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Reference: Ashyrov, Gaygzsyz/Gavoille, Nicolas et. al. (2024). Foreign ownership and productivity : a comparative study of Estonia, Latvia and Norway. Tartu : The University of Tartu School of Economics and Business Administration. https://mjtoimetised.ut.ee/febpdf/febawb148.pdf.

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FOREIGN OWNERSHIP AND PRODUCTIVITY: A COMPARATIVE STUDY OF ESTONIA, LATVIA AND NORWAY

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Tartu 2024

ISSN-L 1406-5967
ISSN 1736-8995
ISBN 978-9985-4-1436-1 (pdf)
The University of Tartu School of Economics and Business Administration
https://majandus.ut.ee/en/research/workingpaper

Foreign ownership and productivity: a comparative study of Estonia, Latvia and Norway

Gaygysyz Ashyrov, Nicolas Gavoille, Kjetil Haukås, Rasmus Bøgh Holmen and Jaan Masso*

Abstract

While attracting foreign direct investment (FDI) has been at the core of the economic policy of many countries since the 1980s, existing evidence of a causal foreign ownership effect on firm-level productivity is mixed. This paper revisits the productivity effect of foreign takeovers on domestic firms. Leveraging administrative firm-level data from Estonia, Latvia and Norway, we shed light on the following key questions: 1) Does the magnitude of the effect of foreign ownership depend on the host country's level of development?; 2) Does spatial, cultural, and economic proximity between the sending and receiving countries play a role in the foreign ownership effect?; and 3) To what extent are these effects heterogeneous across industries? By implementing a propensity score matching procedure, combined with a difference-in-differences approach, our results indicate that the productivity effect of foreign ownership greatly varies across host countries, sectors and the region of origin for the FDI. We document an overall positive but heterogeneous effect of foreign acquisitions on domestic firms, with a stronger productivity boost in Estonia and Latvia than in Norway. The effects in each country are concentrated on FDI from particular regions and specific economic sectors. These results suggest that the positive effect of FDI on receiving companies is conditional on both the characteristics of the investor and the acquisition target.

JEL Classification: F23, F63, D24

Keywords: productivity, foreign direct investment, foreign ownership, Northern Europe.

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We are grateful for the comments made by conference participants in Tartu, Vilnius, Riga, Visby and Bari, particularly Konstantins Benkovskis, Dea Tusha and John Lewis. Financial support from the EEA and Norway grant project No. LT08-2-LMT-K-01-070 "The economic integration of the Nordic-Baltic region through labor, innovation, investments and trade (LIFT)" and Estonian Research Council project PRG791 "Innovation Complementarities and Productivity Growth" are duly acknowledged. Gaygysyz Ashyrov and Jaan Masso acknowledge support for the compilation of the datasets used in the paper from the Estonian Research Infrastructures Roadmap project "Infotechnological Mobility Observatory (IMO)". We are also thankful to Statistics Estonia, the Central Statistical Bureau of Latvia, and Statistics Norway for providing the data.

1. INTRODUCTION

Attracting foreign direct investment (FDI) has been at the core of the economic policy of many countries since the 1980s. This policy is essentially motivated by two key aspects. First, the direct effect of foreign ownership assumes that foreign multinationals' affiliates have access to more advanced technologies and management practices, resulting in higher productivity than domestic firms (Driffield and Love, 2007). Second, the spillover effect supposes that foreign-owned firms diffuse this enhanced production technology to other firms in the host economy through, for instance, competition or a supplier-client relationship (Dries and Swinnen, 2004).

The vast literature aimed at estimating the productivity spillovers of foreign ownership in the host economy, however, remains on the whole inconclusive (for surveys see Rojec and Knell, 2017 and Saurav and Kuo, 2020; and for two meta-analyses see Bruno and Cipollina, 2017 and Iwasaki and Tokunaga, 2016). This mostly missing spillover effect has generated renewed interest in estimating the direct FDI effect. In the absence of such a direct effect, observing FDI spillovers seems elusive. However, evidence of a causal foreign ownership effect on firm-level productivity is mixed. While some studies document a strong positive effect (Arnold and Javorcik 2009, Balsvik and Haller 2010, Wang and Wang 2015), some others report much weaker results (Griffith 1999, Bandick 2011, Schiffbauer et al. 2017, Fons-Rosen et al. 2021) or even a null effect (Chari et al. 2012, Weche Geluebcke 2015). This heterogeneity in the direct FDI productivity effect remains largely unexplored.

This paper revisits the productivity effect of foreign takeovers on the acquired firms exploiting near-comprehensive administrative firm-level data from Estonia and Latvia, as well as a sample of Norwegian firm-level administrative data. The two small very open Eastern European countries, Estonia and Latvia, have been major recipients of FDI, providing an excellent location to study the effects of FDI on economic convergence. On the other hand, a comparison with Norway, one of the richest countries in the world, makes it possible to study how the effects of FDI differ between middle-income (post-communist or converging economies) and high-income economies in a unified empirical framework. We aim to shed light on the factors conditioning the productivity-foreign ownership nexus by addressing a set of key questions: 1) Does the host country's stage of development matter for the magnitude of the foreign ownership effect?; 2) Does spatial, cultural and economic proximity between the sending and the receiving countries play a role?; and 3) To what extent are these effects heterogeneous across industries? In sum, we investigate the heterogeneity of the impact of foreign ownership productivity for the following three dimensions: country of destination, country of origin, and receiving industry.

To address these questions, we first estimate the effect of foreign acquisitions on firm productivity in this set of three countries, measured in terms of both labour and total factor productivity. A common issue in this literature is the possible endogeneity of foreign ownership status, as foreign investors are likely to cherry-pick highly productive domestic firms. As a result, simply comparing foreign-owned firms to domestic ones would not provide information on the causal link between foreign ownership and productivity. To mitigate this issue, we implement a propensity score matching procedure combined with a difference-in-differences approach in a similar fashion to Heyman et al. (2007), Arnold and Javorcik (2009) and Javorcik and Poelhekke (2017).

We further explore the heterogeneity in productivity response to foreign acquisition by disaggregating FDI depending on the FDI's region of origin. Spatial, cultural and economic proximity have been documented to matter for the potential productivity effect of incoming

FDI (e.g., Krugman, 1991; Shenkar, 2001; Cezar and Escobar, 2015). Several channels could be put forward to explain this relationship. First, investors from neighbouring countries may know more about the local conditions and legal framework than remote investors, providing a first-mover advantage (Kamal, 2015). Investors from faraway countries, geographically or culturally, may also face higher transaction costs (Ashyrov and Masso, 2020). Second, Huang et al. (2010) highlight the importance of sharing a common culture for knowledge diffusion from the foreign acquirer to the target firm. Nordic and Baltic countries share both geographical and cultural proximity. Based on Hofstede's index of cultural proximity, Huettinger (2008) shows that Baltic countries are much more similar to Nordic countries than Central and Eastern European countries. This proximity is reflected in international country classifications – Nordic and Baltic countries form the Northern European subregion in the European Union official country classification and the Geoscheme classification of the United Nations. In addition, Nordic countries are the largest investors in all three Baltic States. To study whether FDI from the same cultural region has a different effect on productivity than FDI from other origins, we distinguish FDI from the Nordics and Baltics (i.e., the EU definition of Northern Europe), from the rest of the European Economic Area (EEA) and from the rest of the world. This classification aims to capture economic integration and cultural proximity between the investor and the host country.

Analysing Estonia, Latvia and Norway in a homogeneous framework allows us to shed some light on the relationship between host country characteristics and the productivity effect of foreign acquisitions. In particular, the conditioning role of the host country's initial level of technology received some empirical support (e.g., Damijan et al., 2013). Kastratović (2020), in a meta-study on the effects of FDI on host-country exports, concluded that the impact of FDI is larger in the case of developing countries. Li and Liu (2005) found that FDI has a stronger effect on economic growth in the case of FDI coming from high-income countries. Estonia and Latvia are both post-transition economies at an earlier stage of economic development with middle-income levels. Conversely, Norway is among the most advanced economies in the world. The country constitutes an interesting benchmark, as it is also located in Northern Europe. Compared to the other Nordic countries, the stock market capitalisation to GDP and trade union density are somewhat lower, although still considerably higher than the Baltic levels (Thomsen 2016). Norway has the highest GDP per capita among the Nordic countries without having the highest scores on technological parameters (Burinskas et al. 2021). Observing an overall stronger effect of foreign takeovers in Estonia and Latvia than in Norway would support this technology transfer mechanism via FDI, increasing firm productivity.

Our empirical results indicate the positive effects of foreign acquisitions on domestic companies in Estonia and Latvia, where productivity increases by 20–30% in the aftermath of a foreign acquisition. The evidence is considerably weaker in Norway, which aligns with the hypothesis that the host's level of economic development matters for the direct FDI productivity effect. We also show that these aggregate productivity boosts in each country are driven by FDI from particular regions and targeting specific sectors. In Estonia, North European investors' acquisitions in the service sector have the largest productivity effect. In Latvia, productivity boosts are concentrated in acquisitions by investors from the rest of the EEA in manufacturing firms. We also report suggestive evidence that the most likely productivity-enhancing acquisitions in Norway are driven by investors from the rest of the world. Taken together, these results indicate that the positive effects of FDI on the receiving company are highly conditional on both the characteristics of the investor and the acquisition target.

Our paper makes several contributions to the existing literature on productivity gains from foreign acquisitions. First, we extend the current body of literature, which has produced conflicting findings, by delving into the potential variations in the effects of foreign ownership across different sectors. Our empirical analysis shows that foreign takeover productivity boosts are sector-specific. Second, we contribute to the strand of the literature that underscores the importance of the source country for FDI productivity analysis. This contribution sheds light on how it varies based on factors such as economic integration and the spatial and cultural proximity between the investor and host countries. Not all FDI matters in terms of productivity enhancement. Third, we contribute to the literature by providing a multi-country comparison based on administrative data. Most papers studying the effect of FDI on productivity rely either on survey data or commercial databases (e.g., Bureau van 'Dijk's Orbis). This implies essential restrictions that administrative data makes it possible to (at least partially) mitigate. First, survey data is usually exclusively about manufacturing companies. Our administrative data covers a broad scope of firms from both service and manufacturing industries. Second, survey data typically focus on large firms, even if produced by the national statistical bureaus. For instance, Arnold and Javorcik (2009), studying the direct FDI effect in Indonesia, exploited a survey that included all manufacturing plants with more than 20 employees. Restricting attention to large firms may be an issue since 1) FDI also targets relatively small firms, and 2) small firms are key drivers of growth, especially in transition and emerging market economies (Gorodnichenko et al., 2014). The problem is potentially similar in papers using commercial databases, since constructing nationally representative samples from this resource is not straightforward (see Kalemli-Özcan et al. 2022 for a thorough discussion).

The rest of the paper is organised as follows. We provide a literature review in Section 2. Next, we describe our data in Section 4. The empirical design is introduced in Section 4, and the results are presented and discussed in Section 5. Section 6 concludes.

2. LITERATURE REVIEW

Most of the literature investigates the productivity consequences of FDI on the host country’s economy. This productivity effect may take place through two different channels. First, the direct FDI effect posits that the target firm benefits from more advanced technologies provided by the acquiring firm, resulting in a productivity boost. Second, the indirect effect hypothesises that a productivity boost occurs through spillovers: domestic firms benefit from interacting with (presumably) more productive foreign-owned firms. This spillover effect can be either horizontal or vertical. The former refers to the productivity gains in the same industry (Markusen, 1984), while the latter takes place through backward linkages-forward linkages (Helpman, 1984). The spillover channel has generated a vast amount of empirical literature. Yet, the empirical evidence is mixed, failing to reach a consensus not only on the magnitude but also on the mere existence of the spillover effect. This absence of consensus is highlighted by Rojec and Kneel (2017) in their review of the literature, but also by several meta-analyses (Hanousek et al. 2011, Iwasaki and Tokunaga 2016, Bruno and Cipollina 2017).

This lack of support for a non-zero productivity spillover has generated renewed interest in estimating the direct effect. In the absence of such an effect, it would be "difficult to see how foreign direct investment (FDI) can have a positive impact on overall (…) productivity and thus growth" (Harris and Robinson 2003, pp. 208, cited in Arnold and Javorcik 2009). The first strand of papers documents a positive association between foreign ownership and productivity (e.g., Aitken et al. 1996, Doms and Jensen 1998, Modén 1998, Griffith 1999, Conyon et al. 2002, Criscuolo and Martin 2009). These papers usually consider the foreign ownership status

as exogenous. However, firms acquired by foreign MNEs are likely to have specific characteristics. If targeted firms are ex-ante more productive, then the treatment status is endogenous. Simply comparing foreign-owned firms to domestic ones is hence not informative about the causal direct FDI effect.

The most common approach to overcome this issue is a combination of propensity score matching and difference-in-differences. In this setup, Arnold and Javorcik (2009) show that Indonesian manufacturing plants exhibit a 13.5% higher productivity than the control group three years after foreign acquisitions. In the same Indonesian setup, Javorcik and Poelhekke (2017) observe a productivity drop when firms switch from foreign to domestic ownership, suggesting that the foreign ownership effect is not a one-off productivity boost. Karpaty (2007) and Bandick (2011) also document a positive effect of foreign ownership on Swedish firms' productivity, as do Bentivogli and Mirenda (2017) in the case of Italian firms. On the other hand, studying Slovenian manufacturing firms, Salis (2008) does not find any significant change in productivity in the aftermath of foreign acquisitions. Bellak et al. (2006), Fabling and Sanderson (2014) and Shiffbauer et al. (2017) obtained similar null results, respectively, by examining a sample of firms from Austria, New Zealand, and the UK. Gregori et al. (2024) found for the EU using Orbis data and propensity score matching combined with difference-in-difference estimations that cross-border acquisitions may even decrease the productivity of the acquired firm. In this paper, we contribute to the existing literature by studying important moderating factors that could reconcile these conflicting results regarding the productivity effects of foreign ownership.

To better understand these mixed and inconclusive results, several paths have been explored in the literature. First, a possible explanation is that the effect of foreign ownership on productivity may be heterogeneous across sectors. Girma and Görg (2007) document that for the UK manufacturing industry, productivity in foreign-owned firms increases faster than that of their domestic counterparts. However, the sign and magnitude of the effect vary across sectors, with some sectors even experiencing a decrease in productivity in the short run. Siedschlag et al. (2014) highlight that most papers exclusively focus on manufacturing sectors. Using a sample of firms from the Amadeus database and focusing on six EU countries, they show that foreign direct investment has a stronger effect on firm performance in the service rather than the manufacturing sector. Surprisingly, the productivity effects of foreign ownership and its conditionality on sectoral differences have been understudied, particularly for relatively newer members of the European Union, such as Estonia and Latvia. We investigate possible heterogeneous effects of foreign ownership across sectors as we exploit information on firms operating in both the manufacturing and the service sectors.

Second, another strand of papers seeks to isolate the *pure* foreign acquisition effect on productivity by comparing acquisitions of domestic plants made by foreign firms and by domestic owners. In Norway, Balsvik and Haller (2010) observe an improvement in productivity following the acquisition of the plant by a foreign firm. Plants acquired by other domestic firms are only able to recover their original productivity level, the three pre-acquisition years being associated with a decline in productivity. Wang and Wang (2015) follow a similar approach using a sample of Chinese firms. They find that both foreign and domestic acquisitions lead to similar productivity improvements compared to firms that did not experience any ownership change. Weche Geluebske (2015) applies a similar approach using a sample of German firms. In contrast to Wang and Wang (2015), this paper finds that the productivity of foreign-acquired firms does not change differently than that of domestic firms in the aftermath of their acquisition. The datasets we use for our empirical investigation do not

provide information on domestic firms being acquired by other domestic firms (except for in Estonia), limiting our ability to contribute to this strand of the literature. This data limitation could be a concern for our analysis, as any foreign ownership effects we find could instead capture the effect of ownership changes. However, Fons-Rosen et al. (2021), relying on the Orbis database, provide cross-country evidence that the post-acquisition productivity boost they observe is mostly driven by foreign takeovers. They also show that this boost occurs with a four-year lag and only when foreign acquirers take the majority position. Similarly, we document that in Estonia, the effect of domestic takeovers is much smaller than that of foreign acquisitions (see Section 5.3).

Third, another series of papers investigates the productivity effect conditional on the country of origin of the acquirer. Focusing on the major source countries of incoming FDI in the US, Ford et al. (2008) show that the effect of FDI at the state level differs by source country. They argue that relative differences in factor endowments between the source country and the state drive this conditional effect. At the firm level, Criscuolo and Martin (2009) contrast the performance of UK plants acquired by US firms against the performance of plants acquired by other source countries or other domestic firms. They report that new US affiliates are more productive than firms acquired by other source countries. Kamal (2015) examines the performance of foreign-owned Chinese firms, explicitly distinguishing between FDI originating from OECD countries and those from Hong Kong, Macao and Taiwan (HMT). The rationale is that sharing a common language and culture should facilitate knowledge diffusion between the target firm and its acquirer, but also that investors from a similar cultural background benefit from a first-mover advantage. Her results, however, point to the fact that OECD-acquired firms experience higher productivity post-acquisition relative to HMT-acquired firms, which can be explained by the fact that OECD acquirers implement more advanced management practices than their HMT counterparts. On the other hand, Xu et al. (2022) document that cultural proximity matters for the foreign ownership-productivity nexus, in line with Cezar and Escobar (2015), who show that institutional proximity matters for FDI activity at the country level. Building on this literature, which puts forward the importance of country of origin in productivity analysis, we carefully compare three levels of origin via a clear classification of Nordic countries, EEA and the rest of the world. This contribution to the productivity analysis literature widens our knowledge about the foreign ownership-productivity relationship depending on economic integration and the spatial and cultural proximity between the investor and host countries.

Our paper also relates to a series of papers studying FDI effects in new EU member states. After the collapse of the Communist Bloc, Baltic and Central Eastern European countries have undertaken numerous developments as part of their economic and political reforms, such as market liberalisation, financial institution reforms and labour market restructuring (Douarin and Mickiewicz, 2017). Before EU accession, these economies were transforming into attractive destinations for foreign investors by improving the quality of the business environment. Full memberships of the European Economic Area (2003), the European Union (2004) and the Euro Area (2011 for Estonia and 2014 for Latvia) have made these countries even more attractive to foreign investors. Many studies examine the effect of incoming FDI in the region (e.g., Bijsterbosch and Kolasa 2010, Hanousek et al. 2011, Damijan et al. 2013, Gorodnichenko et al. 2014, Damijan et al. 2015). The meta-analysis by Iwasaki and Tokunaga (2016) concluded that this literature has not provided evidence of a non-zero productivity spillover effect in the region. Regarding more recent studies, Vujanovic et al. (2022) found for Serbia that domestic firms benefit from the presence of foreign companies in the earlier stages of the innovation process (and in the case of innovation through knowledge use rather than knowledge creation). Orlic et al. (2018) using data from five CEE transition countries show that domestic manufacturing

companies benefit from the presence of FDI in upstream services. Nevertheless, the literature usually documents a small positive direct FDI effect, which significantly varies across firms and host countries. Damijan et al. (2015) show that small unproductive firms benefit the most from foreign acquisitions. Gorodnichenko et al. (2014) provide (weak) evidence that the FDI effect also depends on the host country's absorptive capacity: if the technology and human capital gap between the domestic and foreign firms is too large, the FDI effect is weaker. We re-examine this question in a comparative setup, contrasting firms operating in neighbouring countries sharing similar cultural traits but at different stages of economic development.

Finally, while to our knowledge, the only related study using Norwegian data is Balsvik and Haller (2010), several papers focus on the Estonian and Latvian cases. An early study by Vahter and Masso (2007) does not find robust evidence of spillover effects of outgoing or incoming FDI on productivity in Estonia. On the other hand, Vahter and Masso (2019) find that hiring employees with experience from FDI firms is associated with an increase in total factor productivity. Masso and Vahter (2023) document that domestic firms enhance their productivity by supplying to multinational companies. Roosaar et al. (2022) argue that in times of crisis, foreign firms operating in Estonia improve their labour productivity by a better readjustment of the pool of available employees compared to domestic firms. Finally, Benkovskis et al. (2020) show that exporting firms in Latvia and Estonia receive more productivity gains by being part of global value chains, which creates an opportunity to absorb knowledge transfer through connections with multinationals (Simona and Axele, 2012). Our paper contributes to understanding the consequences of FDI inflows in the Baltic States, which have been one of Europe's largest recipients of foreign investments since the 90s. The following section will present the data used in the empirical analysis and the descriptive statistics.

3. DATA CONSTRUCTION AND DESCRIPTIVE STATISTICS

3.1. Administrative Firm-Level Data Processing

This paper exploits firm-level administrative data from Estonia, Latvia, and Norway. This subsection describes the datasets and the construction of our main variables of interest before the next subsection provides a descriptive analysis.

Our analysis relies on a joint effort to access administrative firm-level data in all three countries, allowing cross-country data processing in a harmonised framework. Papers focusing on the link between productivity and foreign ownership in a multi-country setup typically use commercial databases (e.g., Fons-Rosen et al., 2022). Using such databases nevertheless comes at the cost of potential representativeness issues (Bajgar et al. 2022, Kalemli-Özcan et al. 2022), which can be partly mitigated by using administrative data. On the other hand, accessing administrative data is more challenging, narrowing down the set of countries that can be included in the analysis and preventing data from being merged across countries into a single dataset. The closest paper to our study is Hijzen et al. (2013), which investigates the impact of foreign ownership on wages using administrative data from five countries. The nature of their data impairs cross-country comparability (e.g., sample-based data in some countries in terms of firms or establishment units of observations). In our analysis, the three countries provide very similar raw data material, with firm-level observations and near-universal firm coverage (for Estonia and Latvia), ensuring high data comparability. Norwegian data is also administrative data, but the coverage is more limited as information related to foreign ownership comes from an official survey, as will be described below. Despite this data

restriction, Norway provides a valuable benchmark for evaluating Estonian and Latvian results, as all three countries are part of the same cultural and geographical area but are at different stages in terms of economic development. At the same time, Norway is also located in Northern Europe, thereby serving as an overlapping regional investor market.

Estonian Administrative Firm-Level Data

Estonian data are obtained via Statistics Estonia. Firms' financial indicators are obtained from the Estonian Commercial Registry (Äriregister) data on the companies' annual reports, including balance sheets and income statements. Ownership data is obtained from Statistics Estonia's Business Entities Statistical Register (majandusüksuste statistiline register, MSR) and matched using a unique firm identifier. The latter includes, for all business entities, the lists of owners, the shares of ownership, and the source country code. Estonian ownership data includes the precise stakes of all owners. We consider a firm foreign-owned if the foreign-owned share is at least 50%. We use this 50% threshold to be consistent with the Latvian data (see below). This 50% threshold is also commonly used in the related literature (e.g., Balsvik and Haller 2010, Bandik 2011, Fons-Rosen et al. 2021). In addition, the official classification of foreign ownership used by the Estonian Business Registry is based on this threshold. The final sample in the calculations covers the 2006–2019 period, with ownership data available from 2006. The number of economically active firms (those with positive sales or employees) grew from 51,000 in 2006 to 93,000 in 2019.

Latvian Administrative Firm-Level Data

Latvian data are obtained via the Latvian Central Statistical Bureau (CSB). The core dataset is the Comprehensive Database of Firm Indicators (GADA data), which provides a wealth of firm-level characteristics covering the 2009–2019 period. We merge this database with other resources from the CSB via a unique firm identifier. First, we merge it with a detailed balance sheet (Finance data), based on information collected by the Latvian State Revenue Service. Second, we merge it with FAT data, providing comprehensive information on foreign ownership, including the country of the direct owner. Unlike in the Estonian data, we do not have the exact foreign-owned capital share, but only a foreign ownership dummy taking the value one if 50% or more of the capital is owned by a foreign entity (thus, the same definition for the firm being foreign-owned is used in the study). The data includes 67,140 unique firms in 2009 up to 104,913 in 2019.

Norwegian Administrative and Survey Firm-Level Data

For the investigations in the Norwegian economy, we use firm data from the Norwegian Enterprise Register, which contains basic administrative data on the income statement and the balance sheet. The dataset is pre-processed and made ready for empirical investigations by Statistics Norway. For FDI data, we exploit Statistic Norway's questionnaire for foreign direct investments in Norwegian firms. Statistics Norway's sample survey "Investments abroad" entails information on Norway's direct investments abroad (i.e., outward FDI) and foreign direct investments in Norway (i.e., inward FDI). It consists of a sample covering the largest enterprises with direct investments abroad and a selection of smaller enterprises. In the statistics, foreign ownership positions above 20% are recognised as foreign direct investments. We merge the Norwegian Enterprise Register Data with the FDI survey data and remove observation units with missing data for the variables used in our study. The data includes 5,388 firms and 47,213 observations from 2007 to 2016. Note that while the Estonian and Latvian accounting figures are reported in euros, the Norwegian key figures are reported in Norwegian

krone, where one Norwegian krone on average corresponded to 0.1227 euros over the study period (according to exchange rate data from the Norwegian Central Bank).

Deflator Data and Data Processing

Data from all three countries are processed in the same way. Deflators for gross production, intermediates, real estate capital and mobile fixed capital by industry are collected from Statistics Norway and the OECD STAN database for Estonia and Latvia. We apply the A64 second revision industry classification, commonly applied in national accounts, consisting of 64 industries. We exclude some economic sectors that are considered offshore activities and are highly volatile or non-market oriented: petroleum extraction, international shipping, banking and finance, real estate, public sector, household, and non-profit services.

We drop observations in the top and bottom percentile for each continuous variable. As explained above, we disaggregate foreign ownership into three subcategories based on the origin of the owner: Northern European countries (Denmark, Estonia, Finland, Iceland, Latvia, Lithuania, Norway, and Sweden, including dependencies), the Rest of Europe (EU28, including dependencies) and the Rest of the World (all other countries, including European overseas territories outside Europe).

3.2. Descriptive Statistics

Table 1 displays descriptive statistics for the main variables. In Estonia and Latvia, most incoming FDI originates from other Northern European countries. On the other hand, FDI from the rest of the EEA is more prevalent in Norway. The mean firm size in terms of the log number of employees is the largest in Norway, followed by Estonia and Latvia. The same pattern appears for gross production, fixed capital stock and the consumption of intermediate goods. In Section 4.1 we outline the construction of the productivity variables. These patterns are broadly in line with expectations from the sizes and development levels of the three countries.

Figure 1 shows the share of foreign-owned firms detained by each of the three regional groups across industries. In all three countries, there is a wide variation in the percentage of the foreign ownership categories across industries. In Estonia, Northern Europe represents over 50% of the foreign-owned firms in all industries. This observation is heavily driven by the importance of the FDI from Finland and Sweden for the Estonian economy. The share of FDI from other regions is largest in the mainland transportation sector (sector H). Generally, the industries with the larger share of FDI from the rest of the world also have a higher share of FDI from the rest of the EEA. In Latvia, the share of Northern European ownership is consistently lower than in Estonia in all industries, often being below 50%. As in Estonia, the consumer manufacturing sector (sector C.1) is one of the sectors where Northern European investors represent the largest share of foreign investors. In Norway, the rest of the EEA dominates, except in the information and communication sector (sector J) and consumer manufacturing (sector C.1). The share of the rest of the world is generally moderate, except in mainland transportation (sector H).

Table 1. Descriptive statistics

	Estonia		Latvia		Norway	
Variable	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Acquisition - Northern Europe	0.017	0.131	0.017	0.128	0.007	0.082
Acquisition - Rest of EEA	0.003	0.055	0.010	0.100	0.010	0.098

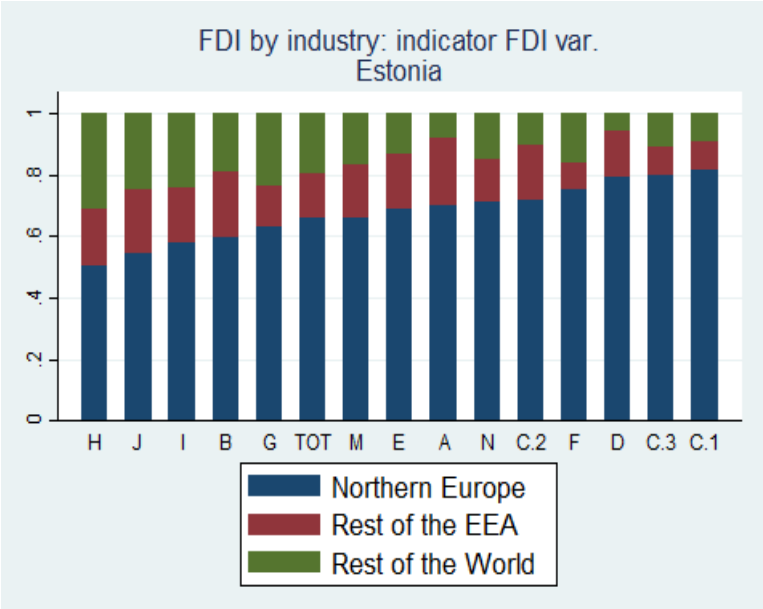
	Estonia		Latvia		Norway	
Variable	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Acquisition - Rest of the World	0.003	0.053	0.010	0.099	0.002	0.047
Employees (log)	1.494	1.334	1.280	1.238	1.843	1.346
Gross production (log)	10.502	2.156	10.039	2.130	14.653	2.079
Fixed capital stock (log)	11.222	2.798	9.835	2.669	13.618	2.446
Intermediates (log)	10.464	2.411	10.400	2.421	14.163	2.788
Labour productivity (log)	9.641	1.099	8.818	1.312	13.292	0.886
TFP Wooldridge (log)	9.179	1.308	7.918	1.381	13.198	1.167
Time period	2006–2019		2009–2019		2007–2016	

Note: Firm-level descriptive statistics. Estonian and Latvian monetary variables are expressed in the 2015 euro, while Norwegian monetary variables are expressed in the Norwegian 2015 krone. According to data from the Norwegian Central Bank, the average exchange rate between Norwegian krones and euros between 2007 and 2016 was 8.1502.

4. EMPIRICAL DESIGN

4.1. Productivity Measurement

Our outcome of interest is productivity at firm level. The literature on the productivity/foreign-ownership relationship has used a broad set of productivity measures. Most of these measures can be classified into two broad categories: total factor productivity and labour productivity.[1] In this paper, we use both a measure of total factor productivity and labour productivity. Descriptive statistics of the TFP estimates are provided in Table 1.



[1] Arnold and Javorcik (2009) is a notable exception. They use a multilateral index based on Aw et al. (2001), which consists in expressing firm input and output as a deviation from a synthetic average plant.

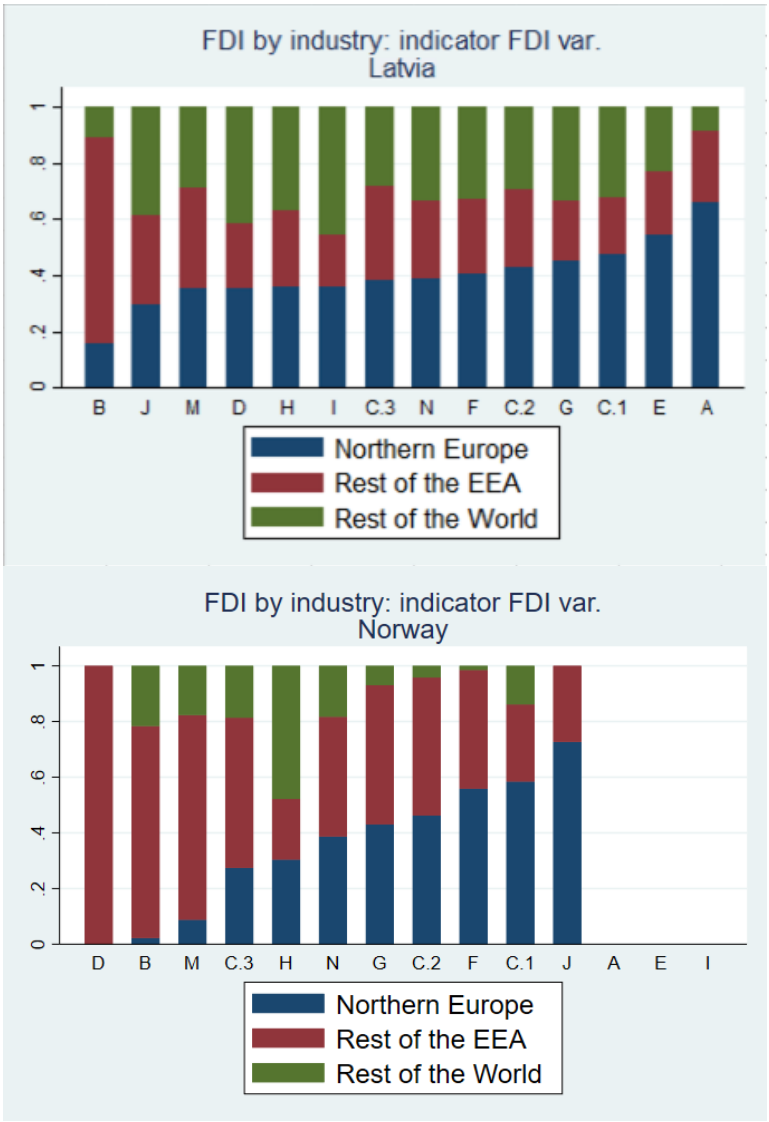


Figure 1. Breakdown of FDI by regional groups
Note: These graphs display the share of foreign-owned firms detained by each of the three regional groups (Northern Europe, the rest of the EEA, and the rest of the world) for Estonia, Latvia, and Norway.

Total Factor Productivity

We estimate total factor productivity (TFP) by the control function procedure of Wooldridge (2009) using Cobb-Douglas technology. Production estimation is carried out at the industry level (i.e., two-digit NACE Rev 2). Gross value added in fixed prices is used as a production measure, while we use employment and fixed capital stock as factor inputs. The control function procedures address endogeneity biases associated with the choice of factor input, particularly fixed capital. In principle, Wooldridge's (2009) procedure constitutes an improvement on Levinsohn and Petrin's (2003) estimation procedure, as it reduces the estimation steps from two to one and handles potential identification challenges associated with collinearity between the free variable and proxy for productivity shocks.

When formulating the production equation, Wooldridge's procedure uses the Markovian nature of productivity to exploit the relevant moment restriction to an equation set for production in a natural logarithm, $y_{i,t}$, with different instruments:

$$(1)\quad \begin{aligned} y_{i,t} &= \alpha_0 + \alpha_l l_{i,t} + \alpha_l k_{i,t} + \phi(m_{i,t}, k_{i,t}) + a_{\varepsilon,i,t} \\ y_{i,t} &= \alpha_0 + \alpha_l l_{i,t} + \alpha_l k_{i,t} + \psi\left(\phi(m_{i,t-1}, k_{i,t-1})\right) + e_{i,t} \end{aligned}$$

where $l_{i,t}$ $k_{i,t}$ and $m_{i,t}$ denote the number of employees, fixed capital stock in fixed prices and intermediates in fixed prices (all in a natural logarithm). $a_{\varepsilon,i,t}$ is a normally, independently and identically distributed error term that captures TFP development over time. α_0 is a parameter reflecting average productivity, while the output elasticities of capital and labour are captured by α_k and α_l, respectively.

The ϕ and ψ are two sets of control functions. Assuming that productivity follows a random walk with drift, we can write:

$$\begin{aligned} \phi(m_{i,t}, k_{i,t}) &= \lambda_0 + \lambda_1 h(m_{i,t}, k_{i,t}) \\ \psi\left(\phi(m_{i,t-1}, k_{i,t-1})\right) &= \theta_0 + \theta_1 \phi(m_{i,t}, k_{i,t})' \end{aligned}$$

where ϕ and ψ are approximated as third-degree polynomials. Rearranging equations (1) such that the residuals are on the left-hand side and inserting the control functions from equations 0, we obtain the following GMM system:

$$(2)\quad \begin{aligned} a_{\varepsilon,i,t} &= y_{i,t} - \gamma_1 - \alpha_l l_{i,t} - \alpha_l k_{i,t} - \lambda_1 h(m_{i,t}, k_{i,t}) \\ \tilde{a}_{f,t} &= y_{i,t} - \gamma_2 - \alpha_l l_{i,t} - \alpha_l k_{i,t} - \lambda_2 h(m_{i,t-1}, k_{i,t-1}) \end{aligned}$$

Note that $\gamma_1 = \alpha_0 + \lambda_0$ and $\gamma_2 = \theta_0 + \theta_1 \lambda_0$. Assuming orthogonality for both equations:

$$(3)\quad \begin{aligned} \mathbb{E}(a_{\varepsilon,i,t} | m_{i,t}, l_{i,t}, k_{i,t}, m_{i,t-1}, l_{i,t-1}, k_{i,t-1}, \dots, m_{i,1}, l_{i,1}, k_{i,1}) = 0 \\ \mathbb{E}(e_{i,t} | k_{i,t}, m_{i,t-1}, l_{i,t-1}, k_{i,t-1}, \dots, m_{i,1}, l_{i,1}, k_{i,1}) = 0 \end{aligned}$$

The system is estimated simultaneously using a generalised method of moments, exploiting that $\mathbb{E}(k_{i,t} a_{\varepsilon,i,t}) = \mathbb{E}(l_{i,t} a_{\varepsilon,i,t}) = \mathbb{E}(h_{i,t} a_{\varepsilon,i,t}) = 0$ and $\mathbb{E}(k_{i,t-1} \tilde{a}_{i,t}) = \mathbb{E}(l_{i,t-1} \tilde{a}_{i,t}) = \mathbb{E}(h_{i,t-1} \tilde{a}_{i,t}) = 0$. We implement this procedure using the Stata package *prodest* (Rovigatti and Mollisi 2018).[2]

Labour Productivity

Labour productivity (LP) is simply measured by gross value-added volumes per employed. As the measure does not consider capital input, it will be less vulnerable to measurement errors in fixed capital, although the productivity measure becomes biased towards capital-intensive firms. Gross value-added volumes are estimated as the difference between gross production at fixed prices and intermediates at fixed prices.

Relationship between Productivity and FDI

presents the kernel densities of the productivity distributions depending on their ownership status: domestic firms, Northern European-owned firms, firms with owners from the rest of the EEA, and firms with owners from the rest of the world. In all three countries, domestic firms are, on average, less productive than foreign-owned ones. This is visible using either labour

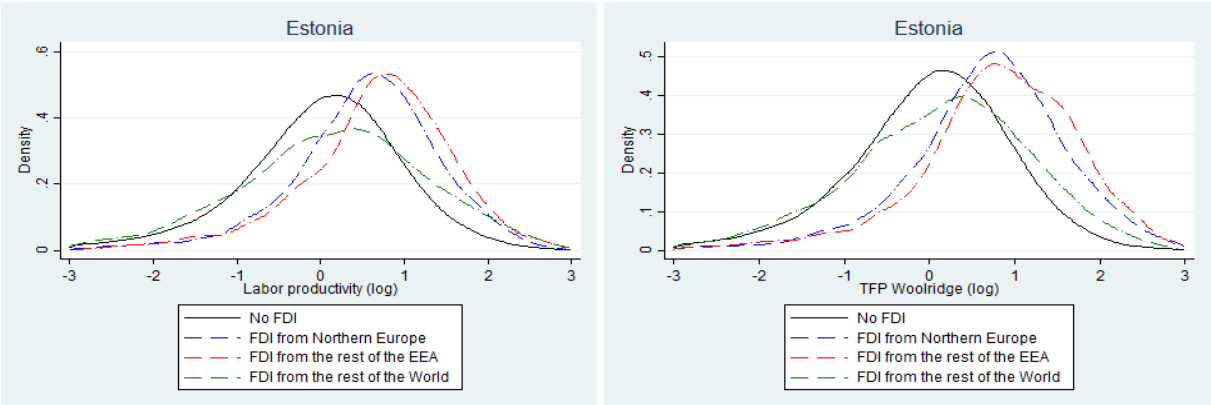
[2] Van Beveren (2012) provides a comparison of TFP estimates obtained using various estimation techniques (e.g., OLS, Levinsohn and Petrin 2003, Wooldridge 2009, De Loecker 2011). She documents a high correlation between these estimates (higher than 0.8).

productivity or TFP measures. In the Norwegian data, the lines for the three groups of FDI almost overlap, especially for TFP. At the same time, there are minor differences in labour productivity, with the companies from the rest of the world group showing the highest levels of labour productivity. The differences between the three groups of FDI source countries are generally slight, also in the case of Latvia. Yet, in Latvia, the companies with FDI from the rest of the world are clearly less productive. The most significant differences across FDI companies are in Estonia, where the rest of the World group is not much more productive than domestic companies. In Estonia, companies with FDI from the rest of the EEA are the most productive, which is not visible in the other two countries. We can observe fatter tails in Estonia and Latvia and more compressed distributions in Norway, generally for all the productivity measures and types of ownership.

4.2. Identification Strategy

The differences in productivity between foreign and domestic-owned firms observed above are, however, only correlations. One of the main challenges in this literature is understanding whether FDI boosts the acquired firm's productivity or foreign investors acquire the best-performing domestic firms. Simply comparing the productivity of domestic and foreign-owned firms in the aftermath of their acquisition would capture both components. For example, if foreign investors are more prone to acquire large firms, which are generally expected to be more productive, contrasting domestic and foreign-owned firms would also capture a size effect in addition to the foreign ownership effect.

We aim to disentangle the productivity boost (if any) from the cherry-picking effect. To achieve this goal, we adopt the standard strategy implemented by most of the (recent) related literature: propensity score matching combined with a difference-in-differences approach. The idea is to compare domestic companies with foreign-owned firms similar in various observable characteristics associated with firm performance *before* their acquisition by a foreign investor. We can then contrast the evolution of the productivity of domestic firms not acquired by foreign-owned firms to that of foreign-acquired firms around the acquisition.



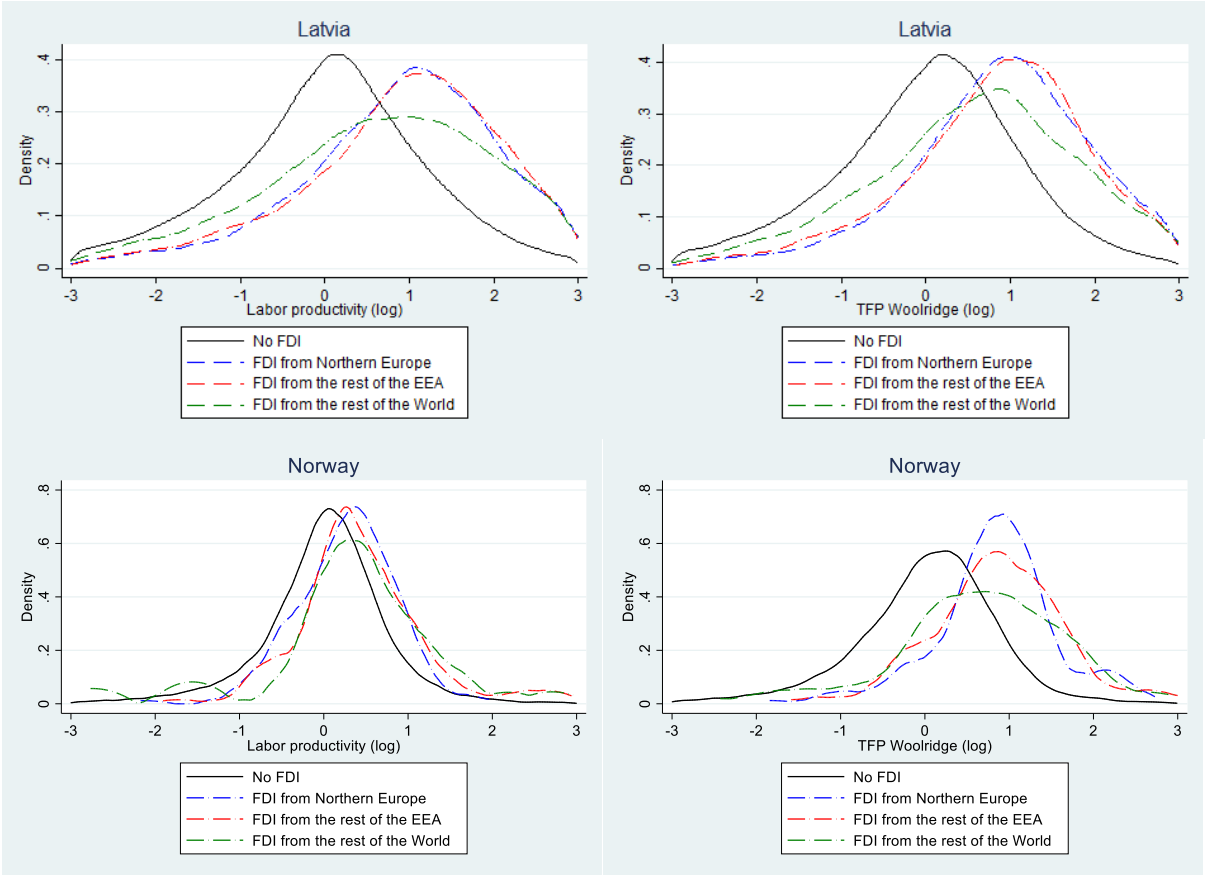


Figure 2. Productivity measures – kernel density
Note: These figures display the kernel densities of the productivity distribution by type of ownership. The horizontal axis represents the deviation from the 2-digit industry mean productivity.

In the first step, we construct a control group out of the domestically owned companies with characteristics similar to those of foreign-owned firms (the treated group). We first estimate the probability for a firm to be acquired by a foreign-owned company via a probit model (i.e., the propensity score). As is well known, a crucial assumption with matching methods is that all the relevant firm characteristics are observed. The quality of the matching depends on the quality of the observed data. We gather detailed features of firms from our rich databases, broadly covering the standard set of variables used in this literature. The variable list includes the pre-treatment firm productivity, firm size and firm size squared (measured in terms of the number of employees), firm age and firm age squared, and capital-labour ratio (capturing the effects of capital deepening). The companies' financial conditions are approximated using the liquidity ratio (calculated as the ratio of cash and other liquid assets to total assets) and the credit risk ratio (calculated as the ratio of the earnings before interest and taxes, EBIT, to the annual average of total debt net of cash and other liquid assets). The company's location is captured by a set of dummies representing the Eurostat degree of urbanisation (DEGURBA index). Categories 1, 2 and 3 represent densely, intermediate and thinly populated areas. The matching is implemented using the *psmatch2* Stata package (Leuven and Sianesi, 2003).

In our baseline analysis, firms are matched based on the calculated propensity score using nearest-neighbour matching with five neighbours (NN5). Alternatively, we also implement nearest-neighbour matching with two neighbours (NN2) and kernel matching with the Epanechnikov kernel. We restrict the matching process to have matches within the same year and the same industry. All the variables are measured one year before the treatment. We assess

the matching quality by checking whether any differences in the observable variables between the treatment and control groups before matching remain after matching.

In the second step, we estimate the average treatment effect on the treated (ATT) calculated as follows:

(4) $ATT_{PSM} = \overline{\Delta\pi_{t+s}^{treated}} - \overline{\Delta\pi_{t+s}^{control}}$

The first term is the average growth of the outcome variable (productivity, denoted π) for the treated firms. In contrast, the second term is the counterfactual productivity growth, calculated as the average productivity growth rate of the matched domestic firms. The symbol t denotes the year of the treatment (i.e., the foreign acquisition), and s indicates the period over which the growth of the outcome variable is calculated. We investigate the foreign-ownership effect at times t, $t+1$, $t+2$, and $t+3$. All firms with more than 50% foreign ownership at time t but not at time t-1 are considered as treated (following the definitions of FDI as explained in the data section above). To ensure that the control group companies have not received treatment after t, we require the control group firms to be domestically owned during each of these periods. As π is measured in logs, the change of log points $\Delta\pi_{t+1}$ is also approximately equal to the percentage growth rate in productivity (but the exact growth rate can be calculated as $(\exp(ATT_{PSM}) - 1)$.

For the last step in the analysis, we combine propensity score matching with the difference-in-difference (DiD) regression analysis to investigate whether any pre-treatment differences in the companies may have affected the estimated effects. Accordingly, we apply the following DiD regression model on the matched sample of the treated and control group firms:

(5) $\pi_{it+s} = \beta_0 + \beta_1 Foreign_{it} + \sum_k \beta_{2k} Z_{kit-1} + \sum_k \beta_{3k} Foreign_{it} \times Z_{kit-1} + \tau_t + \varepsilon_{it}$

$Foreign_{it}$ is the binary treatment variable, indicating acquisition by foreign investors of domestic company *i* at time *t*. We allow the treatment effects to vary across firms by including interactions between the treatment group dummies and the firms' initial characteristics Z_{kit-1}. The latter includes three firm-level variables: 1) firm productivity, 2) firm size, and 3) sector (manufacturing versus services). In addition, we also investigate interactions with two source country-level variables: the GDP per capita of the FDI source country (measured in logs) and the log distance between the capitals of the FDI source and destination countries (Estonia, Latvia, and Norway). These two country-level variables are obtained from the CEPII database (Conte et al., 2022). Various specifications with different sets of explanatory variables are estimated, whereby the estimations that include only the foreign ownership variable give us estimates of β_1 corresponding to the ATT effects discussed above.

5. RESULTS

5.1. Propensity Score Estimation

Table 2 displays the results of the propensity score estimations. For each country, we report the results obtained when considering acquisitions by: 1) any foreign owner; 2) a Northern European owner; 3) an owner from the rest of the EEA; and 4) an owner from the rest of the world. All models include constant, industry dummies and fixed effects for years. All the explanatory variables are lagged by a year.

The results indicate that firms acquired by foreign investors systematically differ from other domestic-owned firms, which is in line with existing literature. The models perform quite well across the three analysed countries and the four distinct FDI variables. The goodness of fit is similar across countries, and the pseudo R-squared is in the range of 10–40%, which is common in similar firm-level data studies. The variables (all lagged by one period) have the expected signs. Most importantly, pre-acquisition productivity and firm size increase the probability of a foreign takeover, especially in Estonia. The capital-labour ratio predicts foreign acquisitions positively in Estonia, while the association is negative in Latvian and Norway. Variations in the significance and size of several covariates might be due to different motives for undertaking FDI (e.g., market-seeking versus efficiency-seeking FDI). The association between firm age and foreign acquisition is more nuanced. We see a negative relationship in the case of Estonia but a positive one (at least in the linear term) in Latvia. The very active entry of start-up companies in Estonia (e.g. the highest number of funded start-ups per capita in Europe 2023, Atomico 2023) might explain some of these patterns: recently created small knowledge-based and R&D-intensive companies acquire funding from abroad in subsequent financing rounds.

On the other hand, in Latvia, foreign investors might look relatively more towards established companies. The financial situation of the domestic company also seems to matter strongly in Estonia, with the liquidity ratio being positively associated with foreign acquisitions in Estonia and negatively in Latvia. The overall better financial situation of Estonian companies (possibly related to the retained earnings not being subject to corporate income taxation) (Masso et al. 2013) might be driving these patterns. Finally, the urbanisation dummies are statistically significant, indicating that FDI is much less likely to acquire companies in rural areas (despite the lack of precision in the location measurement, like the lack of detailed geodata for multi-plant companies). Overall, we conclude that the observable data is rich enough and of reasonable quality for the matching exercise. The Norwegian results are generally similar, but some key coefficients, such as pre-acquisition productivity, are even larger, and the goodness of fit is somewhat higher, while the company's age and financial conditions seem not to matter.

Table 3 presents the results of the balancing tests to assess the matching quality for the baseline specification.[3] With a few exceptions, the difference post-matching is insignificant, indicating that the matching is overall successful. The results are similar across the three different matching algorithms: NN(2), NN(5), and kernel matching. For Latvia and Estonia, the differences are statistically significant for just one variable and only at the 10% level. For Norway, the matching procedure does not fully eliminate the difference in terms of firm size, probably due to the smaller sample. Results should be interpreted more cautiously.

As explained above, we force the matches to come from the same broadly defined industry and year (e.g., we compare acquired manufacturing companies to non-acquired manufacturing companies). These restrictions may decrease the matching quality for the other variables as the pool of firms used to build the control group becomes more limited. We implemented an (unreported) alternative matching, removing these restrictions: the quality of the matching for the control variables is similar to our restricted approach. While the probit models include all the variables lagged by one period, we also tested for the differences in the explanatory

[3] Because of the relatively large number of estimations, we present here detailed information on the quality of the matching procedure only for the baseline specification. Yet, in the subsequent tables of the ATT effects below, we present a summary indicator of the quality of matching in the last columns: the share of control variables for which the matching has been successful (i.e., the difference in mean between the treated and the control group is statistically insignificant after the matching). In all cases, this ratio is close to 1.

variables lagged by two periods (i.e., at t-2). The quality of the matching is also satisfying for the latter.

5.2. Foreign Acquisitions and Productivity

The key outcome indicators of the analysis, ATTs, are reported for the baseline estimations in Table 4. These baseline results are obtained using a 5-nearest-neighbour matching procedure. The results obtained using alternative matching procedures (NN2 and kernel matching) are presented in Table A.2 and A.3 in the Appendix and are qualitatively similar. Overall, we observe evidence supporting the positive effects of foreign acquisitions on the productivity of the acquired domestic companies in Estonia and Latvia but not in Norway. Depending on the specification, FDI acquisition leads to about 20 to 30% increased productivity over the four years after acquisition in Estonia and Latvia. While in the Estonian data, we see positive effects both in labour productivity and TFP, in the Latvian data, the positive effects are mostly limited to labour productivity. Therefore, it seems that Estonian companies can benefit more broadly from foreign ownership, possibly also in terms of technology and managerial know-how, while in the Latvian data, the positive effects are mostly related to capital deepening. This latter finding is consistent with the evidence of the better financial situation of the acquired Estonian companies. The positive productivity effects are mostly present at time t, t+2, and t+3. The lack of evidence on more immediate positive effects at t+1 (and mostly also in the case of t+2) and the presence of the long-run positive effects are also in line with the literature. The positive effects at time t, but not at t+1, are more puzzling. That might be related to the annual frequency of our data: the company may have been acquired at the beginning or the end of year t, thereby splitting the productivity effect over the first two years.

Table 2. Probit results – predicting foreign acquisitions

Acquisition	Estonia				Latvia				Norway			
	All	Northern	EEA	World	All	Northern	EEA	World	All	Northern	EEA	World
Labour productivity	0.277	0.299	0.373	0.028	0.066	0.169	0.106	0.119	0.098	-0.227	0.431	-0.195
	(0.016)***	(0.019)***	(0.036)***	(0.028)	(0.015)***	(0.024)***	(0.020)***	(0.019)***	(0.087)	(0.148)	(0.122)***	(0.141)
Employees	0.224	0.214	0.405	0.183	0.191	0.293	0.259	0.181	0.532	1.968	0.412	0.348
	(0.029)***	(0.033)***	(0.060)***	(0.061)***	(0.038)***	(0.055)***	(0.052)***	(0.045)***	(0.190)***	(0.757)***	(0.222)*	(0.340)
Employees squared	0.018	0.020	-0.010	-0.023	-0.002	-0.009	-0.010	0.001	-0.004	-0.153	0.007	0.015
	(0.005)***	(0.006)***	(0.010)	(0.014)	(0.007)	(0.009)	(0.009)	(0.008)	(0.024)	(0.086)*	(0.028)	(0.050)
Firm age	-0.185	-0.260	-0.319	0.361	0.146	0.316	0.024	0.101	-0.034	0.015	-0.054	-0.041
	(0.066)***	(0.074)***	(0.132)**	(0.139)***	(0.087)*	(0.142)**	(0.117)	(0.108)	(0.049)	(0.132)	(0.066)	(0.494)
Firm age squared	-0.019	0.010	0.041	-0.207	-0.083	-0.116	-0.046	-0.066	0.003	-0.01	0.005	-0.051
	(0.019)	(0.022)	(0.038)	(0.041)***	(0.024)***	(0.038)***	(0.033)	(0.030)**	(0.007)	(0.027)	(0.010)	(0.132)
Liquidity ratio	0.664	0.695	0.822	0.202	-0.010	0.416	-0.406	-0.128	0.010	0.057	0.010	0.015
	(0.144)***	(0.168)***	(0.285)***	(0.275)	(0.122)	(0.155)***	(0.185)**	(0.155)	(0.009)	(0.03)*	(0.012)	(0.024)
Capital labour ratio	0.008	0.039	0.030	-0.101	-0.044	0.003	-0.036	-0.023	-0.145	-0.199	-0.028	-0.308
	(0.009)	(0.010)***	(0.018)*	(0.018)***	(0.011)***	(0.017)	(0.015)**	(0.014)*	(0.038)	(0.074)***	(0.049)	(0.084)***
Eurostat urbanisation index=2 (dummy	-0.416	-0.499	-0.301	-0.159	-0.358	-0.199	-0.325	-0.476	0.012	0.204	0.224	-0.743
	(0.042)***	(0.051)***	(0.083)***	(0.073)**	(0.090)***	(0.119)*	(0.121)***	(0.128)***	(0.157)	-0.329	(0.213)	(0.323)**
Eurostat urbanisation index=3 (dummy)	-0.154	-0.105	-0.042	-0.395	-0.265	-0.233	-0.275	-0.362	-0.347	-0.245	-0.301	-1.264
	(0.048)***	(0.054)*	(0.091)	(0.117)***	(0.051)***	(0.080)***	(0.074)***	(0.071)***	(0.192)*	-0.375	(0.274)	(0.467)***
Credit risk	0.000	0.000	0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.002
	(0.000)	(0.000)	(0.002)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.008)
N	25124	24301	19056	19822	87497	79691	83901	85391	13,802	7.989	9.798	6.578
Log-like.	-6,051.916	-4,481.317	-1,455.152	-1,403.781	-2,546.812	-1,186.612	-1,353.248	-1,615.065	-226.599	-89.267	-127.299	-52.993
Pseudo-R2	0.182	0.199	0.235	0.123	0.105	0.162	0.141	0.123	0.358	0.433	0.316	0.348

Note: This table displays the probit results for the propensity score estimations. The dependent variable is a binary variable taking the value one the year a firm is acquired by 1) a foreign owner; 2) a Nordic owner; 3) an owner from the rest of the EEA; 4) an owner from the rest of the world. All models include a constant term, industry and fixed effects. All explanatory variables are lagged by a year. Standard errors in parentheses. ***, **, * - significant at 1%, 5% and 10%, respectively.

Table 3. Balancing tests

	Estonia		Latvia		Norway	
	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched
Lag: 1 year						
Labour productivity (log)	0.474***	0.127	0.851***	0.197	0.287**	-0.012
TFP (log)	0.662***	0.218	0.495***	0.056	0.974***	0.302
Employees	0.935***	0.285*	0.846***	-0.203	2.106***	0.436
Employees squared	4.717***	1.632*	4.241***	-1.299	13.933***	4.397**
Firm age	-0.21***	0.082	-0.053	-0.094	0.019	-0.224
Firm age squared	-0.84***	0.209	-0.295	-0.334	1.643	0.394
Liquidity ratio	0.004	-0.004	-0.026**	0.001	0.213	0.221
Capital labour ratio	-0.787***	0.094	-1.237***	-0.089	-0.903***	-0.178
Eurostat urbanisation index=2 (dummy	-0.12***	-0.034	-0.044**	0.005	0.077	0.014
Eurostat urbanisation index=3 (dummy)	-0.034	0.013	-0.059*	0.008	-0.068	0.037
Credit risk	0.774	1.01	-0.083	-0.270	-2.361	-0.241
Lag: 2 years						
Labour productivity (log)	0.509***	0.14	0.916***	0.329*	0.398***	0.134
TFP (log)	0.7***	0.222	0.574***	0.187	1.060***	0.451**
Employees	0.88***	0.24	0.818***	-0.196	1.327***	-0.470
Employees squared	4.603***	1.469	4.158***	-1.208	17.099***	9.691
Firm age	-0.192***	0.076	-0.096	-0.080	-0.043	-0.336
Firm age squared	-0.798***	0.154	-0.381*	-0.263	2.567	1.215
Liquidity ratio	-0.001	-0.003	-0.012	0.032	-0.569	-5.170
Capital labour ratio	-0.724***	0.01	-1.190***	-0.097	-1.186*	-0.622
Eurostat urbanisation index=2 (dummy	-0.116***	-0.026	-0.044**	0.005	0.029	-0.028
Eurostat urbanisation index=3 (dummy)	-0.015	0.027	-0.059*	0.008	-0.065	0.047
Credit risk	-0.02	0.121	0.007	-0,056	-2.392	-0.197

Note: This table displays the results of balancing tests. Columns “unmatched” show the difference in the average values between the treatment group (foreign-owned firms) and the *unmatched* control group. Matching method: NN(5). Columns “matched” shows the difference in the average values between the treatment group (foreign-owned firms) and the *matched* control group. ***. **. * represent the significance level at 1%, 5% and 10%, respectively.

Table 4. Foreign acquisitions and productivity – main results

Treatment variable	No. of treated	No of. untreated	Labour productivity					Total Factor Productivity					Matching success rate
Year			0	1	2	3	4	0	1	2	3	4	
Estonia													
All	141	12,858	.202**	.100	.123	.227***	.269***	.293***	.170	.200	.278***	.314***	1.00
Northern Europe	96	12,737	.165*	.001	.011	.158*	.213**	.234**	.061	.088	.196*	.257**	1.00
Rest of EEA	33	8,216	.11	.096	.124	.163	.209*	.349	.289	.313	.321	.463**	1.00
Rest of the World	22	7,148	-.044	.198	.276	.194	.112	-.06	.173	.257	.180	.086	1.00
Latvia													
All	194	28,711	.341***	.261**	.323***	.314***	.203*	.198	.119	.174	.170	.085	1.00
Northern Europe	104	26,817	.123	.130	.196	.290**	.200	.079	.080	.123	.200	.130	1.00
Rest of EEA	94	27,741	.329*	.233	.457***	.345**	.323*	.223	.124	.326	.232	.229	0.90
Rest of the World	113	28,221	.108	.066	.092	.069	.028	.048	.011	.054	.022	-.003	1.00
Norway													
All	43	7,132	.041	-.020	-.006	.146	.154	.146	.144	.143	.301*	.253	0.95
Northern Europe	20	4,201	-.016	-.112	-.166	-.009	.132	.125	.056	.125	.235	.373	0.90
Rest of EEA	20	5,731	.243	.205	.012	.104	-.035	.321	.268	.035	.143	-.146	0.90
Rest of the World	27	4,022	-.044	-.228	-.079	-.030	.016	.214	.325	.559	.784*	.832**	0.90

Note: This table displays the average treatment effect on the treated (ATT) with foreign ownership on labour productivity (LP) and total factor productivity (TFP), from the acquisition year (year 0) to four years later (year 4). Matching method: NN(5). ***. **. * represent the level of significance of a t-test at 1%, 5% and 10%, respectively. The matching success rate in the last column indicates the percentages of the variables in the probit model, where the differences after the matching are insignificant at the 10% level.

At the same time, the Norwegian results are inconclusive, and we fail to detect a systematic productivity change following a foreign acquisition. Even though the Norwegian sample size is smaller, that nevertheless may indicate that in a more developed economy like Norway, FDI is more often a source of merely fixed capital rather than a technological contribution.

Our study was also motivated by the discussion on FDI spillover effects (or the lack thereof). As explained above, it would be illusionary to seek FDI spillover effects in the absence of evidence of a positive *direct* FDI effect. Therefore, the positive direct effect in Estonia and Latvia provides some support to studies finding evidence of positive spillover effects via the use of more novel methods, such as via labour mobility from domestic to foreign-owned companies through the study of inter-company transaction (supplier-customer) linkages (e.g., Masso and Vahter 2023).

Regarding the region of origin of the foreign investors, we clearly see some differences across regions and countries. While we observe positive effects in Estonia and Latvia at the aggregate level, disaggregating by region of origin provides contrasting results between Estonia and Latvia. The positive Estonian results are driven mainly by FDI coming from Northern Europe (dominated by Sweden and Finland), as we had hypothesised. On the other hand, there is no evidence of significant positive effects in Latvia despite a large number of treated observations (Sweden being the largest FDI provider). For FDI from the rest of the EEA, we document only a little evidence of a positive effect in the case of Estonia limited to t+4. Yet, the Latvian results are primarily driven by positive effects on labour productivity in that group of countries. Compared to some Estonian estimates, the positive effects are larger already at t+2, then decrease somewhat thereafter. That might also align with the story that the benefits take more time to materialise in Estonia due to the transfer of knowledge and the need for complementary assets. In contrast, capital deepening in Latvia drives incoming FDI, resulting in a short-term productivity boost. Both in Estonia and Latvia, there is not (much) evidence of positive FDI effects in the case of FDI from the rest of the world, which the small number of treated firms cannot explain, at least in the Latvian case. The insignificant point estimates are even negative in Latvia. That group is likely to include FDI from Russia and other countries with income levels lower than that of the Baltic States, while some of the FDI from the high-income countries outside of Europe may enter the Baltic States indirectly through other EU countries.

In the case of Norway, the very small number of treatments (though not unforeseen in the literature) may explain the absence of significant results. However, unlike in Estonia and Latvia, we see some (weak) evidence of positive effects in the group "rest of the world". This may indicate that more developed countries, such as Norway, might be more able to attract more capable investors from far away or that the latter enter Norway directly, not via other European countries.

Table 5 presents the matching results by broad industries: manufacturing and services. We previously noted a positive acquisition effect in Estonia, both in terms of labour productivity and TFP. This effect seems to be entirely driven by the services sector, while all the estimates in manufacturing are statistically insignificant. That highlights the importance of studying FDI effects beyond the manufacturing sector. Yet, earlier studies have found evidence of FDI spillover effects in Estonian manufacturing (Vahter, Masso 2019; Masso, Vahter 2023). For Latvia, we see positive labour productivity effects for commodities but not for services. The different structures of the service sectors in Estonia and Latvia may, to some extent, explain these results – namely, in Estonia, services are dominated much more by the IT sector and in

Latvia by international transport. However, some of the strong negative ATT effects in Latvia are surprising. In principle, this might be related to the acquired companies concentrating more on relatively simple sub-contracting activities instead of tasks in the value chain with higher value-added contents.[4] In the Norwegian sample, the positive results are mostly limited to the commodities sector, following acquisition by investors from the rest of the EEA.

Table 5. Foreign acquisitions and productivity – by sector

			Labour productivity		TFP		
Treatment	Sector	No. treated	t	t+3	t	t+3	Matching success rate
			Estonia				
FDI from any country	Comm.	38	0.147	0.003	0.298	0.158	1.00
	Serv.	42	0.305*	0.328**	0.315**	0.302**	1.00
FDI from Northern Europe	Comm.	27	0.065	0.038	0.213	0.22	1.00
	Serv.	27	0.489**	0.402**	0.386**	0.223	1.00
FDI from the rest of the EEA	Comm.	13	-0.060	0.047	0.313	0.399	1.00
	Serv.	12	0.151	0.259	0.309	0.415	1.00
FDI from the rest of the world	Comm.	2	1.206	0.99	0.782*	0.873*	1.00
	Serv.	7	-0.219	0.359	-0.236	0.311	1.00
			Latvia				
FDI from any country	Comm.	57	0.191	0.169	-0.471**	-0.518***	1.00
	Serv.	49	0.211	0.201	0.079	0.045	1.00
FDI from Northern Europe	Comm.	30	0.289	0.357**	-0.225	-0.157	1.00
	Serv.	27	0.174	0.191	0.110	0.094	1.00
FDI from the rest of the EEA	Comm.	24	0.352	0.098	-0.356	-0.602**	1.00
	Serv.	27	0.126	0.35	0.031	0.146	1.00
FDI from the rest of the world	Comm.	17	-0.125	0.200	-0.639	-0.351	1.00
	Serv.	41	0.233	0.19	0.209	0.148	1.00
			Norway				
FDI from any country	Comm.	18	0.336*	0.159	0.493**	0.479***	1.00
	Serv.	25	0.004	0.136	0.145	0.330*	1.00
FDI from Northern Europe	Comm.	8	-0.098	-0.136	0.039	0.169	1.00
	Serv.	12	-0.19	-0.101	0.004	0.077	1.00
FDI from the rest of the EEA	Comm.	9	0.406**	0.424**	0.710**	0.746**	1.00
	Serv.	11	0.301	0.298	0.309	0.212	1.00
FDI from the rest of the world	Comm.	4	0.342	-0.142	0.187	0.066	1.00
	Serv.	3	-0.592	-0.181	-0.428	0.662	1.00

Note: This table displays the average treatment effect on the treated (ATT) with foreign ownership on labour productivity (LP) and total factor productivity (TFP), from the acquisition year (year 0) to four years later (year 4). ***. **. * represent the level of significance at 1%, 5% and 10%, respectively.

[4] Čirjevskis (2023), using Latvian firm-level data aggregated to industry level for 1995–2021 and fixed effects regression analysis, documents a strong positive productivity effect of FDI originating from OECD countries (explained by OECD countries high management standards and quality of institutions), but mostly negative effects of FDI from other regions (CIS countries and the rest of the world countries). Thus, while the comparability of the results is limited due to the different methodologies, the two sets of results are consistent.

5.3. Additional estimations and discussions of the limitations

To further investigate the robustness of our PSM results and shed additional light on the reasons behind the variation of the ATT effects, we present the results of the difference-in-differences regression analysis for labour productivity in Table 6 and for TFP in Table 7. The results in tables 6 and 7 provide relatively robust evidence (both for different home and host countries of the FDI) that the ATT effects are more prominent for companies with higher productivity (the only exception being Norway for FDI from the rest of the world). Initially (before acquisition), more productive companies benefit the most from foreign takeovers. This highlights the importance of the absorptive capacity. Yet, the importance of absorptive capacity can be seen in Table 7: the companies with initially higher productivity gain more in terms of the subsequent increase in TFP. While one may assume smaller companies have more to learn and gain from foreign acquisition, we do not find strong evidence that the size of the acquired company (in terms of the log number of employees) matters. The positive effects of being larger in the services sector in Estonia but smaller in Latvia are in line with the results in Table 4.

The three regional binary variables that we use in the main part of the paper primarily aim to capture cultural proximity. However, one can argue that instead of cultural proximity, we rather capture geographical proximity. Alternatively, the stronger effects observed in Latvia and Estonia are simply due to the gap in economic development between the Baltic States and other Nordic countries. To rule out this alternative explanation, instead of a set of three binary variables indicating the investors' region of origin, we introduce two variables capturing the physical distance and the difference in terms of economic development between the sending and the receiving countries, respectively.[5] We do not find much evidence that the effects of FDI on acquired local companies vary with the GDP per capita of the FDI source country, nor with the distance between the home and host countries. That lends some support for grouping the source countries of FDI as we do. The only exception we can see is that the effects on TFP in Latvia increase with the GDP per capita of the FDI country of origin. Yet, given the above results on the negative effects on TFP, this suggests that with the increase in the source country's per capita GDP, the effect on TFP changes from negative to insignificant.

Next, we discuss several issues that could impact our estimations. First, while all our estimations are about foreign investor acquisitions of local firms, a natural question could be whether mere changes in ownership (including acquisitions by domestic owners) do not simply drive the foreign-acquisition effects we capture. To investigate this point, we conduct additional estimations where the treatment indicates the takeover of domestic-owned firms by domestic investors (similar to Balsvik and Haller, 2010). The control group then consists of local firms without such ownership change. We can only implement such estimations for the Estonian case since this is the only country where we have the complete list of owners and their ownership shares. The estimations in Table A3 in the Appendix show that there is generally much weaker evidence of positive effects for domestic acquisitions despite the larger number of treatments (156 domestic takeovers in total). The significant positive effects at t+4 are much smaller in magnitude than the effects of acquisition by a foreign-owned company for labour productivity, 0.168 (for FDI 0.269) and for TFP, 0.144 (for FDI 0.310). These results strengthen our interpretation that foreign acquisitions matter more than any kind of ownership change.

[5] We implement this alternative approach only for Estonia and Latvia, since we only observe the precise country of origin of FDI for these two countries.

Table 6. Difference-in-differences estimation results – labour productivity

Variable	All FDI	Northern Europe	Rest of EEA	The rest of the world	All FDI
Specification	(1)	(1)	(1)	(1)	(2)
			Estonia		
Treatment	0.003	-0.035	0.079	-0.312	0.077
Treatment × Log labour prod. (-1)	0.305***	0.310***	0.210	0.400**	0.293***
Treatment × Log firm size (-1)	-0.026	-0.022	0.011	0.074	0.000
Treatment × service	0.380***	0.350**	0.237	0.637*	0.431***
Treatment × log GDP per capita of FDI origin country					-0.050
Treatment × Log distance to FDI origin country					-0.012
Number of observations	687	478	180	130	667
R-squared	0.100	0.103	0.050	0.090	0.099
			Latvia		
Treatment	-0.001	-0.341	0.167	-0.726**	0.559
Treatment × Log labour prod. (-1)	0.316***	0.754***	0.343***	0.604***	0.313***
Treatment × Log firm size (-1)	0.030	-0.149**	-0.032	0.105	0.020
Treatment × service	-0.672***	-0.651***	-0.651**	-0.735***	-0.636***
Treatment × log GDP per capita of FDI origin country					-0.015
Treatment × Log distance to FDI origin country					-0.075
Number of observations	1034	566	538	662	1028
R-squared	0.076	0.173	0.115	0.114	0.073
			Norway		
Treatment	0.314	0.119	0.293	-0.413	
Treatment × Log labour prod. (-1)	0.235	0.488*	0.299	-0.736***	
Treatment × Log firm size (-1)	-0.027	0.019	-0.027	0.115	
Treatment × service	0.023	-0.568	0.057	-0.337**	
Number of observations	215	104	110	42	
R-squared	0.051	0.141	0.066	0.295	

Note: Difference-in-differences regression models are based on the matched sample of local companies acquired by foreign investors and those not acquired by foreign investors. The dependent variable in the regressions is the log labour productivity at time t+4 after the foreign acquisition. The treatment and control groups are matched based on propensity scores with NN5. ***. **. * represent the significance level at 1%, 5% and 10%, respectively.

Second, an important limitation of our analysis is that the control group may also include domestic multinationals. This implies that locally owned companies investing abroad may lead to positive productivity effects through learning. In that case, the positive home-country effects of FDI may affect the estimated host-country productivity effects. This concern is particularly relevant for Estonia, where many firms have implemented an active outward investment policy over the past decade (e.g., Varblane et al., 2019). However, this set of companies is relatively small compared to the number of foreign-owned companies (just 0.3% of economically active companies in Estonia over the sample period, though these represent 1.5% of turnover). This limits the importance of this issue on our results.

Table 7. Difference-in-differences estimation results – TFP

Variable	All FDI	Northern Europe	Rest of EEA	The rest of the world	All FDI
Specification	(1)	(1)	(1)	(1)	(2)
			Estonia		
Treatment	0.136**	0.144*	0.167	-0.097	-0.007
Treatment × Log labour prod. (-1)	-0.119***	-0.153***	-0.140	0.060	
Treatment × Log firm size (-1)	-0.065**	-0.042	0.002	-0.136	
Treatment × service	0.174**	0.078	0.159	0.474**	
Treatment × log GDP per capita of FDI origin country					-0.076
Treatment × Log distance to FDI origin country					0.018
Number of observations	687	478	180	130	667
R-squared	0.061	0.054	0.075	0.107	0.007
			Latvia		
Treatment	-0.017	0.064	0.125	-0.029	-0.009
Treatment × Log labour prod. (-1)	-0.158***	-0.027	-0.140**	-0.149**	
Treatment × Log firm size (-1)	0.072**	0.031	0.042	0.074**	
Treatment × service	0.081	-0.008	0.140	0.095	
Treatment × log GDP per capita of FDI origin country					0.199**
Treatment × Log distance to FDI origin country					-0.025
Number of observations	1034	566	538	662	1028
R-squared	0.076	0.005	0.082	0.062	0.031
			Norway		
Treatment	-0.108	0.098	-0.419	0.971	
Treatment × Log labour prod. (-1)	-0.129	0.229	0.009	-1.785***	
Treatment × Log firm size (-1)	0.111	0.090	0.151*	0.049	
Treatment × service	-0.587*	-1.105	-0.257	-1.684***	
Number of observations	215	104	110	42	
R-squared	0.090	0.119	0.086	0.540	

Note: Difference-in-differences regression models are based on the matched sample of local companies acquired by foreign investors and those not acquired by foreign investors. The dependent variable in the regressions is the log labour productivity at time t+4 after the foreign acquisition. The treatment and control groups are matched based on propensity scores with NN5. ***. **. * represent the significance level at 1%, 5% and 10%, respectively.

Third, another limitation of our PSM approach is that our estimation of the ATT implicitly assumes that there are no FDI effects on the companies foreign investors have not acquired (i.e., no FDI spillover effects). In Estonia, previous studies have, however, demonstrated positive FDI spillover effects via labour mobility and transaction linkages (Masso, Vahter 2019; 2022). That means that our estimated ATT effects might, in principle, be biased downwards. That issue could be mitigated by excluding from the control group local companies that have hired employees with previous work experience in foreign-owned companies (using matched employer-employee data) or those with transaction linkages with foreign-owned companies (using the data on cross-country transaction linkages, e.g., from the VAT tax registry where

available). Unfortunately, we do not have access to this type of data in the framework of this project.

Finally, Driffield et al. (2018) document an increasing (but non-linear) relationship between foreign ownership and productivity. The less stringent foreign-ownership definition for Norway potentially means that our estimates for this country may be lower bound estimates if firms with greater foreign shares are expected to benefit the most from foreign acquisition. On the other hand, in the three countries we study, foreign investors own most of the company in the vast majority of cases. In Estonia, we calculate that in the set of foreign-owned companies, the share of foreign investors amounts to 82% on average. In Latvia in 2019, foreign investors were majority owners in more than 90% of the firms receiving foreign capital (Jurša, 2021). In 80% of the cases, foreign investors own 100% of the shares. In the sample of Norwegian firms used by Fitjar and Rodriguez-Pose (2013), 82% of firms with foreign investors are majority foreign-owned, among which 88% are wholly foreign-owned. Hence, we do not expect the threshold definition to play a substantial role in our context.

7. CONCLUSIONS

First, our paper presents evidence of the positive effect of foreign acquisitions on the productivity of the acquired domestic firm in Estonia and Latvia. FDI acquisitions increase productivity by 20–30% on average, whereas productivity gains are realised in Estonian and Latvian domestic firms in the long run, consistent with previous studies. However, the productivity boost in Latvia is sensitive to productivity measures: this boost is more salient when studying labour productivity than total factor productivity. We hypothesise that the better financial situation of acquired Estonian firms could enable them to reap broader benefits from foreign investments, possibly also in terms of technology and managerial know-how, while in the Latvian case, positive gains are mostly linked to capital deepening. This is consistent with the observation that the services sector mainly drives this overall productivity boost in Estonia and the manufacturing sector, in Latvia. In Norway, however, we observe only (very) weak evidence of a productivity boost in the aftermath of a foreign acquisition. Given that the sample of Norwegian firms is of lower quality than its Latvian and Estonian counterparts, this null result must be interpreted with a grain of salt. In sum, these results nevertheless suggest that the stage of economic development matters for the magnitude of the *direct* FDI effect.

Second, we provide evidence that the region of origin for FDI matters for Estonian and Latvian firms. Productivity gains in Estonian firms are primarily driven by foreign investors from Northern Europe, with Sweden and Finland being the crucial sources of foreign investment in Estonia. However, Latvian firm productivity effects are driven by investment by the rest of the EEA rather than Northern countries. Besides, the results from Norway give some support to the hypothesis that more advanced economies are better equipped to attract more capable investors from faraway regions. Productivity differences based on the region of origin of the FDI suggest that host country policies to attract foreign investors could encompass prior cultural, spatial, and economic proximity, enabling domestic firms to reap larger potential benefits from incoming investors. On the other hand, one could further investigate source-country-related frictions that cause reductions in potential productivity gains for domestic firms. In this way, new strategies could be produced to eliminate or minimise these frictions or find alternative ways to enhance the productivity effect of these investment projects.

Third, observing that these regional effects materialise faster in Estonian firms than in Latvian ones is consistent with the hypothesis on knowledge transfer and the need for complementary

assets in Estonia and capital deepening in Latvia. Differences in how long it takes for productivity gains to materialise could also signal the differences in the level of structural development in the two Baltic countries. From a policy perspective, the slower materialisation of productivity gains in Latvia following foreign acquisitions suggests that governments could develop new strategies to shorten this realisation time.

Finally, our findings suggest that heterogeneous effects of foreign ownership across industries could encourage governments to reassess current foreign investment policies and redesign the strategies to minimise adverse productivity effects. Identifying the motivations of investors and understanding the nature of the acquisitions and mergers would greatly help them direct their investments to more promising sectors.

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APPENDIX

Alternative matching in Analysis of Foreign Acquisitions and Productivity

Table A1. Foreign acquisitions and productivity – alternative matching: 2 nearest-neighbour matching

Treatment variable	No. of treated	No. of. untreated	Labour productivity					Total Factor Productivity					Matching success rate
Year			0	1	2	3	4	0	1	2	3	4	
Estonia													
All	141	12858	.200**	.080	.105	.205**	.255***	.304***	.166	.199	.272**	.31***	1.00
Northern Europe	96	12737	.194*	.062	.053	.169*	.272***	.239*	.091	.094	.166	.267**	1.00
Rest of EEA	33	8216	.156	.090	.080	.077	.224	.324	.226	.225	.193	.349	1.00
Rest of the World	22	7148	-.128	.129	.151	.151	.061	-.159	.092	.125	.128	.017	1.00
Latvia													
All	194	28711	.35**	.285**	.355***	.347***	.212*	.179	.116	.181	.172	.058	0.90
Northern Europe	104	26817	.151	.144	.180	.283*	.202	.105	.090	.097	.190	.128	1.00
Rest of EEA	94	27741	.190	.111	.401**	.309	.207	.090	.006	.267	.205	.136	0.90
Rest of the World	113	28221	.071	-.011	.021	.021	-.046	0.000	-.071	-.016	-.019	-.07	1.00
Norway													
All	43	7,132	.041	-.020	-.006	.146	.154	.146	.144	.143	.301*	.253	0.95
Northern Europe	20	4,201	-.016	-.112	-.166	-.009	.132	.125	.056	.125	.235	.373	0.90
Rest of EEA	20	5,731	.243	.205	.012	.104	-.035	.321	.268	.035	.143	-.146	0.90
Rest of the World	27	4,022	-.044	-.228	-.079	-.030	.016	.214	.325	.559	.784*	.832**	0.90

Note: This table displays the average treatment effect on the treated (ATT) with foreign ownership on labour productivity (LP) and total factor productivity (TFP), from the acquisition year (year 0) to four years later (year 4). Matching method: NN(2). ***. **. * represent the level of significance of a t-test at 1%, 5% and 10%, respectively. The matching success rate in the last column indicates the percentages of the variables in the probit model, where the differences after the matching are insignificant at the 10% level.

Table A2. Foreign acquisitions and productivity – alternative matching: kernel matching

Treatment variable	No. of treated	No. of. untreated	Labour productivity					Total Factor Productivity					Matching success rate
Year			0	1	2	3	4	0	1	2	3	4	
						Estonia							
All	141	12858	.204*	.068	.109	.219**	.277***	.278**	.099	.148	.229*	.273**	1.00
Northern Europe	96	12737	.169	.097	.061	.133	.26**	.184	.121	.105	.136	.276*	1.00
Rest of EEA	33	8216	.126	.076	.048	.024	.209	.215	.17	.146	.088	.304	1.00
Rest of the World	22	7148	-.317	-.144	.06	.068	.022	-.341	-.102	.113	.148	.059	1.00
						Latvia							
All	194	28711	.406**	.313*	.426***	.435***	.324**	.245	.146	.241	.25	.169	1.00
Northern Europe	104	26817	.17	.14	.228	.275	.282	.081	.065	.116	.146	.176	1.00
Rest of EEA	94	27741	.233	.232	.538**	.431*	.299	.067	.048	.34	.253	.148	0.90
Rest of the World	113	28221	.105	.022	.06	.065	.041	.016	-.048	.001	.005	.013	1.00
						Norway							
All	43	7,132	.04	.022	-.032	.107	.111	.289	.294	.199	.442**	.367	0.90
Northern Europe	20	4,201	.007	-.289**	-.421***	-.216	.084	.195	-.081	-.1	.086	.355	0.90
Rest of EEA	20	5,731	.418**	.405	.241	.476**	.353	.508*	.469	.195	.432	.173	0.90
Rest of the World	27	4,022	.274	.08	.283	-.191	-.09	.664	.879	1.217	.91	.914	0.90

Note: This table displays the average treatment effect on the treated (ATT) with foreign ownership on labour productivity (LP) and total factor productivity (TFP) from the acquisition year (year 0) to four years later (year 4). Matching method: Epanecnikov kernel. ***. **. * represent the level of significance of a t-test at 1%, 5% and 10%, respectively. The matching success rate in the last column indicates the percentages of the variables in the probit model where the differences after the matching are insignificant at the 10% level.

Disentangling Alternative matching in Analysis of Foreign Acquisitions and Productivity

Table A3. Domestic acquisitions and productivity

Treatment variable: Domestic acquisition	No. of treated	No of. untreated	Labour productivity					Total Factor Productivity					Matching success rate
Matching:			0	1	2	3	4	0	1	2	3	4	
						Estonia							
NN5	156	11366	-.102	.015	.034	.095	.168**	-.119	.003	.029	.066	.144*	0.90
NN2	156	11366	-.099	.052	.064	.125	.176**	-.05	.117	.129	.181*	.235**	0.90
Kernel	156	11366	-.062	.06	.091	.146	.21**	-.026	.103	.148	.203*	.271**	0.90

Note: This table displays the average treatment effect on the treated (ATT) with domestic acquisitions on labour productivity (LP) and total factor productivity (TFP), from the acquisition year (year 0) to four years later (year 4) in Estonia. Data on domestic takeovers are only available for Estonia. ***. **. * represent the level of significance at 1%, 5% and 10%, respectively. The matching success rate in the last column indicates the percentages of the variables in the probit model where the differences after the matching are insignificant at the 10% level.

KOKKUVÕTE

Välisosalus ja tootlikkus: Eesti, Läti ja Norra võrdlev analüüs

Kuigi välismaiste otseinvesteeringute ligimeelitamine on olnud paljude riikide majanduspoliitika keskmes alates 1980ndatest aastatest, on olemasolev tõendusmaterjal välismaise omandiõiguse põhjusliku mõju kohta ettevõtte tootlikkusele mitteühene. Käesolevas uurimuses võetakse uuesti vaatluse alla välismaiste ülevõtmiste (s.t. ettevõtte omandiõiguse üleminek kohalikelt omanikelt välisinvestoritele) mõju kodumaiste (s.t. ülevõtmise objektiks olevate) ettevõtete tootlikkusele. See tähendab, vaadeldakse mõju investeeringut saanud ettevõttele, aga mitte laiemaid mõjusid kohalikele välisinvesteeringuid mitte saanud ettevõtetele läbi välisinvesteeringute ülekandefektide. Kasutades Eesti, Läti ja Norra ettevõtete andmeid erinevatest administratiivsetest andmebaasidest (nt Eesti Äriregistrist), heidame valgust järgmistele põhiküsimustele: 1) kas välisomandi mõju suurus sõltub vastuvõtva riigi arengutasemest; 2) kas investeeringute päritolu- ja sihtriigi vaheline ruumiline, kultuuriline ja majanduslik lähedus mängib rolli välisomandi mõju suuruse juures, ja 3) mil määral erinevad need mõjud erinevate majandusharude (nt tööstus ja teeninduse) lõikes.

Rakendades tõenäosusliku sobitamise (*propensity score matching*) protseduuri koos diferents-diferents meetodiga (s.t. tootlikkuse varieeruvus ajas ja üle ettevõtete), näitavad meie tulemused, et välisomandi mõju välisinvestori poolt üle võetava ettevõtte tootlikkusele erineb suuresti investeeringut vastuvõtvate riikide, majandussektorite ja välismaiste otseinvesteeringute päritolupiirkonna lõikes. Me dokumenteerime välismaiste ülevõtmiste üldist positiivset, kuid heterogeenset mõju kodumaistele ettevõtetele, kusjuures ettevõtte omandiõiguse üleminekuga välisomanikele kaasnev tootlikkuse kasv on Eestis ja Lätis suurem kui Norras. Mõju on igas riigis keskendunud konkreetsetest piirkondadest ja konkreetsetest majandussektoritest pärit otseinvesteeringutele. Otsestest välisinvesteeringutest tulenev Eesti ettevõtete tootlikkuse kasv on peamiselt tingitud Põhja-Euroopa riikide välisinvestoritest, kusjuures Rootsi ja Soome on peamised välisinvesteeringute allikad Eestis. Välisinvesteeringute positiivne mõju Läti ettevõtete tootlikkusele tuleneb aga pigem ülejäänud Euroopa Majanduspiirkonna riikide kui Põhja-Euroopa riikide investeeringutest. Peale selle toetavad Norra tulemused mõnevõrra hüpoteesi, et arenenumad majandused (mille näiteks on käesolevas uuringus Norra) on paremini võimelised meelitama kaugematest piirkondadest pärit võimekamaid investoreid. Välisinvesteeringute positiivsete mõjude kiirem realiseerumine Eesti ettevõtetes võrreldes Läti ettevõtetega on kooskõlas hüpoteesiga, et Eestis toimub välisinvesteeringu saamisega teadmussiire ja vajadus täiendavate varade järele, Lätis aga kapitaliintensiivsuse kasv. Erinevused tootlikkuse kasvu realiseerumise ajas võivad anda märku ka kahe Balti riigi arengutaseme erinevustest.

Ülaltoodud tulemused viitavad sellele, et välismaiste otseinvesteeringute positiivne mõju vastuvõtvatele ettevõtetele sõltub nii investori kui ka omandatava ettevõtte omadustest. Ettevõtte välisomanikele kuulumise heterogeenne mõju eri tööstusharude lõikes võiks julgustada valitsusi ümber hindama senist välisinvesteeringute poliitikat ja kujundama ümber strateegiaid, et vähendada võimalikku negatiivset mõju tootlikkusele. Investorite motivatsioonide tundmaõppimine ning ülevõtmiste ja ühinemiste olemuse mõistmine aitaks neil suuresti suunata oma investeeringuid suurema potentsiaaliga sektoritesse.