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A better place to play: Public support and spatial patterns of firm relocation in Europe

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Contents

Abstract

This paper explores the spatial patterns associated with large-scale relocation events in the European Union. It examines both relocation within national borders and delocalisation across countries, using data from 2002 to 2023 at the NUTS2 level. The study draws on Eurofound's European Restructuring Monitor (ERM) dataset and applies Probit and Poisson regression models to identify key regional characteristics linked to these events. The findings suggest that cost efficiency plays a central role in driving both types of relocation. Regions with greater access to Cohesion Policy funds tend to experience fewer internal relocations, while a higher availability of State aid is associated with a lower incidence of cross-border delocalisations. The analysis also indicates that manufacturing sectors - particularly electronics, automotive, and computer industries - are most frequently affected, likely due to the nature of their production processes. Moreover, such relocation dynamics appear more dominant in more developed regions, possibly due to the cost advantages offered by less developed regions.

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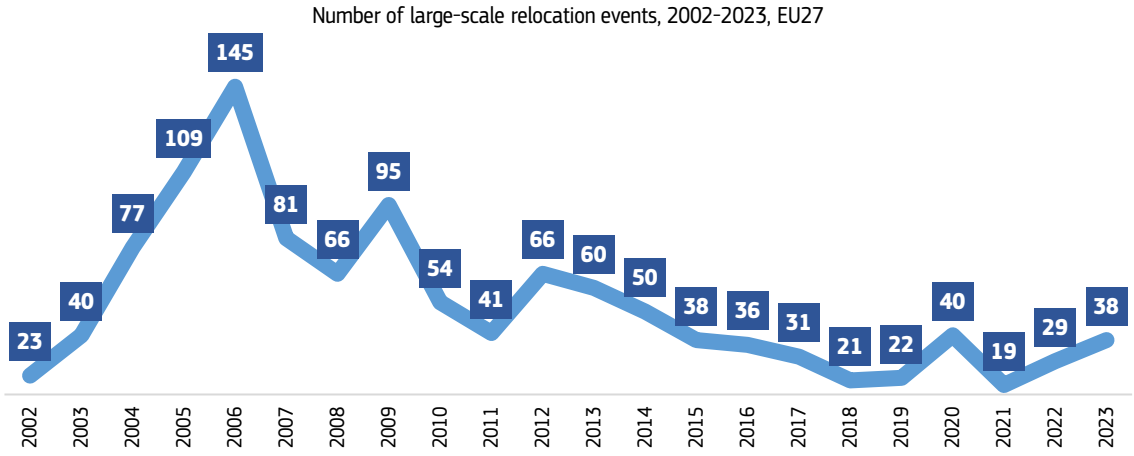
Executive summary

The concept of firm relocation is generally used to refer to the transfer of company's facilities to another region, either within the same country or across national borders. The European Foundation for the Improvement of Living and Working Conditions (Eurofound) distinguishes between intra-national relocation and international delocalisation. In this article, following existing literature, we will use relocation to designate both phenomena. In recent years, the determinants of relocation have attracted significant attention from policymakers due its effects on the local economies, particularly in terms of job losses.

This paper aims to provide an in-depth analysis of the large-scale relocation events reported in the European Union from 2002 to 2023, assessing sectorial and regional patterns, as well as its main drivers. While existing studies often focus on country-specific cases, few have examined the phenomenon at the EU level. Additionally, there is a lack of research on geographical patterns and the role of public support in firm relocation. By utilizing data from Eurofound's European Restructuring Monitor (ERM) and integrating regional characteristics and EU funding information, we identify key factors explaining the likelihood and frequency of these migration events.[3]

How many large-scale business migrations have been registered between 2002 and 2023?

Between 2002 and 2023, the ERM identified 1.090 relocation events in the EU with an announced destruction of at least 100 jobs or affecting at least 10% of the workforce at sites with more than 250 employees. The countries the most affected are France, Germany and Sweden, which concentrate 40% of all the events. Relocation has been particularly high between 2004 and 2006 after the EU enlargement.



Source: Own elaboration based on ERM dataset.

[3] The analysis presented in this paper does not aim to establish causal relationships. While explanatory variables are lagged by one year to reflect temporal ordering, the possibility of endogeneity - such as omitted variable bias or reverse causality - remains. The results should therefore be interpreted as associations rather than causal effects.

Which companies are moving their production to other regions?

86% of the relocation events registered in the ERM dataset are from companies operating in manufacturing industries[4], with the manufacture of electrical equipment, automotive and computer-related products being the most affected.

Where do firms go?

When companies delocalise within or across national borders, in 66% of the cases they move to another EU country, mainly Poland and Czechia. Outside the EU territory, Asia represents 14% of the new destination, namely to China, India and Turkey.

Why do firms relocate their production?

The reasons for moving are identified in our analysis as the socio-economic factors that have a positive influence on the probability of relocation. Firms relocate mainly for cost efficiency reasons. The strategic decision to relocate is often driven by the need to find a more advantageous location in terms of costs, resources or business environment. More specifically, according to our analysis, labour wages are significantly correlated with relocation decisions within the country and across country borders. Population density and road infrastructures appear also to bear a positive influence on relocation decisions. Large manufacturing enterprises, which represent the bulk of firms' migration, may relocate its headquarters from a high-cost city to a lower-cost area, or from densely populated regions to less densely populated ones, in order to save costs - especially if regions to which they relocate are well-connected.

What are the reasons to stay?

Conversely, our analysis identifies reasons to stay as factors that have a negative influence on the probability of being affected by a relocation event or the number of events. Overall, the availability of European Structural and Investment (ESI) funds and state aid for rescue and restructuring are negatively correlated with the likelihood and intensity of relocation events. However, when looking at the differences between relocation within a country and delocalisation outside the country, ESI funds are only a significant determinant in the reduction of intra-national business migration, while state aid tends to be more associated with the reduction of delocalisation events across countries.

[4] The high concentration of relocation events from manufacturing in the ERM dataset could also be due to the higher propensity of large firms in manufacturing sector in the EU (see Figure B1 in Appendix B). Since the ERM data focus only on large restructuring events, this may also influence this pattern. However, the nature of some activities (e.g. agriculture, mining, water supply) also makes them less prone to relocate than manufacturing.

1. Introduction

Firm relocation refers to the intra-national and international movements of company operations. It includes, in line with the Eurofund (2013) distinction, both relocation within domestic borders and delocalisation outside a country. Relocation from one site to another within the same country or region is often driven by factors such as cost reduction, improved infrastructure, or access to resources, and does not involve a cross-border shift (McCann and Acs, 2011). For instance, a firm might relocate a manufacturing plant from one city to another to take advantage of tax incentives or better logistical support, while maintaining operations within the same national framework (Storper, 1997). In contrast, delocalization across international borders, typically from a developed to a developing country is often part of broader globalization strategies, reflecting the redistribution of production networks on a global scale (Dicken, 2015). Delocalization tends to involve offshoring or outsourcing and is motivated by the need to remain competitive in an increasingly globalized economy (Boschma and Frenken, 2006). Thus, while relocation in a country involves domestic shifts in the location of business activities, delocalization across countries entails a more substantial, international movement of operations, often tied to global economic dynamics and supply chain restructuring. In this paper, in line with most of the existing literature, we refer to relocation when we talk about both phenomena, i.e. relocation within the same country or delocalisation outside the country's borders.

The direct and indirect socio-economic effects of firm relocation in terms of loss of employment and wealth have attracted the attention of academics and policymakers to understand the drivers of such restructuring events. For instance, Braakmann and Vermeulen (2024) showed that the effect of mass lay-offs on the local labour economy takes an average of six to eight years to recover, with relocation processes having the largest and statistically significant impact on regional employment.

The globalisation of the economy combined with economic, technological, and managerial factors have been placed at the heart of this phenomenon (Barney, 1991). Firms engage in relocation to improve their competitive position by seeking cost efficiencies (Dunning, 1998; Mudambi, 2008), new market opportunities (Buckley & Ghauri, 2004) and better exploitation of global value chains (Gereffi & Fernandez-Stark, 2011).

Public support may play an important role in shaping the relocation landscape under certain circumstances (see e.g. Egger and Falkinger, 2006; Sleuwaegen and Pennings, 2006; Devereux et al., 2007; Eurofound, 2020). In the European Union (EU), the European Single Market, with its principle of free movement of goods, services, capital, and labour, aims to create an environment conducive to doing business across Member States, potentially reducing the need for relocation outside the EU. However, the combined effects of the single market and the enlargement, by facilitating competition and economies of scale and scope, have also accelerated the restructuring of various industrial sectors and a more efficient spatial allocation of firms, thereby spurring intra-EU relocation processes. EU cohesion policy was established in the first place to compensate for such unintended territorial impacts of the single market and tackle the potential contradiction between the latter and the EU objective of economic convergence across Member States and its regions (Molle, 2007).The main objective of the policy is to reduce disparities between regions and promote economic, social, and territorial cohesion. Over time this rationale has evolved from a purely redistributive logic to a development one focusing on the territorial competitiveness (Camagni and Capello, 2015) and thus aimed at improving the attractiveness of regions for business, including to mitigate the impacts of relocation processes (Basile et al., 2008).

This study has a two-fold objective. First, it aims to explore the spatial determinants of large-scale relocation events in the EU. There is no shortage of theoretical works on the influence of spatial factors on location decisions and empirical papers on relocation certainly abound. Yet far less explored from an empirical perspective is the territorial dimension of the relocation phenomenon and its determinants in Europe. Various studies assume an intrinsic geographical dimension, suggesting that the discussion should be broadened to a finer level of analysis.

The second objective of the study is to probe the role of EU funds in relation to relocation. Comprehensive studies about the role of EU policy as a determinant in the relocation of firms are missing and this paper wants to represent a first step toward a better comprehension of the phenomenon.

Accordingly, the paper addresses four research questions:

- Which European regions are more exposed to relocation events?
- Why do firms relocate their production from a place?
- How territorial socio-economic factors explain the decision to relocate?
- Can the availability of public support reduce the likelihood to delocalize/relocate?

Using Eurofound's European Restructuring Monitor (ERM) dataset, we constructed a time series dataset that included the large-scale relocation events at NUST2 level between 2002 and 2023. This dataset is then combined with data on the regional distribution of EU funds - European Structural and Investment (ESI) Funds and EU Framework Programme (FP) for Research and Innovation (R&I), the country's State aid support to restructuring and socio-economic characteristics of the regions. To understand the spatial patterns of large-scale relocation events, we use a Probit regression model to explain the likelihood of having such events in a region and a Poisson model to describe the frequency of the events. As a complementary analysis, we apply a topic modelling algorithm to the description of the relocation events reported in the ERM dataset, to identify the main motivation for relocation reported by the company in the dataset. This analysis, in complement with scientific literature, aimed to better identify the explanatory variables to include in the econometric model.

This study is particularly relevant from a policy and academic perspective. Understanding the spatial patterns of firm relocation is essential for policymakers to provide targeted support to retain businesses, and foster economic growth. It enables informed decisions for resilience, competitiveness, and efficient use of public resources while shaping urban and regional development to meet business needs. In the current global scenario increasingly marked by trade frictions and global value chains disruptions, preventing delocalization outside the EU intersects with the emerging attention on strategic autonomy and economic security (European Commission, 2023).

Furthermore, the paper also aims to highlight the role of public support in explaining relocation decision. Indeed, existing literature has focused more on exploring other determinants like cost-efficiency (see e.g. Gereffi and Fernandez-Stark, 2011; Hayter et al., 2013).

The paper is structured in five sections. After the introduction, section 2 provides a review of the literature. Section 3 and 4 describe the data used and the methodological approach, respectively. Section 5 discusses the results. Section 6 concludes.

2. Background literature

The relocation of firms involves the transfer of business activities, such as manufacturing, services, or administration, from their home country to alternative locations globally (Grossman and Rossi-Hansberg, 2008). It encompasses a wide range of strategies and decisions in global business operations. For example, outsourcing involves transferring production to external parties, while insourcing entails the return of production, representing strategic "make or buy" decisions (Grossman and Rossi-Hansberg, 2008). However, the relocation of production activities does not guarantee their reuse by the firm, highlighting the nuanced relationship between outsourcing and relocation, which may be seen as complementary or substitutive depending on the theoretical framework and contextual analysis (Mazzanti et al., 2011).

Driven by globalisation, firms may pursue relocation to streamline operations, enter new markets, and optimise supply chains (Gereffi and Fernandez-Stark, 2011). Such shifts have profound economic, social, and political consequences for both source and destination regions, affecting employment, trade dynamics, and regional economic health (Kaplinsky, 2005; Basile et al. 2008).

2.1. Theory and studies about determinants of relocation of firms

Several drivers are influencing firm relocation, and the relevant literature spans different theoretical frameworks. Neo-classical location theory, which emphasises explanatory normative models focusing on factors such as transport and labour costs, and market size, seeks to identify spatial margins of profitability in the new economic geography (Krugman, 1997; Fujita et al., 2001). Additionally, the behavioural approach, rooted in bounded rationality and limited information, highlights how firms often settle for sub-optimal outcomes rather than maximise profits, with internal factors such as firm age and size influencing location decisions (Hayter, 1997). Complementing these perspectives, institutional theory considers the wider social environment that shapes business decisions, where institutions, networks, and value systems influence firms' location choices (Amin and Thrift, 1995).

Various theories underpin relocation, including transaction cost economics (TCE), the resource-based view (RBV), and the ownership advantages, location advantages, and internalisation advantages model (OLI). TCE, which is commonly applied to make-or-buy decisions, posits that firms tend to relocate from high-cost to low-cost environments, all else being equal (Ellram, 2013). In contrast, the RBV suggests that firms will invest their capital in areas where they have key competencies and outsource all other (non-critical) activities. Both in TCE and RBV, location advantages are multifaceted. Resource-related advantages include factors such as the availability of raw materials, infrastructure, and local partnerships (Mudambi, 2008), while market-related advantages revolve around access to talent, suppliers, markets, and government policies (Buckley and Ghauri, 2004). Location advantages focus on efficiency-related factors such as production capabilities, cost efficiencies, and industry clusters. Strategic asset-seeking advantages involve the acquisition of knowledge assets and the exploitation of agglomeration economies. These advantages, which are consistent with the TCE literature on asset specificity and intellectual property risks (Martínez-Mora and Merino, 2014), highlight the importance of firms focusing their capital investments on areas where they have critical competencies while outsourcing non-essential activities, according to the RBV. In contrast, the OLI model suggests that firms engage in international activities when the benefits are evident or, in simple words, if the cost of completing the same actions internally, or in-house, is higher. Each model has some limitations, for example, TCE tends to overlook the need for

specialisation advantages for outsourcing to take place, where these benefits should outweigh the costs associated with trade (Mazzanti, et al. 2011). This requires integrating TCE with the resource-based view of the firm and considering the interconnectedness of the firm's activities within the production process (Nooteboom 2004; Jacobides and Winter 2005).

All strands of the literature provide important insights into the drivers of business relocation decisions, ranging from the pursuit of business expansion to cost optimisation and the need to access key resources (McCann, 2001; Hayter et al., 2013). However, all of these studies include only an intrinsic geographical dimension, suggesting that the discussion should be broadened to a finer level of analysis. Several studies confirm the importance of local and firm-level factors (see e.g. Amin and Thrift, 1995; Mazzanti, et al. 2011). Hayter (1997) argued that the firm size and the sector of economic activity cover a key role in the decision-making process of locating firms. In addition, Grossman and Helpman (2005) suggested how market dimensions, competition pressure and locational characteristics, influence the location decision, as well as factors such as previous restructuring events and market adaptability (Brouwer et al., 2004). Moreover, the distinction between "push" factors that force relocation and "pull" factors that attract firms to optimal locations is recognised, providing deeper insights into the dynamics of firm migration (van Wissen, 2000; Holl, 2004; Capasso et al., 2011).

Several empirical studies underlined key factors that influence firms' decisions to relocate their operations. Van Dijk and Pellenbarg (2000) found that internal factors within firms, such as sector, size, and previous relocation behaviour, were primary drivers of relocation decisions in the Netherlands, with site-related factors playing a secondary role. In contrast, government policy was not a significant factor (van Dijk and Pellenbarg, 2000). Brouwer et al. (2004) examined firm relocation across Europe, finding that companies changing acquisitions, mergers, or employment growth were more likely to relocate. Additionally, younger firms and those operating in internal markets showed a greater willingness to move (Brouwer et al., 2004). Furthermore, Holl (2004) focused on manufacturing relocations in Portugal, revealing that firms preferred areas with better market accessibility. The study highlighted the importance of inter-regional motorway access and the availability of qualified labour in attracting relocations, while labour costs were not a significant factor (Holl, 2004). Moreover, Sleuwaegen and Pennings (2006) studied firm relocation in Belgium, noting that less profitable and labour-intensive firms had a higher probability of relocating for competitive advantage. Multinational firms were more inclined to relocate, with public aid being a decisive factor only for relocations to adjacent regions (Sleuwaegen and Pennings, 2006). Differently, Lampón (2020) found that moving/sunk costs and a firm's age negatively influenced the likelihood of relocation, in the Spanish automobile industry, with labour-intensive firms being more likely to relocate production to low-cost labour locations (Lampón, 2020). Finally, Muco and Golemi (2022) studied Italian enterprises, concluding that labour market regulation, business regulation, and the size of government - or more specifically, the labour cost in the host country - were the main incentives for Italian companies to delocalise their production (Muco and Golemi, 2022).

2.2. The role of policies in the relocation of firms

Among the various determinants of the relocation of firms, the institutional environment is an important factor. Policies shape the economic landscape and influence the costs and benefits of operating in different regions, thereby influencing firms' decisions on where to locate their operations (Eurofound, 2020). Regulatory frameworks, trade policies and economic incentives set by

governments can either encourage or discourage firms to relocate their activities to other regions or countries (Jackson and Deeg, 2008). The intersection of institutional frameworks and public intervention plays a crucial role in shaping firm strategies, and there is a growing body of management literature that addresses this issue. This body of research highlights the need for firms to have a clear understanding of the interplay between institutional structures and public intervention to formulate effective management strategies. Studies such as Musacchio et al. (2015) highlight how the government can influence the competitiveness and strategic decisions of firms. Furthermore, contributions such as Li et al. (2014) emphasise the tendency of firms to shape their strategies according to different levels of government intervention. In addition, Jackson and Deeg (2008) have provided a comparative analysis of institutional environments, highlighting the complex nature of government intervention and its impact on firms' strategic decisions. Additionally, Devereux et al. (2007) highlighted how government grants can impact multinational firms' relocation, emphasising how the impact of government subsidies tends to diminish in regions with a smaller existing presence of firms from the same industry. Following this rationale, public intervention might play a crucial role in the relocation of firms by influencing the factors that drive companies to relocate operations (Basile et al., 2008). In the same literature strand, De Beule et al. (2022) studied how differences in environmental regulations across European Union (EU) countries affected foreign direct investment (FDI) decisions of multinational enterprises (MNEs) regulated under the EU Emissions Trading Scheme (ETS). Public intervention through incentives such as tax breaks, subsidies, and infrastructure investment, can make an area more attractive for firms to remain (Baldwin & Krugman, 2004). In contrast, contributions such as Dunning and Lundan (2008) emphasise how regulations and trade agreements can be adapted to protect domestic industries and jobs, help the retrain of displaced workers and promote innovation and competitiveness in new sectors (Storper, 1995). However, none of these studies directly address the role of public support in the decision of firms to relocate. There is a gap in the literature, especially when considering the European framework of analysis, and this research aims to be a first step to fill this gap.

3. Data source

3.1. Dependent variable: Relocation events

To obtain a time series at NUTS2-level on relocation events in the EU, we use the European Restructuring Monitor (ERM) dataset, compiled by Eurofound[5] since 2002. The ERM database comprises fact sheets containing data on significant restructuring events as reported in the main national media and on company websites on EU, United Kingdom and Norway. Events are included in the dataset if they involve the announced destruction or creation of at least 100 jobs or affect at least 10% of the workforce at sites with more than 250 employees.[6] The type of large-scale restructuring events included in the dataset are: bankruptcy, closure, internal restructuring, merger and acquisition (M&A), delocalization, outsourcing, relocation and business expansion (see definition in Table B1 in Appendix B). For the purposes of this study, we are interested in all events that involve the displacement of companies' activities from one EU region to another within the same country or across national borders, so in the ERM dataset we selected all events related to relocation and offshoring/delocalisation from 2002 to 2023.

From 2002 to 2023, the ERM dataset registered 1.090 relocation and offshoring/delocalisation events with an effect on EU member states. Some of these events have more than one location within the same country or on several countries. NUTS2 location is available for 72% of the observations, and we use the region name to find the corresponding NUTS2 code (version 2021) as the NUTS2 code available in the dataset refers to different NUTS version (2021, 2016, 2010 and 2006). To enrich the dataset we applied the following strategy if a NUTS2 name is missing:

1. When a NUTS1 code is equivalent to a NUTS2 code (i.e. a single NUTS2 region within a NUTS1 region) we use the NUTS1 region name to find the NUTS2 code;
2. When we have country with a mono-region (country with a single NUTS 2 region), we use the NUTS2 code equivalent to the country code;
3. Lastly, we use the information available on "Location affected units" in the dataset which includes the name cities, municipalities, NUTS3 or NUTS2 regions to find the correspondent NUTS2 code of these locations. If we have more than one location, the event ID is replicated by the number of location.

After all the cleaning and enrichment processes, we have a dataset of 1.191 location-events with a NUTS2 code for 94% of the observations. In addition to the number of relocation/delocalisation events in a given region, the ERM dataset also contains general information about the events (e.g.

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[5] https://apps.eurofound.europa.eu/restructuring-events/methodology

[6] We also acknowledge that there are some limitations to the use of this data, which we try to overcome or to control for, as explained in the next section. First, the ERM dataset is based on information from the media, which may be influenced by the freedom of the press in the country. Second, as only medium and large enterprises appear in the dataset, due to the criteria to select the events, it may provide only a partial overview of restructuring events in EU Member States. Nevertheless, the characteristics of the events registered in the ERM allow accounting for the most important large-scale restructuring events, which has the greatest impact on the local economy. Furthermore, the ERM data represents the unique EU dataset, updated each year since 2002, with comprehensive and detailed information about large-scale relocation events, offering valuable insights especially concerning sectoral shifts.

the reason for the relocation) and the profile of the enterprises concerned (economic activity, size and belonging to a group).

3.2. Explanatory variables: Regional characteristics

The regional characteristics explaining the relocation events are extracted from different data sources: EUROSTAT, ARDECO, Cohesion Open Data Platform, Horizon Dashboard and State Aid Scoreboard data. The socio-economic characteristics of the regions were obtained from EUROSTAT and ARDECO. Data on EU funds allocated to regions, namely cohesion policy and the EU Framework Programmes for Research and Innovation (FP), are extracted from the Cohesion Open Data Platform and the Horizon Dashboard respectively. Public support in the form of state aid for rescue and restructuring from the State Aid Scoreboard website.

4. Methodology

In order to disentangle the complex phenomenon of firm's relocation, the study follows two methodological steps: (1) text-mining analysis to events' description and (2) econometrics to explain the determinants of relocation events.

4.1. Topic modelling

To better understand the reasons behind the decision to relocate firm's activities, we use the information about the events contained in the ERM dataset and text-mining methods, specifically a topic modelling algorithm. Topic modelling is a text-mining technique that allows us to automatically identify and organise the main themes and topics in a large corpus of documents (Asmussen and Møller, 2019). The main goal of this approach is to uncover the hidden semantic structures present in large collections of unstructured or semi-structured text by identifying recurrent patterns of words that correspond to topics (Nikolenko et al., 2017). To achieve this, the research relies on the gold standard of topic modelling algorithms, Latent Dirichlet Allocation (LDA). As a generative probabilistic model, LDA estimates the probability distribution of topics within each document and the probability distribution of words within each topic, allowing us to gain valuable insights into the content and structure of our textual data (Blei et al., 2003). The rationale for incorporating topic modelling into the methodology is twofold. First, it allows for the extraction of more general information about relocation events. Second, topic modelling allows us to refine the study of the determinants of corporate relocation by adding conceptual elements to the analysis with a bottom-up approach.

4.2. Econometric Model

To explain the spatial patterns of large-scale relocation events we design an econometric model combining elements from the neo-classical location theory (Krugman, 1997; Fujita et al., 2001) and institutional theory (Amin and Thrift, 1995), as expressed in equation (1).

$$\begin{aligned} RELOC_{i,t} = {} & \beta_0 + \beta_1 POP_{i,t-1} + \beta_2 ROAD_{i,t-1} + \beta_3 MANUF_{i,t-1} + \beta_4 EDUC_{i,t-1} \\ & + \beta_5 COST_{i,t-1} + \beta_6 ESIF_{i,t-1} + \beta_7 FP_{i,t-1} + \beta_8 AID_{i,t-1} + \beta_9 PAST_{i,t-1} + \tau_t + \varepsilon_{i,t} \end{aligned} \quad (1)$$

The dependent variable (RELOC) refers to the region i likelihood of being affected by a large-scale relocation event(s) – or alternatively the number of events – in year t. Explanatory variables based on related literature (Table A in Appendix) include: population density (POP), road infrastructure (ROAD), concentration of manufacturing (MANUF), population skills (EDUC), labor cost (COST), availability of EU investment funds (ESIF), capacity to attract competitive EU funds for R&I (FP), availability of state aid for rescue & restructuring (AID), and region dynamics in terms of other large-scale restructuring events, excluding relocation/delocalisation (PAST). Table 1 provides a detailed description of the variables included in equation (1), as well as their source.

Table 1. Variables description and source

Name	Description	Source
RELOC	Two measures: – Binary variable: = 1 if the region is affected by at least a large-scale relocation event; 0 otherwise – Count variable: number of large-scale relocation events in the region Relocation is also divided into relocation across borders or within the same country.	Own estimation based on ERM dataset
POP	Concentration of population is measured by the ratio between population density (population by square kilometre) in region i and population density in the EU	Own estimation based on ARDECO (SNPTN) and EUROSTAT (reg_area3)
ROAD	Motorways network expressed in kilometre (log) and referring to the total length of motorways within a given region	EUROSTAT (tgs00114)
MANUF	Gross value added (GVA) of manufacturing as a percentage of total GVA	Own estimation based on EUROSTAT (nama_10r_3gva)
EDUC	Concentration of population with tertiary education, measured by the ratio between the share of population with tertiary education in region i and the EU share	Own estimation based on EUROSTAT (lfst_r_lfsd2pop)
COST	Labour cost expressed as the compensation to employees per hour worked, constant price (2015) and purchasing power parities (PPS)	ARDECO (ROWCDH; SUVGD)
ESIF	Stock of European Structural and Investment Funds (ESIF) payments estimated using the perpetual inventory method (PIM) and a depreciation rate of 15% for European Social funds and 8% for the other funds. The stock is expressed in per capita term (x1000), constant price (2015) and Purchasing Power Parities (PPS)	Own estimation based on Cohesion Open data platform and ARDECO (SUVGD; SOVGD)
FP	Estimated stock of the EU contribution to the Framework Programme for Research and Innovation (FP), estimated using the perpetual inventory method (PIM) and a depreciation rate of 15%. The stock is expressed in per capita terms (x1000), constant prices (2015) and purchasing power parities (PPS). The annual flows used to estimate the stock are estimated using the start and end dates of the projects	Own estimation based on combining data provided the European Commission and Horizon dashboard
AID	Annual cumulative share of State aid for rescue and restructuring as a percentage of Gross Domestic Product (GDP), recorded at the country level. The data series begins in 2000, with each year's value representing the total sum from 2000 up to that year (e.g., the 2002 value includes the sum of 2000, 2001, and 2002)	Own estimation based on State aid scoreboard and ARDECO (SUVGD)
PAST	Cumulative number of restructuring events (bankruptcy, closure, internal restructuring, merger and acquisition) with an negative effect on employment	Own estimation based on ERM dataset

Source: Own estimation.

All explanatory variables are lagged by one year because the decision to relocate is typically based on prior conditions and strategic planning[7]. The characteristics of a region in the current year would not immediately influence such decisions, as the process of relocating is often a response to economic, infrastructural, or policy factors observed in previous periods. Time dummies (τ_t) are also included in the regression to control for unobserved factors that vary across time but are constant across regions, such as macroeconomic trends, policy changes, or global economic shocks. The error term ($\varepsilon_{i,t}$) in the regression captures all other unobserved factors that may influence the likelihood of region relocation (or the number of events) but are not explicitly included in the model. This accounts for random variation or measurement errors in the data, ensuring that the model only attributes relocation likelihood to the explanatory variables and not to unknown influences.

We have also considered including country dummies to account for potential reporting bias. However, due to severe multicollinearity between country dummies and key explanatory variables - such as AID (VIF = 83.76) and COST (VIF = 26.22) - we decided against this approach. The high collinearity suggests that these variables already capture important country-specific characteristics, making the inclusion of country fixed effects redundant. Moreover, adding country dummies inflates the labor cost coefficient and even reverses the sign of the State aid coefficient compared to a model without them[8]. Similarly, including region fixed effects exacerbates multicollinearity issues, leading to a mean VIF of 15.91 and extremes values of VIF such as 858.47 for ROAD and 630.91 for COST. Given these distortions, we opted for the specification that ensures the robustness and interpretability of our results, as reported in equation.

Given the nature of our dependent variable (see Table 1), we opted for both binary and count data models to ensure an appropriate estimation framework. For the relocation likelihood, which is a binary outcome indicating whether a relocation event occurs in a region, we use a Probit model. A Probit regression model is used instead of a Logit regression (see Table D2, Figure D1 and Figure D2 in Appendix D) because it perform better in predicting the large-scale events if we look at Pseudo R^2 (higher value for Probit models), Log pseudolikelihood (lower value for Probit models) and the area under ROC curve (higher value for Probit model).

For the count data specification, where the dependent variable represents the number of relocation events, we employ a Poisson regression model. This choice is justified by the nature of the data, which consists of non-negative integer counts (Cameron and Trivedi, 2013). The use of a Poisson regression instead of a Negative Binomial regression (Table D3 in Appendix D) is justified by the higher Pseudo R^2 values of the Poisson regression and the non-significant dispersion parameter - log(alpha) - in the Negative Binomial models. Although the Negative Binomial model fits slightly better in terms of likelihood, this improvement is not substantial enough to outweigh the benefits of the higher Pseudo R^2 in the Poisson models.

An alternative could have been to use as dependent variable the number of relocation events divided by the number of firms in the region - using as proxy for the number of firms, the number of business units in the region from EUROSTAT's business statistics. However, we think that this approach may not be appropriate for several reasons. First, the correlation between the number of

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[7] We also conducted the same analysis with a two- and three-year lag to test the robustness of our findings. The results remain consistent across all specifications, reinforcing the reliability of our conclusions. Detailed results are available upon request.

[8] The results of these analyses are available upon request.

relocation events and total business units is low[9], suggesting that the number of events does not scale strongly with this aggregate measure. Second, the number of relocation events is already a low-frequency variable (mean of 0.2 and maximum of 7 - Table C1 in Appendix), and dividing it by the total number of business units[10] results in extremely small values close to zero. Therefore, we think that normalizing the dependent variable by the business units may introduce additional noise rather than improving the model's explanatory power.

Finally, the regression estimate is weighted by the inverse square root of the 'World Press Freedom Index'[11] to control for potential bias because information in the ERM dataset comes from national media. This correction is also justify when we look at Figure B3 and Figure B4 in Appendix B and we observe a positive correlation between the number of relocation events and the World Press Freedom index. Therefore, this adjustment allows observations from countries with less press freedom to be given higher weights, as events may be underreported there, while countries with high press freedom should be given lower weights, as their reported events are likely to be more accurate.

9 Correlation coefficient equal to 0.146 based on correlation matrix available upon request.

10 Which means is around 134,600 units in 2021-2022 [EUROSTAT, sbs_r_nuts2021]

11 Developed by the "Reporters without borders": https://rsf.org/en/index

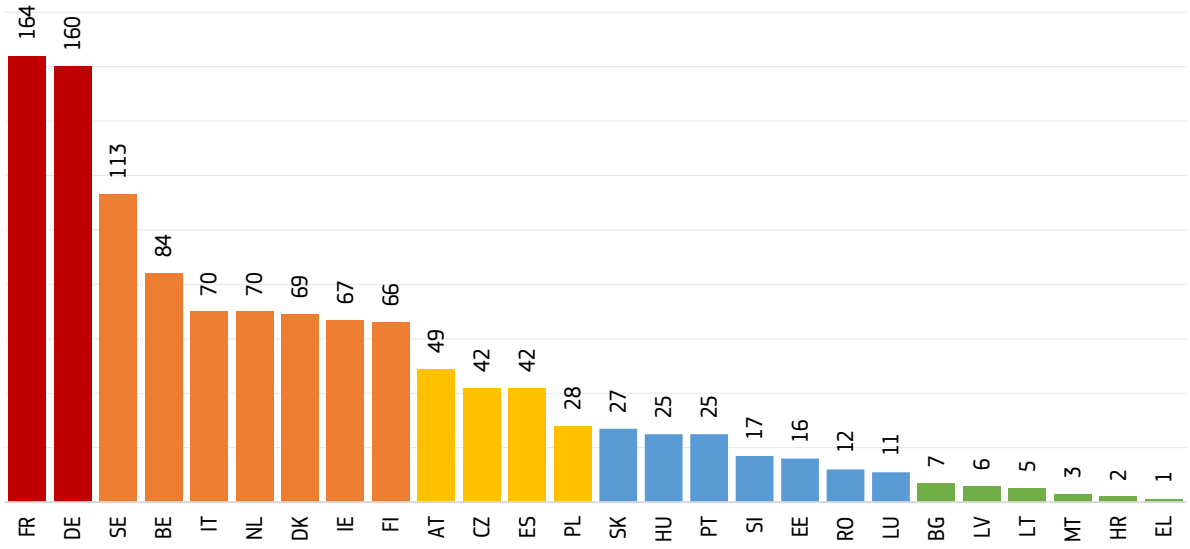
5. Results

This section shows several results of the research. Firstly, the paper provides descriptive statistics related to relocation events in the EU27 (Section 5.1). Secondly, we provide the results related to the topic modelling algorithm (Section 5.2) and the results of the econometric estimation (Section 5.3).

5.1. Describing large-scale relocation events in EU

The geographical distribution of large-scale relocation events across the EU27 countries (Figure 1) and its regions (Figure 2) between 2002 and 2023 exhibit significant differences. Unsurprisingly, the majority of events are highly concentrated in a number of countries from Western Europe, likely driven by factors such as labour costs, economic stability, and regulatory conditions (Figure 1). France (FR) and Germany (DE), the two largest and most industrialized economies, show the highest frequency of relocation events, accounting for 164 and 160 large-scale events, respectively. Member States where industry traditionally represents a significant share of GVA such as Italy, Ireland, Belgium, and the Netherlands were also among the most exposed to the processes. This ranking may also be influenced by the higher number of large enterprises in some of these countries, like Germany, France and Italy (Figure B2 in Appendix B), and by the sectoral specialization. Making them more prone to large-scale restructuring events. Overall, Central and Eastern European countries appear to exhibit the lowest frequency of events, also potentially because these countries appear in the ERM dataset as they join the EU. The observation of the events across time (Figure 2) gives an idea of the likely influence of major historical events: the trend rises steeply in the period 2004-2006 and peaks again in 2008, around the time of the EU enlargement and the financial crisis.

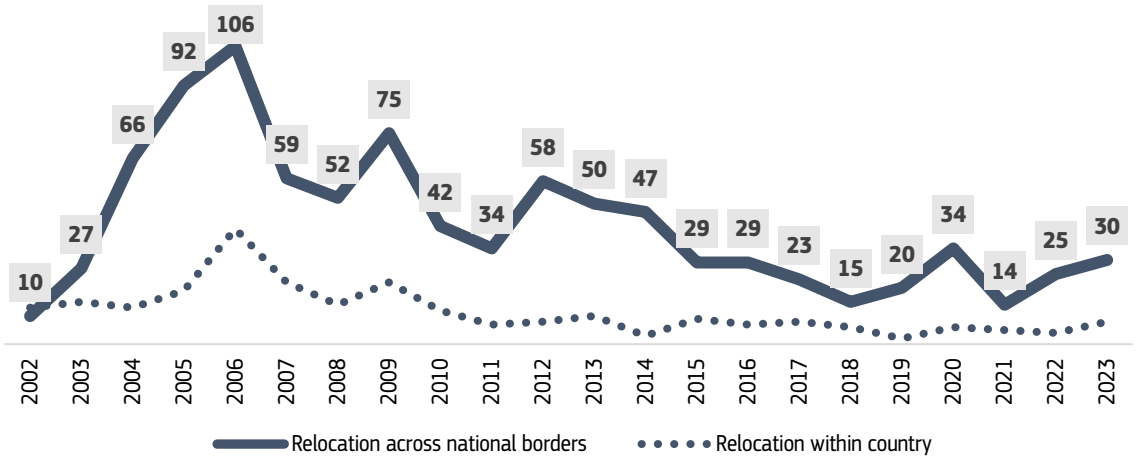
Figure 1. Number of large-scale relocation events, 2002-2023, EU27



Source: Own elaboration based on ERM dataset.

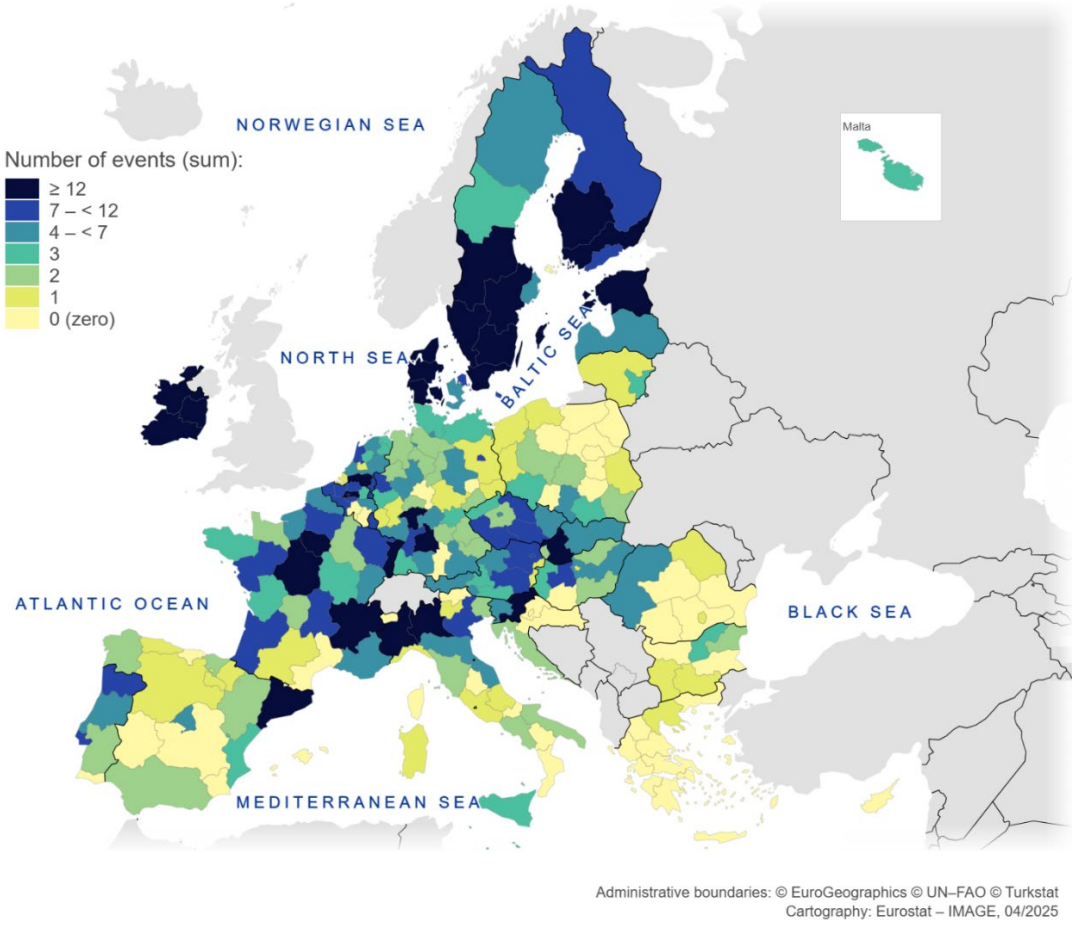
Note: Relocation events include both relocation within the country and across country borders. Countries are included in the dataset from the year they join the EU.

Figure 2. Number of large-scale relocation events by typology and year, 2002-2023, EU27



Source: Own elaboration based on ERM dataset.

Figure 3. Number of large-scale relocation events at NUTS2-level: Total, 2002-2023



Source: Own elaboration based on ERM dataset.

Figure 3 illustrates the distribution of firm relocation events across NUTS2 regions in Europe. The regions that were most exposed are essentially concentrated in North-West Europe, and to a lesser extent in Central Europe. A large number of events can be observed in historical industrial regions such as Italy's Lombardy and Piedmont, Germany's Stuttgart (Baden Württemberg) and Darmstadt (Hessen) or France's Île-de-France. Several capital or metropolitan regions, such as Brussels, Antwerp, Noord-Holland, Catalonia, Dublin, Rhone-Alpes, Berlin, Region Hovedstaden, Stockholm, were also home to high levels of firm relocation. Both in Ireland and in the Nordic countries most regions experienced a significant relocation activity. More developed regions exhibited the highest share of events, but relocation events were also numerous in transition (middle-income) ones as most of these regions are old industrial hubs (Table 2).

Table 2. Number of large-scale relocation events by region category, EU27, 2002-2023

Cohesion classification	**Relocation within/outside**		**Relocation outside**		**Relocation within**	
	Nr. Events	% Total	Nr. Events	% Total	Nr. Events	% Total
More developed	667	60%	538	62%	129	53%
Transition	300	27%	232	27%	68	28%
Less developed	151	14%	104	12%	47	19%
Total	1,118	100%	874	100%	244	100%

Source: Own elaboration based on ERM dataset.

Note: Region category refers to 2021-2027 cohesion policy classification based on GDP per capita in PPP relative to the EU average. Number of regions by category: More developed = 95, Transition = 67 and Less developed = 80.

The sectoral classification of events is also showing a very clear trend with manufacturing being by far and large the most impacted area (Table 3). The high concentration of relocation events from manufacturing in the ERM dataset could also be due to the higher propensity of large firms in manufacturing sector in the EU (see Figure B1 in Appendix B). Since the ERM data focus only on large restructuring events, this may also influence this pattern. However, the nature of some activities (e.g. agriculture, mining, water supply) also makes them less prone to relocate than manufacturing.

Table 3. Number of large-scale relocation events by economic activities, EU27, 2002-2023

Economic activities	**Freq.**	**% Total**
Manufacturing (C10-C33)	929	86%
Financial and insurance activities (K64-K66)	33	3%
Information and Communication Technology (J61-J62)	29	3%
Specialised services (M69-N82)	26	2%
Wholesale and retail trade (G45-G47)	22	2%
Transport and storage (H49-H53)	19	2%
Construction (F41-F43)	8	1%
Other economic activities	18	2%
TOTAL	**1,084**	**100%**

Source: Own elaboration based on ERM dataset.

Zooming in on the most impacted manufacturing industries, Table 4 shows that relocation events in medium-high tech activities accounts for 47% of the total events happening in the manufacturing industry. Regarding the top 10 of the most affected manufacturing activities (Table 5), the most significant share of events concern the manufacture of electrical equipment, the manufacture of motor vehicles, trailers and semi-trailers and the manufacture of computer, electronic and optical products. This shows that not just the automotive but also hi-tech activities experienced major relocation processes likely due to global supply chain dynamics and cost considerations.

Table 4. Number of large-scale relocation events in manufacturing by technology classification, EU27, 2002-2023 by economic activities

High-tech classification	**Freq.**	**% Total**
High-technology (HT)	134	14%
Medium-high-technology (MHT)	434	47%
Medium-low-technology (MLT)	111	12%
Low-technology (LT)	250	27%
Total manufacturing	**929**	**100%**

Source: Own elaboration based on ERM dataset.

Table 5. Top 10 manufacturing activities the most affected by relocation, EU27, 2002-2023

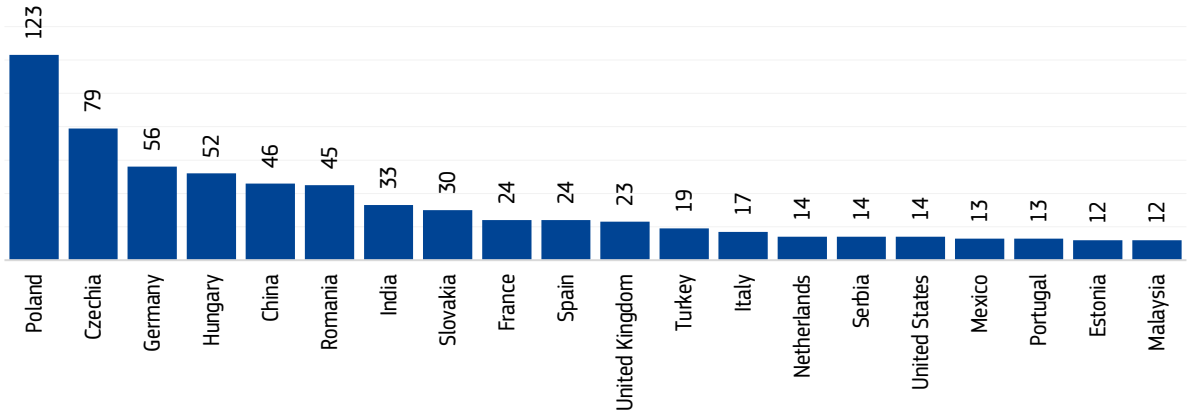
Economic activity (Manufacturing)			**Freq.**	**% Total**
C27	Manufacture of electrical equipment	(MHT)	155	17%
C29	Manufacture of motor vehicles, trailers and semi-trailers	(MHT)	140	15%
C26	Manufacture of computer, electronic and optical products	(HT)	104	11%
C28	Manufacture of machinery and equipment n.e.c.	(MHT)	78	8%
C10	Manufacture of food products	(LT)	72	8%
C20	Manufacture of chemicals and chemical products	(MHT)	42	5%
C22	Manufacture of rubber and plastic products	(MHT)	38	4%
C25	Manufacture of fabricated metal products, except machinery and equipment	(MHT)	36	4%
C13	Manufacture of textiles	(LT)	32	3%
C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	(HT)	30	3%
Total Top 10			**727**	**78%**
Total Manufacturing			**929**	**100%**

Source: Own elaboration based on ERM dataset.

Finally, it appears informative to look at the new locations of companies that have delocalise their production across the border (Figure 4). The results show a clear trend in offshoring preferences. Eastern European countries, in particular Poland and Czechia, are by far the preferred destinations.

The presence of Germany and France in the list suggests that some companies are choosing to relocate within Western Europe, perhaps to optimise operations while staying close to key larger markets. Among extra-EU countries, China and India lead but with a number of events significantly lower than the two Central and Eastern European countries. This shows, as confirmed by the statistics by continent (Figure 5), that the majority of firms which delocalisation remain in Europe (66%).

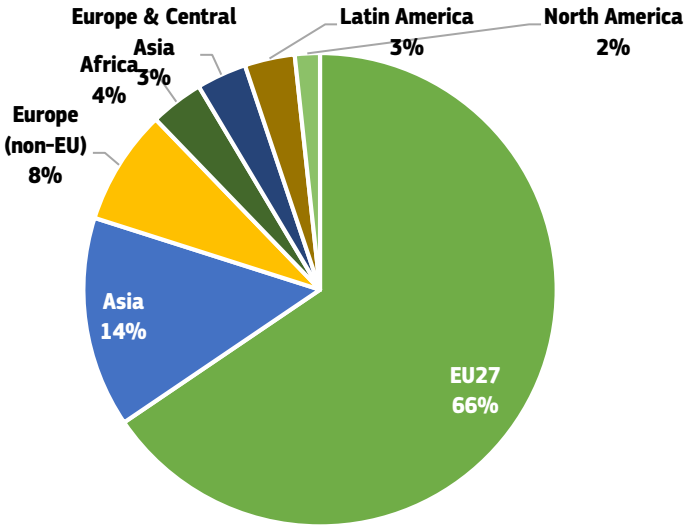
Figure 4. Top 20 destinations of businesses due to large-scale relocation events, EU27, 2002-2023



Source: Own elaboration based on ERM dataset.

Note: The list excludes destinations classified as various, which are also in the top 20. Of the 861 delocalisation events, only 79% have a description of the new location.

Figure 5. New destinations of businesses due to large-scale relocation events outside the country borders by continent, EU27, 2002-2023



Source: Own elaboration based on ERM dataset.

Note: The list excludes destinations classified as various. Of the 861 relocation outside events the country, only 79% have a description of the new location.

5.2. Main motivation for relocation: a topic modelling analysis

The analysis conducted using the topic modeling technique identifies two key themes. The first theme relates to performance factors, indicating a focus on efficiency as a driver of business migration. The second theme revolves around investment-related aspects. These findings align with the relevant literature discussed in Section 2, suggesting that the two primary themes identified are “efficiency-seeking” and “plant-related factors”[12]. The first theme emphasizes performance elements, with terms like "cut," "restructuring," and "management" pointing to efficiency as a key factor in business migration decisions. The second theme focuses more on investment considerations, with terms like “plant”, “production”, “unions”, and “dismissal” reflecting the importance of these factors.

The use of topic modeling in this research serves two purposes. First, it provides a deeper insight into the effective determinants influencing relocation decisions. Second, it helps testing the consistency of the information in the ERM dataset by ensuring alignment with the theoretical assumptions underlying this study. Overall, the results are consistent with the existing literature, and the way the announcements are made enables a robust analysis of the phenomenon.

5.3. Explaining spatial patterns of relocation

Table 4 presents the results of the Probit – columns (1) to (3) – and Poisson regression models – columns (4) to (6). The Probit model estimates the probability of a region being affected by large-scale relocation events, which includes relocation within or outside the country borders, based on a set of regional characteristics and policy measures. The dependent variable in a Probit model is a binary variable equal to 1 if the region has experienced both types of large-scale event (relocation within or outside the country borders) or one of them, and 0 otherwise. In the Poisson regression model, the dependent variable is the number of large-scale relocation events (or its split into the two typology). It estimates the expected number of occurrences of an event (e.g., how many large-scale relocation events are expected to occur in a region per year) given the values of the predictors.

All models seem to predict the data well, looking at the results of the validation test at the bottom of Table 4. The model estimates don’t suffer from bias due to multi-collinearity, based on the result of the correlation matrix, the variance inflation factor (Table C2 in Appendix C), and if we compare the results of the mono-variable regressions (Table D1 in Appendix D) with those in column (1) of Table 4.

[12] The names of the topics were obtained by employing a Large Language Model (ChatGPT) and using the most frequently occurring words (20 words for each generated topic). The resulting names are "Search for Efficiency" and "Plant-Related Reasons" respectively.

Table 6. Results Probit and Poisson regression, dependent variables: experiencing a type of event – (1) to (3) - or the number of events – (4) to (6)

Variables	Probit model			Poisson model		
	Relocation within/outside (1)	Relocation outside (2)	Relocation within (3)	Relocation within/outside (4)	Relocation outside (5)	Relocation within (6)
Concentration of population, T-1	0.0258***	0.0250***	0.00975*	0.0283***	0.0296***	0.0248*
	(0.00397)	(0.00408)	(0.00558)	(0.00452)	(0.00462)	(0.0131)
Road networks (log), Km, T-1	0.190***	0.193***	0.134***	0.342***	0.360***	0.297***
	(0.0280)	(0.0307)	(0.0340)	(0.0411)	(0.0468)	(0.0761)
Share manufacturing, T-1	2.827***	2.742***	1.783***	3.797***	3.893***	3.502***
	(0.313)	(0.327)	(0.412)	(0.405)	(0.440)	(0.743)
Labour cost per hour worked, T-1	0.0191***	0.0224***	-0.000344	0.0257***	0.0329***	0.000585
	(0.00347)	(0.00381)	(0.00454)	(0.00588)	(0.00676)	(0.00950)
Concentration of population with tertiary education, T-1	0.152*	0.0262	0.633***	0.412***	0.169	1.292***
	(0.0859)	(0.0910)	(0.119)	(0.126)	(0.138)	(0.244)
Stock ESIF (x1000) per capita, T-1	-0.0544**	-0.0390	-0.124***	-0.0937*	-0.0461	-0.267***
	(0.0264)	(0.0280)	(0.0386)	(0.0512)	(0.0569)	(0.0965)
Stock FP (x1000) per capita, T-1	0.118	0.537	-1.685*	-0.261	0.310	-3.623*
	(0.544)	(0.562)	(0.918)	(0.768)	(0.782)	(2.065)
Cum. share of State aid for Rescue & Restructuring (% GDP), T-1	-17.67**	-38.35***	7.838	-43.21**	-94.27***	18.21
	(7.772)	(12.22)	(8.821)	(17.06)	(26.53)	(19.83)
Cumulative Nr Restructuring events, T-1	0.0104***	0.0103***	0.00766***	0.0171***	0.0177***	0.0156***
	(0.00133)	(0.00139)	(0.00170)	(0.00172)	(0.00191)	(0.00319)
Time dummy	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-4.188***	-4.328***	-3.897***	-6.763***	-7.347***	-7.613***
	(0.315)	(0.345)	(0.391)	(0.483)	(0.548)	(0.845)
Observations	5,082	5,082	5,082	5,082	5,082	5,082
Wald test: joint significance (p-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.1614	0.1706	0.1199	0.1804	0.1833	0.1266
Log pseudolikelihood	-194.71	-171.51	-81.19	-264.82	-222.55	-89.07

Source: Own elaboration.
Note: Weighted regression using the inverse square of the country World Press Freedom Index as a weight. Robust standard errors in parentheses.
Significance level: *** p<0.01, ** p<0.05, * p<0.1.

The results in Table 4 reveals that in all the model specifications (binary and count data models, as well as for all event typologies), there is a positive relationship between population concentration and the likelihood of being affected by relocation events or of experiencing a higher frequency of these events. This may seem counterintuitive given the typical benefits of agglomeration economies (Glaeser and Kerr, 2009), but in line with An et al. (2014) who showed a trend of manufacturing firms (which correspond to more than 85% of our database) to move from cities to suburbs. In the context of the present study several factors may explain why businesses might migrate to another region within the country or across the border. Firstly, capital and metropolitan areas are also home to a higher concentration of firms, which explains, in relative terms, why they are the most impacted. Secondly, in advanced economies there is a long-standing trend of manufacturing firms migrating away from large cities while in many instances metropolitan areas have increasingly attracted knowledge-intensive companies (Moretti, 2013).

Let's recall that the results of topic modelling analysis demonstrated that efficiency and competitiveness are the main reasons justifying company's decision to relocate their activities, so our findings can be explained by high costs and real estate constraints in high densely populated regions. For example, dense regions often have higher operating costs, including rent, labor, and utilities). These costs may lead businesses in densely populated areas to move to less congested regions to reduce overhead costs. In addition, real estate in densely populated areas might be limited and expensive (De Bok and Sanders, 2005), making it difficult for businesses to expand or operate efficiently. Relocating to less dense areas can provide more space and flexibility.

To reinforce previous findings, and to justify why companies move from more densely populated regions, related to agglomerations economies, the results in Table 4 also show evidence that road networks are positively associated with business relocation in all the models (Probit and Poisson models), and for both types of events. Indeed, improved transport infrastructure facilitates business operations, but it could also increase the mobility of firms, leading to more frequent business migration events in well-connected regions as it might make it easier and less costly to reach the markets anyway (Puga, 1999).

The previous argument is also supported by the positive relationship between regional labour costs (or the high skill level of the population) and business relocation. Wages and salaries of workers are often correlated with the education level, higher levels of skilled workers tend to have a general on wages (Echeverri-Carroll and Ayala, 2009). Therefore, if the main reason for large companies (included in the ERM dataset) to move is related to cost efficiency, there are strong arguments to justify these findings. However, when analyzing the behavioral differences between the two types of relocation, that is, intra-country and extra-country migration, we find unsurprisingly that labor costs are more of an issue for the latter than for the former. Indeed, labor cost vary less within a country than between countries, which may explain why there is no significant relationship between labor cost and domestic relocation events. On the contrary, the skills of the population are only a significant explanatory variable for relocation within the same country, perhaps because the decision to relocate is driven by the advantage of other factors, such business eco-systems for their specific industry or economic incentives. For example, companies may relocate to take advantage of better supply chain logistics, industry-specific infrastructure, or to be closer to key partners. On the other hand, companies may relocate to take advantage of financial benefits such as grants, even if this means moving away from a highly educated workforce.

This last argument is also supported by the negative correlation between relocation events and the public support availability in the region or the ability of the region to attract competitive R&I funds,

in both Probit and Poisson regressions. Indeed this shows that the likelihood of relocation or the rate of relocation events within the same country decrease with the higher availability of EU funds. Nevertheless, these variables (ESIF and FP) are not significant explanatory variables of relocation outside the country. Conversely, a higher intensity of state aid for rescue and restructuring in a country is associated with a lower probability of relocation or fewer relocation events outside the country. In contrast, there is no significant relationship between state aid and relocation events within the same country. This difference may be explained by the different nature of public support as well as the different nature of the business relocation. For example, state aid may influences the likelihood of firm migration abroad which is also more costly than a relocation, by providing specific financial incentives that could potentially mitigate or delay further restructuring events as firms receive support to stabilize, whereas EU funds may not have a significant effect due to their broader and less targeted nature.

Finally, our analysis shows that the sectoral composition of a region is an important driver of large-scale relocation events. Regions with a high concentration of manufacturing industries are particularly vulnerable to these events and tend to experience a higher frequency of such relocations, consistent with previous findings in the literature on industrial transition and economic geography (see e.g., Tomaney and Pike, 2018,). The capital-intensive and often global nature of the manufacturing sector makes these regions more vulnerable to competitive pressures and offshoring, which often drive relocation decisions. In addition, regions with a history of restructuring events that have had a negative impact on employment are more likely to face subsequent relocation, confirming previous research (Brouwer et al., 2004). Regions that are constantly subject to large-scale restructuring events may be also be symptomatic of industrial change and sectoral shifts. Additionally, regions that have historically relied on declining industries (e.g., traditional manufacturing or heavy industry) may face additional delocalization as these sectors undergo transition or are replaced by emerging industries elsewhere (Hassink, 2010). These industries often face international competition, leading to offshoring and relocation as firms seek lower production costs or more favorable regulatory environments (Gereffi and Fernandez-Stark, 2011).

To complement this analysis and to examine whether different categories of regions within the 2021-2027 cohesion policy classification (more developed, transition and less developed regions) behave differently, we re-estimate equation (1), replacing the variables for ESIF and FP stocks with dummy variables for “more developed” and “transition” regions, using “less developed” regions as the reference category (see Table E1 in Appendix E). Since the allocation of funds is highly correlated with the category of region – payments form European Structural and Investment funds are inversely proportional to the level of development of the region – including both in the regression would bias the regression results. In the case of FP funds, although there is no explicit regional allocation, they are highly concentrated in more developed regions, as shown by Molica and Marques Santos (2024). For both reasons, both stocks are removed from this second estimation. The results in Table E1 in Appendix E indicate that the number of relocation events increases when the region affected is classified as more developed or in transition, compared to less developed regions. There are several possible reasons for this finding. First, more developed regions tend to have a higher concentration of large multinational corporations, which are more likely to engage in cross-border activities and relocate to optimize costs or access new markets, as showed by Sleuwaegen and Pennings (2006). Second, and related to the comment on results above, the cost of doing business, including labor and real estate, is typically higher in more developed regions than in less developed areas. Thirdly, transition regions, which are in the process of economic modernization or industrial

transition, may experience similar pressures as they undergo shifts from lower-cost to higher-cost business environments.

6. Conclusion

The present study provides new insights into the spatial distribution of large-scale relocation events, distinguishing between intra-national and international relocation within the European Union. By leveraging data from the Eurofound's European Restructuring Monitor (ERM) and combining it with regional characteristics and EU funding information, we identify factors explaining the likelihood and frequency of these business migration events.

Our findings suggest that densely populated regions, while typically benefiting from agglomeration economies, may be more prone to relocation due to factors such as higher operating costs (e.g., rent and labor) and limited space for expansion.

Additionally, improved transport infrastructure in well-connected regions appears to facilitate increased business mobility, with labor costs and population skills emerging as significant drivers of overall relocation. Notably, cross-border movements are more sensitive to wage differentials than intra-national ones, highlighting the role of economic factors in driving international business delocalisation.

Public support plays a nuanced role in our findings. While the availability of EU funds reduce the likelihood of intra-national relocation events, their capacity to explain international relocation is less pronounced. Conversely, State aid targeted at restructuring seems to be correlated with lower likelihood and frequency of international relocation, suggesting that tailored financial support is crucial for addressing the challenges posed by globalization and industrial shifts.

Sectoral composition is another important determinant, with regions heavily reliant on manufacturing facing higher risks of both intra-national and international relocation, potentially driven by competitive pressures and internationalization trends. Regions historically impacted by restructuring events also appear more likely to experience recurrent migration episodes, reflecting the long-term vulnerabilities of certain industrial sectors.

Our results also indicate that more developed and transition regions are more susceptible to business migration compared to less developed regions. This highlights the importance of continued policy efforts to address regional disparities and support industrial transitions in vulnerable areas.

In conclusion, while our study highlights several key drivers of business relocation, we recognize the complexity of these factors and suggest that future research could further explore the long-term socio-economic impacts of these events and assess the effectiveness of policy interventions in enhancing regional resilience in face of business migration. Indeed, even if this paper provides new insights into the spatial patterns associated with large-scale company relocations in the European Union, the findings should not be interpreted as causal effects but rather as correlations.

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Annex A. Main findings in scientific literature about the determinants of firms' delocalisation, delocation or offshoring

Table A1. Summary of main findings in scientific literature about the determinants of firms' delocalisation, delocation or offshoring

Author(s)	Scope	Variables and econometric model	Main findings
Pennings and Sleuwaegen (2000)	• Belgium • 1990-1996 • Firm-level analysis	• Logit model • Dependent variable: probability to relocate • Explanatory variables - Firm size - Ratio of fixed capital to the number of employees - Ratio of the sunk tangible assets (plant, machinery and equipment) to the total tangible assets - Profit to sales ratio - Value added to sales ratio - Rate of innovation (introduction of combined product and process innovation) - Belonging to a multinational group - Competition pressure	• Labour intensive firms with a low capital to labour ratio are more likely to relocate activities (cost-minimizing) • Innovative and large firms, as well as, belonging to a group are more likely to delocalise • Sales instability as measure of uncertainty also reduce the probability to delocalise
van Dijk and Pellenbarg (2000)	• The Netherlands • 1995-1997 • Firm-level analysis (survey)	• Ordered logit • Dependent variable: probability of firm to move (categorical variable) • Explanatory variables: - Firm internal factors (sector, size and previous delocation behaviour - Location factors (site and situation) - Firm external factors (regions dummy and government policy)	• Decision to relocate is primarily influenced by internal factors within the firm, with site-related factors playing a secondary role • Firms' opinion about government policy is not a relevant and significant factor influencing the decision to relocate
Brouwer et al. (2004)	• Europe • 1997-1999 • Firm-level (survey)	• Logit model • Dependent variable: probability to relocate • Explanatory variables: - Age, size (number of employees) and sector - Size of market - Type of organization - Past performance (increase/decrease in the number of employees) - Past restructuring (firm has been involved in acquisition or merger or if it has been taken over)	• Firms that have undergone changes like acquisitions, mergers, take-overs, or increases in employee numbers are more inclined to relocate • Younger firms and operating in internal market are more willing to relocate
Holl (2004)	• Portugal • 1986-1997 • Manufacturing • Regional analysis (municipality-level data)	• Poisson and negative binomial fixed-effects model • Dependent variable: Number of plants relocations • Explanatory variables: - Market size (population) - Market access (motorway access) - Agglomeration economies (concentration of manufacturing and services producer)	• Relocations show a greater preference for areas with better market accessibility • Attractiveness of areas for relocations is positively related to the access of inter-regional motorways and the availability of qualified labour force • Labour cost is not a significant determinant explaining relocation

		- Factor cost and labour market (labor force cost, qualification and skills diversification - HHI)	

(Continued on the next page)

Table A1. Summary of main findings in scientific literature about the determinants of firms' delocalisation, delocation or offshoring (Continuation)

Author(s)	Scope	Variables and econometric model	Main findings
Sleuwaegen and Pennings (2006)	• Belgium • 1990-1999 • Firm-level analysis	• Nested logit model • Dependent variable: decision to relocate part of the firm's activity in another country • Explanatory variables: - Economic activity - Size (value added) - Multinational - Fixed capital to labor ratio - Profitability - Relocation in adjacent country - Public aid (fiscal incentives or local arrangements)	• Less profitable and labor-intensive firms have a higher probability to relocate for competitive advantage • Firms belonging to a multinational group are more inclined to relocate • Public aid is only a decisive factor if firm relocate to an adjacent region
Kronenberg (2012)	• The Netherlands • 2002-2004 • Firm-level analysis	• Two-stage nested logit model • Dependent variable: decision whether to relocate or not, relocate • Explanatory variables: - Firm's characteristics: age, size, change in employment number and average salary - Municipality's characteristics: population density, distance to the central cities, attractiveness, specialisation in the firm's sector, sectorial concentration, overall average salary and firm's sector average salary	• There are different factors explaining firm relocation depending in the economic sector: manufacturing versus service, and high-tech/knowledge-intensive and low-tech/less knowledge-intensive firms. • Less knowledge-intensive manufacturing and service firms paying high average salaries have an higher likelihood to relocate their production, whereas high-tech manufacturing and knowledge-intensive service firms are usually not affected by labour costs
Lampón (2020)	• Spain • Automobile industry • 2003-2012 • Firm-level analysis • Multinational Enterprise (MNE)	• Logistic regression • Dependent variable: likelihood to delocalise • Explanatory variables: - Relocation costs - Labour intensity - Corporate restructuring - Operational flexibility - Foreign ownership - Plant age	• Moving/sunk costs and firm's age negatively influence the probability to delocalise • Labour-intensive firms are more likely to delocate their production due to pressure to relocate their production to low-cost labour locations • Probability to delocate is positive associated with plant's foreign ownership, the number of plants owned by the firm located in other countries that produce the same product as the plant and the number of plants of the MNE involved in restructuring

Source: Own elaboration based on the cited studies.

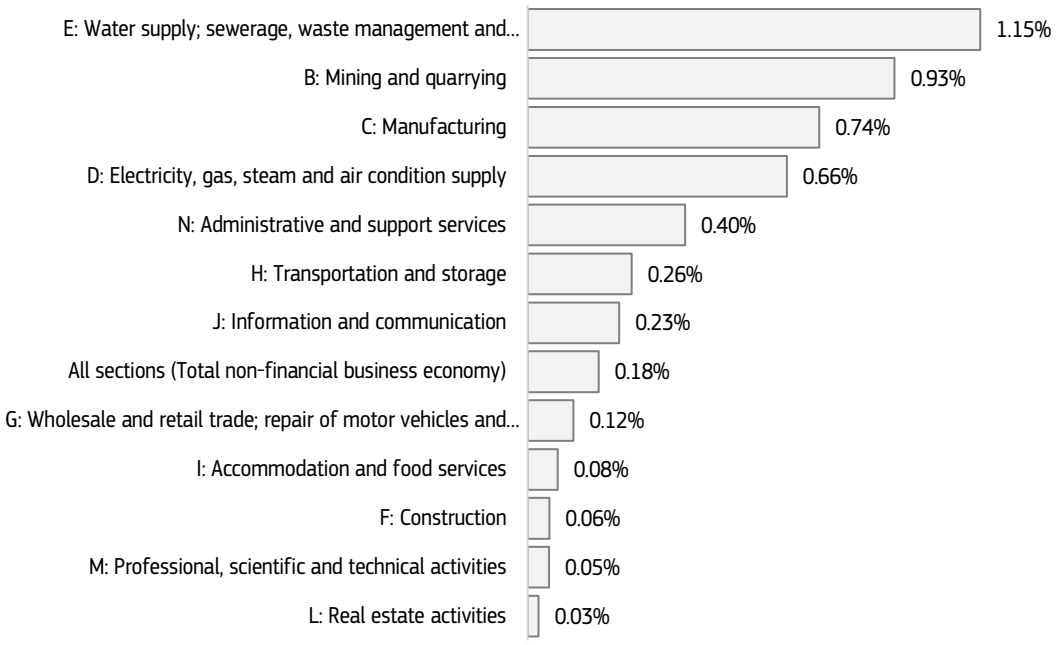
Appendix B. ERM dataset: description of restructuring events and assessing potential "dataset bias"

Table B1. Types of restructuring in the ERM database

Type of events	Description of the events
Internal restructuring	When the company undertakes a job-cutting plan, which is not linked to another type of restructuring defined below
Closure	When a company or an industrial site is closed for economic reasons not directly connected to relocation or outsourcing
Bankruptcy	When a company goes bankrupt for economic reasons not directly connected to relocation or outsourcing
Relocation	When the activity stays within the same company, but is relocated within the same country
Offshoring / delocalisation	When the activity is relocated or outsourced outside the country's borders
Outsourcing	When the activity is subcontracted to another company in the same country
Merger / acquisition	When two companies merge or when an acquisition involves an internal restructuring programme aimed at rationalising an organisation by reducing personnel
Business expansion	Where a company extends its business activities, and hires new workers. This type of restructuring has been introduced to the ERM database in order to report the positive impact of certain restructuring processes on employment, thus conveying that restructuring is not only, or not necessarily, about job cuts.

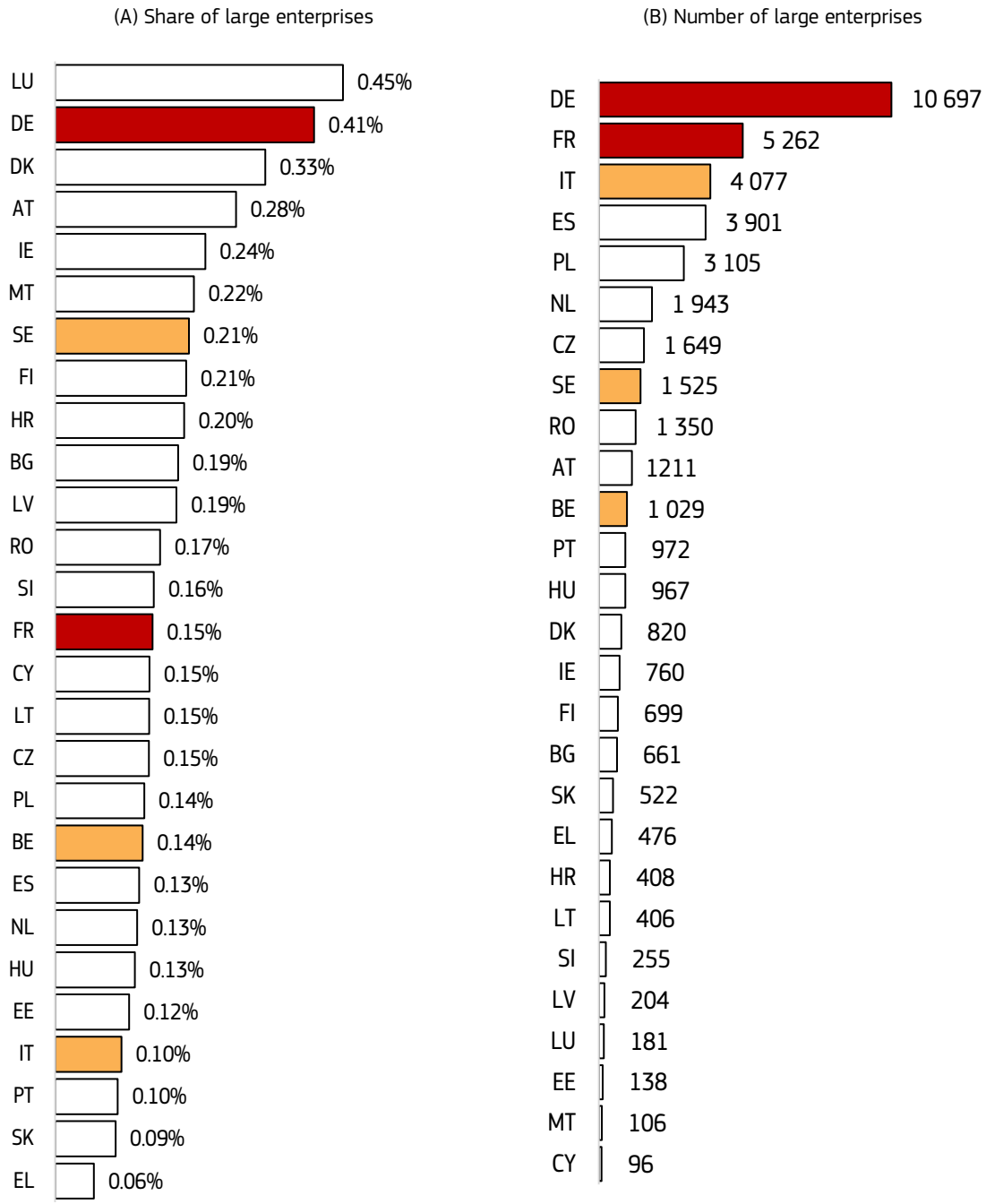
Source: Eurofound (2013:9).

Figure B1. Share of large enterprises (250 + employees), EU27, mean 2008-2024



Source: European Commission (2024). SME Performance Review 2024

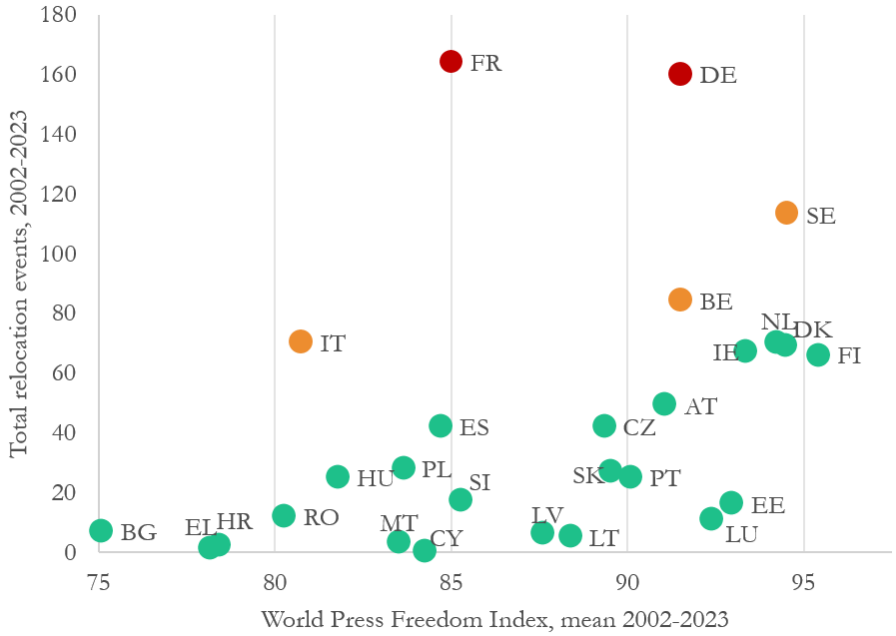
Figure B2. Share and number of large enterprises, EU27, 2024



Source: European Commission (2024). SME Performance Review 2024

Note: Countries in red and orange are the five op countries the most affected by large-scale relocation events in the ERM dataset.

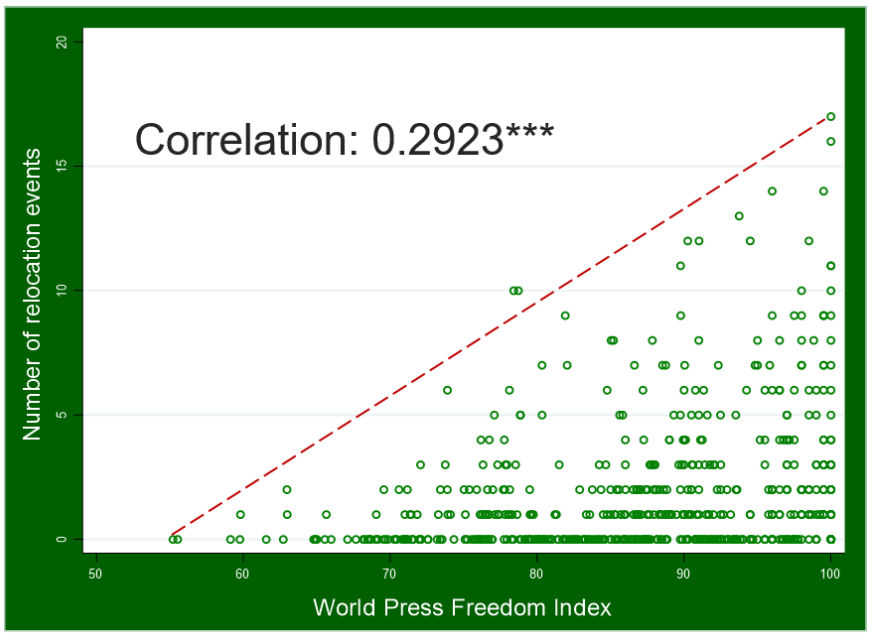
Figure B3. Number of relocation events *versus* World press freedom index by country, 2002-2023



Source: Own elaboration based on ERM data and Reporters without a borders webpage

Note: Countries in red and orange are the five top countries the most affected by large-scale relocation events in the ERM dataset.

Figure B4. Twoway scatterplot number of relocation events and World press freedom index, EU27, 2002-2023



Source: Own elaboration based on ERM data and Reporters without a borders webpage

Appendix C. Descriptive statistics and multi-collinearity diagnostic

Table C1. Descriptive statistics: mean, standard deviation, minimum and maximum

Variable	Mean	SD	Min	Max
Being affected by a large-scale relocation event (Y/N)	0.15	0.36	0	1
Number of large-scale relocation events	0.22	0.60	0	7
Being affected by a large-scale international relocation event (Y/N)	0.13	0.33	0	1
Number of large-scale international relocation events	0.17	0.51	0	6
Being affected by a large-scale intra-national relocation event (Y/N)	0.04	0.20	0	1
Number of large-scale intra-national relocation event	0.05	0.23	0	3
Concentration of population (POP)	3.16	7.51	0.02	72.36
Road networks (log), (ROAD)	9.06	1.37	0	11.54
Share manufacturing (MANUF)	0.17	0.08	0.01	0.68
Labour cost (COST)	20.79	10.53	2.2	47.2
Concentration of population with tertiary education (EDUC)	1.00	0.35	0.24	2.31
Stock ESIF (x1000) per capita (ESIF)	1.21	1.51	0	11.02
Stock FP (x1000) per capita (FP)	0.04	0.06	0	0.64
Cum. share of State aid for Rescue & Restruct., % GDP (AID)	0.00	0.00	0	0.03
Cum. nr. other typology of restructuring events (PAST)	17.41	21.69	0	155

Source: Own elaboration.

Note: Number of observations 5.082. SD = standard deviation.

Table C2. Correlation matrix and Variance Inflation Factors (VIF)

#	Variables	VIF	Correlation matrix								
			1	2	3	4	5	6	7	8	9
1	POP	1.61	1								
2	ROAD	1.62	-0.47	1							
3	MANUF	1.25	-0.27	0.27	1						
4	COST	2.17	0.16	0.00	-0.14	1					
5	EDUC	1.50	0.24	0.03	-0.12	0.42	1				
6	ESIF	1.58	-0.04	-0.07	-0.14	-0.51	-0.23	1			
7	FP	1.69	0.36	-0.05	-0.11	0.39	0.49	-0.17	1		
8	AID	1.35	-0.05	0.10	0.19	-0.44	-0.22	0.10	-0.13	1	
9	PAST	1.45	0.04	0.34	0.15	0.16	0.22	0.00	0.36	0.06	1
	Mean VIF	1.58									

Source: Own elaboration.

Note: Number of observations 5.082.

Appendix D. Robustness test

Table D1. Results mono-regression, Probit model regression model: Being affected by a relocation event

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Concentration of population, T-1	0.0104***	-	-	-	-	-	-	-	-
	(0.00245)	-	-	-	-	-	-	-	-
Road networks (log), Km, T-1	-	0.181***	-	-	-	-	-	-	-
	-	(0.0215)	-	-	-	-	-	-	-
Share manufacturing, T-1	-	-	2.053***	-	-	-	-	-	-
	-	-	(0.235)	-	-	-	-	-	-
Labour cost per hour worked, T-1	-	-	-	0.0263***	-	-	-	-	-
	-	-	-	(0.00221)	-	-	-	-	-
Conc. of pop. tertiary educ., T-1	-	-	-	-	0.599***	-	-	-	-
	-	-	-	-	(0.0596)	-	-	-	-
Stock ESIF (x1000) per capita, T-1	-	-	-	-	-	-0.228***	-	-	-
	-	-	-	-	-	(0.0218)	-	-	-
Stock FP (x1000) per capita, T-1	-	-	-	-	-	-	1.995***	-	-
	-	-	-	-	-	-	(0.325)	-	-
Cum. share of State aid for	-	-	-	-	-	-	-	-30.33***	-
Rescue & Restruct. (% GDP), T-1	-	-	-	-	-	-	-	(6.547)	-
Cum. Nr Restructuring events, T-1	-	-	-	-	-	-	-	-	0.00874***
	-	-	-	-	-	-	-	-	(0.000875)
Time dummy	No	No	No	No	No	No	No	No	No
Constant	-1.072***	-2.705***	-1.409***	-1.618***	-1.655***	-0.809***	-1.121***	-0.999***	-1.209***
	(0.0230)	(0.202)	(0.0480)	(0.0554)	(0.0663)	(0.0280)	(0.0255)	(0.0223)	(0.0273)
Observations	5,082	5,082	5,082	5,082	5,082	5,082	5,082	5,082	5,082

Source: Own elaboration.

Note: Weighted regression using the inverse square of the country World Press Freedom Index as a weight. Robust standard errors in parentheses. Significance level: *** p<0.01, ** p<0.05, * p<0.1.

Table D2. Results of logit regression model, dependent variable: being affected by a relocation event by typology

Variables	Relocation within/outside (1)	Relocation outside (2)	Relocation within (3)
Concentration of population, T-1	0.0461***	0.0451***	0.0210*
	(0.00724)	(0.00746)	(0.0121)
Road networks (log), Km, T-1	0.365***	0.387***	0.292***
	(0.0515)	(0.0580)	(0.0743)
Share manufacturing, T-1	5.101***	4.991***	3.762***
	(0.594)	(0.637)	(0.853)
Labour cost per hour worked, T-1	0.0333***	0.0392***	0.000762
	(0.00638)	(0.00716)	(0.00986)
Concentration of pop. with tertiary education, T-1	0.284*	0.0668	1.394***
	(0.156)	(0.170)	(0.253)
Stock ESIF (x1000) per capita, T-1	-0.122**	-0.0933*	-0.290***
	(0.0505)	(0.0550)	(0.0912)
Stock FP (x1000) per capita, T-1	0.119	0.864	-3.871*
	(1.015)	(1.065)	(2.133)
Cumulative share of State aid for Rescue & Restructuring (% GDP), T-1	-36.62**	-87.55***	20.31
	(16.13)	(27.66)	(19.78)
Cumulative Nr Restructuring events, T-1	0.0183***	0.0185***	0.0169***
	(0.00237)	(0.00251)	(0.00349)
Time dummy	Yes	Yes	Yes
Constant	-7.579***	-8.025***	-7.871***
	(0.585)	(0.653)	(0.872)
Observations	5,082	5,082	5,082
Wald test: joint significance (p-value)	0.0000	0.0000	0.0000
Pseudo R2	0.1609	0.1701	0.1218
Log pseudolikelihood	-194.81	-171.61	-81.01

Source: Own elaboration

Note: Weighted regression using the inverse square of the country World Press Freedom Index as a weight. Robust standard errors in parentheses. Significance level: *** p<0.01, ** p<0.05, * p<0.1

Figure D1. Probit: ROC curve

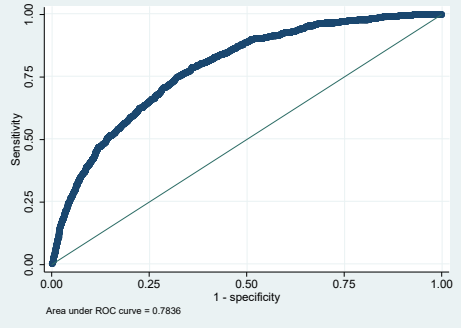


Figure D2. Logit: ROC curve

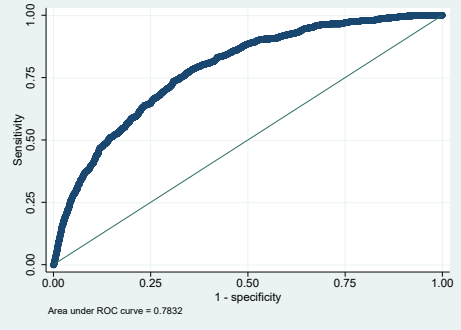


Table D3. Negative binomial regression, dependent variable: number of relocation events by typology

Variables	Relocation within/outside (1)	Relocation outside (2)	Relocation within (3)
Concentration of population, T-1	0.0316***	0.0318***	0.0254**
	(0.00488)	(0.00503)	(0.0126)
Road networks (log), Km, T-1	0.333***	0.352***	0.295***
	(0.0432)	(0.0499)	(0.0739)
Share manufacturing, T-1	4.430***	4.603***	3.533***
	(0.475)	(0.537)	(0.754)
Labour cost per hour worked, T-1	0.0263***	0.0345***	-0.00111
	(0.00596)	(0.00677)	(0.00976)
Concentration of pop. with tertiary education, T-1	0.373***	0.144	1.274***
	(0.127)	(0.137)	(0.251)
Stock ESIF (x1000) per capita, T-1	-0.111**	-0.0612	-0.269***
	(0.0465)	(0.0507)	(0.0962)
Stock FP (x1000) per capita, T-1	0.0632	0.662	-3.565*
	(0.766)	(0.796)	(1.999)
Cum. share of State aid for Rescue & Restruct. (% GDP), T-1	-41.95**	-93.83***	16.16
	(16.56)	(27.04)	(19.54)
Cumulative Nr Restructuring events, T-1	0.0185***	0.0191***	0.0157***
	(0.00189)	(0.00209)	(0.00327)
Time dummy	Yes	Yes	Yes
Log (alpha)	-0.116	-0.147	-0.0904
	(0.138)	(0.157)	(0.538)
Constant	-6.831***	-7.462***	-7.555***
	(0.505)	(0.580)	(0.831)
Observations	5,082	5,082	5,082
Wald test: joint significance (p-value)	0.0000	0.0000	0.0000
Pseudo R2	0.1379	0.1487	0.1133
Log pseudolikelihood	-258.90	-218.52	-88.69

Source: Own elaboration

Note: Weighted regression using the inverse square of the country World Press Freedom Index as a weight. Robust standard errors in parentheses. Significance level: *** p<0.01, ** p<0.05, * p<0.1

Appendix E. Complementarity analysis by region categories

Table E2. Result Poisson regression model, dependent variables: number of large-scale relocation events by typology

Variables	Relocation within/outside (1)	Relocation outside (2)	Relocation within (3)
More developed region (Y/N)	0.604***	0.698***	0.162
	(0.147)	(0.168)	(0.269)
Transition region (Y/N)	0.282**	0.318*	0.0798
	(0.143)	(0.163)	(0.258)
Control variables	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes
Constant	Yes	Yes	Yes
Observations	5,082	5,082	5,082
Wald test: joint significance (p-value)	0.0000	0.0000	0.0000
Pseudo R2	0.1837	0.1883	0.1204
Log pseudolikelihood	-263.76	-221.18	-89.71

Source: Own elaboration

Note: Weighted regression using the inverse square of the country World Press Freedom Index as a weight. Robust standard errors in parentheses. Significance level: *** p<0.01, ** p<0.05, * p<0.1. Reference category for More developed and transition regions is less developed regions.

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