally-owned companied compared to foreign-owned companies (6.61 % versus only 0.41 %). The same pattern is noticed for GOR; locally-owned companies from Eastern Europe enjoyed higher profitability rates in 2016 against 2009 (16.24 % increase) compared to foreign-owned companied from the same region (only 6.96 % increase). Consequently, the ratio between GOR generated by foreign-owned and GOR of locally-owned companies decreased by almost 8 % between 2009 and 2016. On the other hand, the ratio for VAturn increased between 2009 and 2016 by 1.66 %, fueled by a lower increase of VAturn for locally-owned companies against foreign-owned ones in Eastern Europe (4.20 % versus 5.93 %). But the highest increase in the ratio is observed in the case of GIturn (271.5 %), explained by a sharp decline in the GIturn for locally-owned companies (19.80 %) coupled with a remarkable increase of VAturn for foreign-owned companies (197.94 %). When we contrast Eastern-located companies, foreign and locally-owned, against their Western peers, interesting characteristics of their performance dynamics emerge. Locally-owned Eastern BUs recorded, on average, the highest growth in Pcost_emp and GOR, while foreign-owned companies from the same region were the champions in GIturn and VAturn growth between 2009 and 2016. At the other end, locally-owned companies from the region saw the highest decline in GIturn compared to the other four categories of BUs, and foreign-owned companies recorded the lowest increase in SWALP.

Table 3

Performance Dynamics in EU, all Sectors - 2016 Versus 2009

Variables - Means across BUs		Foreign		Local		Ratios of performance			
		East	West	East	West	Foreign West to East	Local West to East	West Foreign to Local	East Foreign to Local
Pcost_emp	2009	0.027	0.048	0.009	0.035	1.778	3.889	1.371	3.000
	2016	0.020	0.058	0.011	0.039	2.900	3.545	1.487	1.818
	2016 versus 2009 (% change)	-25.926	20.833	22.222	11.429	63.125	-8.831	8.440	-39.394
SWALP	2009	217.815	191.731	180.098	172.859	0.880	0.960	1.109	1.209
	2016	218.709	195.216	192.001	184.616	0.893	0.962	1.057	1.139
	2016 versus 2009 (% change)	0.410	1.818	6.609	6.801	1.401	0.180	-4.666	-5.814
GOR	2009	11.334	10.092	11.214	11.678	0.890	1.041	0.864	1.011
	2016	12.123	11.376	13.035	13.376	0.938	1.026	0.850	0.930
	2016 versus 2009 (% change)	6.961	12.723	16.239	14.540	5.387	-1.461	-1.587	-7.981
GIturn	2009	0.097	0.047	0.101	0.059	0.485	0.584	0.797	0.960
	2016	0.289	0.054	0.081	0.058	0.187	0.716	0.931	3.568
	2016 versus 2009 (% change)	197.938	14.894	-19.802	-1.695	-61.437	22.578	16.875	271.503
VAturn	2009	0.270	0.305	0.286	0.339	1.130	1.185	0.900	0.944
	2016	0.286	0.317	0.298	0.345	1.108	1.158	0.919	0.960
	2016 versus 2009 (% change)	5.926	3.934	4.196	1.770	-1.880	-2.328	2.127	1.660

Source: Authors' calculations

Figure 1 details the differences in performance dynamics of Eastern-located locally-owned BUs, on one hand, against Eastern-located foreign-owned BUs (upper part of the figure) and Western-located locally-owned BUs (lower part of the figure), for each performance variable across the nine sectors included in our sample.

The only variable in whose case we find a significantly different performance of Eastern locally-owned BUs in all sectors (against Eastern foreign-owned BUs) and al-most all sectors, except sector L (against Western locally-owned BUs) is Pcost_emp, where Eastern-local BUs record smaller values than the other two categories of BUs in 2009 and 2016. In terms of productivity, measured by SWALP, Eastern-local BUs had better values against Eastern-foreign BUs in 2009 in 3 sectors (G, I and M), but they lost this advantage in 2016 in sectors G and I. At the same time, their performance is better in sector F. Compared to Western-local BUs, though, Eastern-local BUs recorded higher labor productivity in seven out of nine sectors in 2009 and in 6 out of nine in 2006; they have lost their edge between the two years in sectors F and L. Profitability is a perfor-mance area where Eastern-local BUs clearly dominate Eastern-foreign BUs (in 6 out of 9 sectors in 2009 and 2016), but not Western-local BUs (their profitability level, measured by GOR, is higher only in sectors C and L, both in 2009 and 2016). In 2009, Eastern-local BUs recorded higher shares of GI in turnover than Eastern-foreign BUs in seven out of nine sectors (except sectors F and I), and also in seven out of nine sectors against Western-local BUs (except sectors D and H); this advantage remains consistent in 2016, although it disappears in sectors C (against Eastern-foreign BUs) and L (against West-ern-local BUs). The share of value added in turnover offers Eastern-Local BUs an ad-vantage over Eastern-foreign BUs in five out of nine sectors in 2009 and 2016, but only in two sectors against Western-local BUs (L in 2009 and 2016, and I only in 2016). When looking at the progress of performance between 2009 and

2016, we observe that East-ern-local BUs were more dynamic than Eastern-foreign BUs in terms of Pcost_emp in three sectors (C, D and I), of SWALP in five sectors (C, F, H, J, L and M), of GOR in six sectors (C, D, F, H, L and M), of GIturn in only one sector (G), and of VAturn in four sectors (D, F, H and I). When we contrast Eastern-local BUs performance dynamics against Western-local Bus performance, the latter have seen their Pcost_emp growing in eight out of nine sectors (except I), but for what concerns the other performance in-dicators the dominance is shallower. As such, Eastern-local BUs have increased their performance at a higher pace than Western-local BUs in six sectors for GIturn, in four sectors for VAturn, and in three sectors for SWALP and GIturn.

	Sector	Pcost_emp 2009	Pcost_emp 2016	Pcost_emp 2016 vs. 2009 (% change)	SWALP 2009	SWALP 2016	SWALP 2016 vs. 2009 (% change)	GOR 2009	GOR 2016	GOR 2016 vs. 2009 (% change)	GIturn 2009	GIturn 2016	GIturn 2016 vs. 2009 (% change)	VAturn 2009	VAturn 2016	VAturn 2016 vs. 2009 (% change)
Eastern-Foreign minus Eastern-Local	C	0.004	0.005	-0.013	26.469	27.220	-0.013	-0.094	-0.312	-0.022	-0.003	0.402	6.070	-0.036	-0.036	0.011
	D	0.004	0.004	-0.034	65.528	120.011	0.128	-1.278	-1.489	-0.009	-0.057	-0.041	0.090	-0.037	-0.041	-0.012
	F	0.007	0.009	0.060	4.163	-23.719	-0.156	-1.437	-4.467	-0.355	0.020	0.091	0.782	-0.028	-0.044	-0.067
	G	0.007	0.009	0.081	-1.394	1.772	0.019	-0.094	0.122	0.059	-0.001	-0.002	-0.037	-0.012	-0.003	0.096
	H	0.003	0.006	0.231	32.842	-8.527	-0.241	0.149	-5.251	-0.462	-0.152	-0.076	0.145	-0.082	-0.093	-0.050
	I	0.159	0.004	-1.114	-10.811	4.667	0.117	-0.944	0.983	0.209	0.008	0.397	2.134	0.024	0.015	-0.028
	J	0.011	0.013	0.059	38.524	5.926	-0.129	-0.722	-0.185	0.031	-0.014	0.006	0.339	0.023	0.093	0.171
	L	0.039	0.062	0.385	379.827	197.208	-0.294	22.640	14.598	-0.144	-0.045	-0.025	0.025	0.177	0.171	0.006
	M	0.013	0.018	0.264	-22.006	-59.833	-0.233	-1.489	-6.411	-0.451	-0.014	-0.020	-0.169	0.026	0.007	-0.069
Western-Local minus Eastern-Local	C	0.024	0.026	-0.108	-46.927	-46.950	0.036	-1.667	-1.100	0.139	-0.029	-0.426	-5.928	0.063	0.054	-0.048
	D	0.038	0.039	-0.042	-56.084	-70.398	-0.027	1.281	0.466	-0.054	0.000	0.022	0.227	0.028	0.027	-0.007
	F	0.019	0.020	-0.073	-34.251	4.338	0.225	0.730	4.646	0.451	-0.058	-0.125	-0.726	0.101	0.112	0.044
	G	0.011	0.010	-0.130	-15.612	-30.777	-0.084	1.152	0.036	-0.288	-0.011	-0.004	0.249	0.049	0.035	-0.146
	H	0.023	0.023	-0.154	-28.346	-8.402	0.109	4.607	6.675	0.158	0.030	0.035	0.110	0.164	0.173	0.051
	I	-0.148	0.008	1.066	7.866	-5.935	-0.105	2.988	1.221	-0.226	-0.104	-0.422	-1.770	0.048	0.059	0.024
	J	0.023	0.021	-0.125	-47.601	-13.237	0.136	0.977	0.702	-0.016	-0.010	-0.018	-0.097	0.039	-0.039	-0.191
	L	-0.024	-0.044	-0.380	-192.973	7.709	0.311	-11.891	-0.327	0.241	-0.012	0.032	0.117	-0.102	-0.043	0.103
	M	0.008	0.006	-0.130	12.867	28.624	0.105	4.888	7.332	0.212	-0.008	-0.004	0.129	0.104	0.102	-0.020

Figure 1. Performance Dynamics in EU by Sectors of Activity, 2016 Versus 2009

Note: *Darker cells indicate higher values for Eastern-local BUs and lighter cells show the opposite*

When comparatively looking over the sectors and performance variables, Eastern-Local BUs had a superior dynamic than Eastern-Foreign BUs in most sectors, but particularly in sector M (for all performance variables except Pcost_emp). At the other end, in sectors G and J Eastern-Local BUs have mostly seen their performance record lower increases that Eastern-Foreign BUs. When comparing Eastern-Local BUs to Western-Local BUs, sectors D and G were the most dynamic for the latter companies, while sectors H and L were the least dynamic ones.

These findings are related, in our opinion, to the specific period of analysis considered in our study, which covers the years after the Global financial crisis. The restructuring of multinationals after the crisis, in response to increased uncertainty, may have lowered the performance of their affiliates, which explains the edge that foreign-owned businesses had over the period. However, these results contradict the ones of Alfaro and Chen (2012), who showed that affiliates of multinational companies responded better, on average, than domestic firms with similar economic characteristics, but mostly when having stronger vertical production and financial linkages with the parent firms.

Random Forest Classification of EU Businesses

We now proceed to implementing the random forest model on our dataset by firstly determining the best number of trees and leaf size. This is achieved by testing how well the model performs on the observations left out of the bag. In other words, we compute the out-of-bag classification error for different leaf sizes for up to 1,000 trees. The minimum error (0.2231) is reached for 422 trees with a leaf size of 1, indicated in Figure 2. We use these as parameters for the model. As an aside, note that similar results were reported in the literature (see, for example, Oshiro et al., 2012). After about 100 trees, the benefits are marginal or nil.

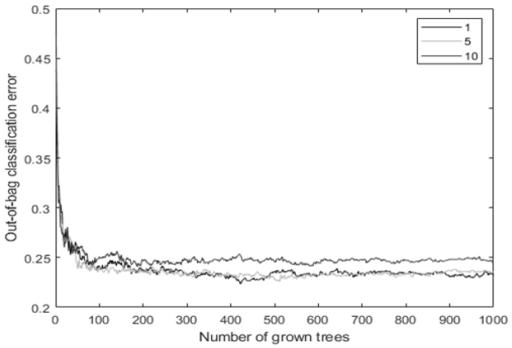

Figure 2. Classification Error for Different Leaf Sizes

Having set up our model, we can now see which predictors or features are the most important in distinguishing between foreign and locally-owned companies. To this end, we use the out-of-bag permuted predictor importance measure. For each variable, this gives us the error increase when the values of the independent variable (or predictor) are permuted across the out-of-bag observations. The underlying logic is that if a variable is important, reordering its values should lead to lower accuracy. Thus, the higher the increase, the more important the variable. Figure 3 shows the out-of-bag feature importance for each variable, and it points towards PcostEmp as the most important variable by far in making the distinction between foreign and locally-owned BUs. The next most important variable to contribute to the difference between the two types of companies is VAturn, closely followed by SWALP and location (East or West).

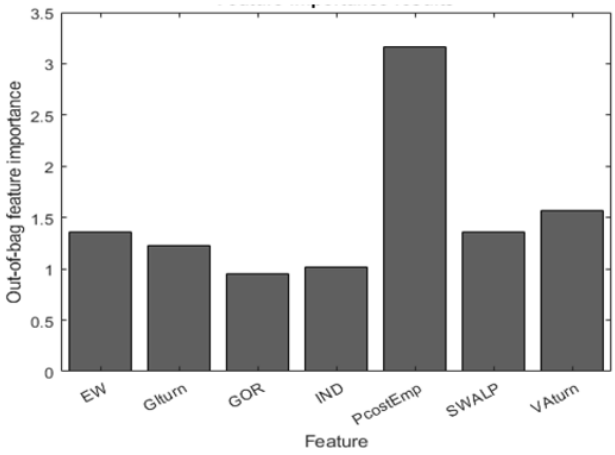

Figure 3. Variable Importance

It is customary to test the model on a reduced set of features and check the accuracy loss compared to the full set. Features that do not add much to the accuracy can be dropped, leading to a parsimonious model. We drop the least important, GOR and IND and plot the classification error – see Figure 4. Since the rise in error is somewhat high and our model already uses a low number of variables, we decided to go with the full set.

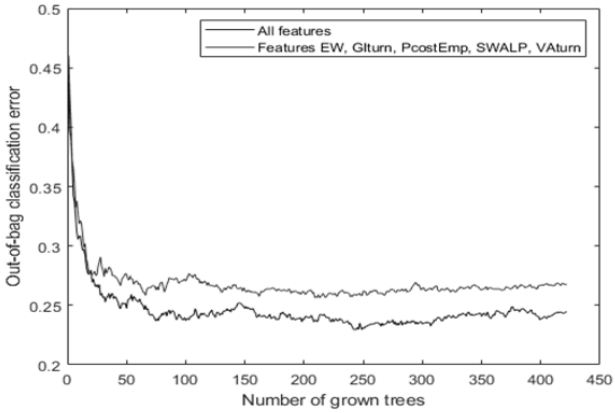

Figure 4. Classification Errors for Different Sets of Predictors

To determine the accuracy of the model we employ a confusion chart. This shows the number of elements correctly predicted (on the diagonal marked in blue) and the number of incorrect predictions (on the diagonal marked in orange). Our small model performs reasonably well, as illustrated in Figure 5. Thus, the model correctly predicts BUs a priori classification in 77 % of the cases (827 BUs compared to the total of 1,080), but it is better at classifying local companies compared to foreign ones (with hit rates of 80 % - 431 out of the locally-owned 540 BUs are predicted by the model as being local - and of 73 % - 396 out of the foreign-owned 540 companies are predicted by the model as being foreign, respectively). This also means that our model "sees" 20 % of the locally-owned companies as being foreign and 27 % of the foreign-owned companies as recording performance that makes them like the locally-owned companies.

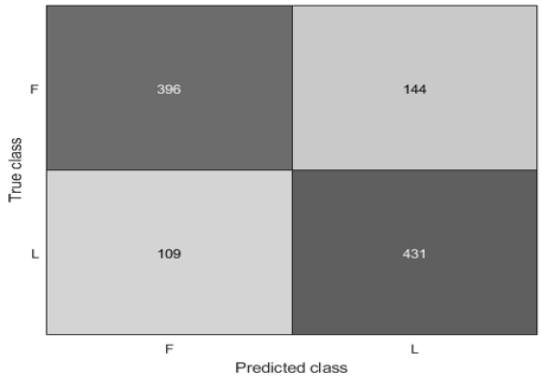

Figure 5. Confusion Chart

Table 4 presents the distribution of misclassified BUs by our model across ownership, location, and sector of operation. In the case of foreign-owned companies, 50 % of the BUs are seen as locally-owned companies (i.e., as having performance attributes that make them similar to local companies) in sector I and approximately one third in sectors C and D, when BUs located in the Eastern part of the EU are considered. When we explore foreign BUs located in Western EU, the highest misclassification rate is noticeable for sector D, followed by sectors I and H. For locally-owned companies the highest misclassification rates are observable for sector D, both for Eastern and Western-located BUs. The other sectors show much lower misclassification rates compared to the case of foreign-owned companies.

Table 3

Misclassification Rates (%)

	Foreign BUs classified as Local		**Local BUs classified as Foreign**	
Sector	East	West	East	West
C - Manufacturing	33.33	29.75	18.18	25.62
D - Electricity, gas, steam and air conditioning supply	33.33	45.45	55.56	63.64
F - Construction	14.81	21.21	7.41	12.12
G - Wholesale and retail trade; repair of motor vehicles and motorcycles	27.78	27.27	22.22	22.73
H – Transportation and storage	27.78	31.82	22.22	13.64
I – Accommodation and food service activities	50.00	36.36	16.67	22.73
J - Information and communication	7.41	18.18	7.41	21.21
L - Real estate activities	11.11	18.18	0.00	18.18
M – Professional, scientific and technical activities	16.67	9.09	22.22	13.64

Source: Authors' calculations

To further test the model, we compute the receiver operating characteristic (ROC) curve. This plots the true positive rate against the false positive rate based on the probability scores for each out-of-bag observation and each class. The score is the probability of the observation originating from the class, averaged across all the trees in the ensemble. For each observation, if the class with the highest score is correct, the true positive rate increases, and the curve moves upward. If it is wrong, the false positive rate increases, and the curve moves to the right. Apart from the shape of the curve, a useful metric is the area under the curve (AUC). The perfect model would have an AUC of one, meaning that the predictions would be 100 % accurate. The worst possible model would have and AUC of 0.5, with the curve represented by a straight diagonal line. This would make the model's results no better than a random decision. Had we been in this situation, our random forest's power to distinguish between foreign and local companies would be no better than a coin toss. As we can see in Figure 6, in our case the AUC is close to 84 %, which indicates that the model used in the random forest algorithm is a good one.

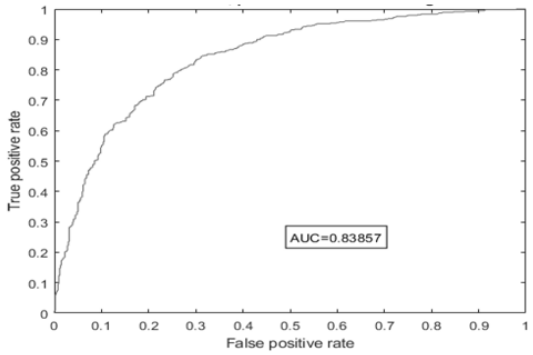

Figure 6. ROC Curve and AUC, Predicted Versus Actual Rating

Conclusions

We used a random forest model to test the ability of a small set of variables to classify foreign and locally-owned companies starting from their performance. We have applied the model to a number of 1,080 business units from the EU, each from a different sector and industry, but also region (Eastern or Western part of the EU), and operating under different ownership, i.e., foreign or locally-owned. The main objective of our new approach to classifying economic activity within the EU resided in identifying whether business performance induced by foreign versus local ownership may be explained by headquarters' location, industry of operation and a reduced set of performance variables, which may be seen as discriminant business attributes.

Our results indicate a diverse landscape of business performance within the EU that, based on our set of variables, does not indicate necessarily a clear-cut dominance of foreign-owned companies against their locally-owned peers, regardless of their location (Western or Eastern EU). Thus, although foreign-owned companies operate with higher personnel costs per employee compared to the locally-owned companies, regardless of the sector they originate from, they do not record better labour productivity (wage-adjusted) and gross operating rates in all sectors against their local-owned peers. Moreover, locally-owned companies have an edge against the foreign-owned ones in terms of the importance of their gross investments compared to turnover and of the ratio between value added and turnover in eight out of nine sectors and in six out of nine sectors included in our analysis, respectively. These results point towards a stronger propensity of locally-owned companies towards investments accompanied by a weaker investment activity of foreign-owned companies. This may be related to business re-structuring because of the financial crisis from the part of foreign-owned companies, including a reconsideration of "foreignness liability", on one hand, but also to a need of locally-owned companies to consolidate and further develop their businesses once the crisis was over. When we refer to the ratio between value added and turnover, the "dominance" of locally-owned companies is less obvious and is observed mostly in labour intensive industries; this might be explained by the lower personnel costs that locally-owned businesses pay compared to the foreign-owned ones, but also by the lower input costs that might be obtained when sourcing locally.

Turning to the results of the random forest classification model, it performs surprisingly well given the low number of predictors considered. What is even more sur-prising, at first sight, is the importance of personnel costs per employee in the classification, as the most important variable that discriminates between foreign and locally-owned companies. On second sight, though, this result complements naturally our previous findings that see a significant gap between personnel costs per employee paid by the two types of companies (higher in the case of foreign-owned companies), but a less important one in favour of locally-owned companies when wage-adjusted productivity, gross operating rate, the ratio between value added and turnover and the ratio between gross investments and turnover are considered. It should be stressed here that the importance of the rest of the variables revealed by our model is relatively uniformly distributed and that regional location plays a smaller role in discriminating performance between foreign and locally-owned companies. At the same time, there are important differences in business performance across sectors, but this performance tends to be more homogeneous between foreign and locally-owned companies and between the Eastern and the Western part of the EU foremost in the Electricity and Accommodation sector – the latter only in the case of Eastern BUs. Still, Eastern-local BUs show stronger dynamic performance than Eastern-foreign BUs and Western-local BUs in several sectors, particularly in terms of personnel costs per employee, labour productivity and operating profitability. Overall, these results may indicate that foreign-owned companies seek to attract the best talent for use across their global operations, irrespective of where the subsidiary is located, but also that there still is a "foreignness liability" within the EU, despite decades-long economic integration.

We should not definitively conclude without recognizing our research limits that impact our results. First, there is a limit connected to data availability, since information on all EU industries, sectors and countries was not available; nevertheless, given our sample's overall share in EU-28 number of enterprises, turnover, value added and persons employed, we believe that our findings can be generalized at EU level regarding the differences in performance between foreign versus locally-owned firms within the region. Second, the data recorded in our dataset for each type of ownership refers only to the businesses in whose case there is a minimum of 50 % foreign ownership, respectively. This means that companies that have a lower participation rate of foreign capital, i.e., below 50 %, are included under locally-owned companied, while they might receive a significant influence from foreign capital that translates into improved performance. Third, the regional division considered in our research, although valuable for highlighting business performance differences within the EU, might play a less important role given that many EU companies are affiliates of multinational groups with designed and implemented strategies aimed at group performance and not necessarily unit performance optimization.

Certainly, more investigation is needed, particularly by taking into consideration performance dynamics at industry and EU regional level, but also at company level. A challenging avenue of further research, given data availability, is represented by enlarging the sample by including under the foreign controlled business those that have a foreign participation of at least 10 %, in line with OECD definition of foreign direct investment and observing differences in findings against this paper's results. At the same time, an analysis of performance induced by spillovers from foreign to locally-owned companied in Eastern Europe is needed for a comprehensive understanding of business interactions and their impact on performance enhancement. We intend to approach these lines of exploration in our future research endeavours.

Appendix 1. Sectors and industries covered

Sectors	**Industries (NACE codes)**
C - Manufacturing	C10 - Manufacture of food products; C13 - Manufacture of textiles; C16 - Manufacture of wood and products of wood and cork; except furniture; manufacture of articles of straw and plaiting materials; C18 - Printing or reproduction of recorded media; C20 - Manufacture of chemicals and chemical products; C22 - Manufacture of rubber and plastic products; C25 - Manufacture of fabricated metal products, except machinery and equipment; C27 - Manufacture of electrical equipment; C28 - Manufacture of machinery and equipment n.e.c.; C29 - Manufacture of motor vehicles, trailers and semi-trailers; C31 - Manufacture of furniture
D - Electricity, gas, steam and air conditioning supply	D35 - Electricity, gas, steam and air conditioning supply
F - Construction	F41 - Construction of buildings; F42 - Civil engineering; F43 - Specialised construction activities
G - Wholesale and retail trade; repair of motor vehicles and motorcycles	G46 - Wholesale trade, except of motor vehicles and motorcycles; G47 - Retail trade, except of motor vehicles and motorcycles
H – Transportation and storage	H49 - Land transport and transport via pipelines; H52 - Warehousing and support activities for transportation
I – Accommodation and food service activities	I55 – Accommodation; I56 - Food and beverage service activities
J - Information and communication	J58 - Publishing activities; J61 – Telecommunications; J62 - Computer programming, consultancy and related activities
L - Real estate activities	L68 - Real estate activities
M – Professional, scientific and technical activities	M71 - Architectural and engineering activities; technical testing and analysis; M73 - Advertising and market research

Appendix 2. Sample representativeness at EU-28 level, 2016 data

Sectors	*Number of enterprises*	*Turnover*	*Value added*	*Persons employed*
C - Manufacturing	80.09 %	60.60 %	60.68 %	64.82 %
D - Electricity, gas, steam and air conditioning supply	88.77 %	92.98 %	89.82 %	93.37 %
F - Construction	84.78 %	90.76 %	93.12 %	91.60 %
G - Wholesale and retail trade; repair of motor vehicles and motorcycles	73.37 %	78.08 %	80.90 %	80.73 %
H – Transportation and storage	70.74 %	68.21 %	73.83 %	71.76 %
I – Accommodation and food service activities	86.38 %	91.23 %	91.87 %	87.58 %
J - Information and communication	63.59 %	71.42 %	74.50 %	74.87 %
L - Real estate activities	90.23 %	93.92 %	95.25 %	97.25 %
M – Professional, scientific and technical activities	25.22 %	32.94 %	30.71%	30.53 %
Total for sectors and industries included in the sample	67.61 %	71.69 %	70.38 %	72.49 %
Total for EU-28 non-financial economy	62.34 %	67.69 %	63.40 %	63.27 %

Source. Authors' calculations based on Eurostat data

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