Foreign Direct Investments as Alliances. An Application of Network Analysis to the European Integration Project in the 2000-2010 Decade

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Abstract

Foreign direct investment (FDI) is a cross-border investment through which an entity in one country exercises lasting control over a firm in another. Each investment forms a dyad, but once an FDI is established, the ultimate controlling parent faces choices for further expansion: it can invest directly or through one of its affiliates. Consequently, the realization of FDIs often takes the form of networks of subsidiaries and affiliates linked to an ultimate controlling parent. We consider this network of FDIs as the outcome of alliances. In the first part of the paper, we provide a definition of alliance to encompass any FDI, regardless of the mode of entry of a firm in a foreign market and its motive for investment. In the second part of the paper, we apply social networks to investigate the change in the network of FDIs in Europe in the 2000-2010 decade. We identify which European countries occupy key positions in the network and explore how the European integration process during that period began to shape it. Furthermore, we examine how firm location – whether in an EU15 member state or a country from the Eastern Enlargement – affected FDI formation by modelling homophily using an exponential random graph model. Due to data availability for constructing the network of affiliated firms, our analysis focuses on Japanese investments in Europe.

1. Introduction

Foreign direct investment (FDI) is defined by the Organisation for Economic Co-Operation and Development (OECD, 2008, p. 22) as

> "a category of cross-border investment made by a resident entity in one economy (the direct investor) with the objective of establishing a lasting interest in an enterprise (the direct investment enterprise) that is resident in an economy other than that of the direct investor."

The term "lasting interest" implies the existence of a long-term relationship between the direct investor and the direct investment enterprise and a significant degree of influence on the management of the enterprise (OECD, 2008, p. 48). We consider this relationship as an alliance. Before providing our definition of alliance to encompass FDI regardless of the mode of entry of a firm in a foreign market and its motive, we briefly review the concept of alliance from literature.

The strategy and international business literature (Thorelli, 1986; Gulati, 1995, 1998; Gulati and Gargiulo, 1999; Bouncken and Fredrich, 2016; Choi, Kim, Kim, 2022; Watts and Koput, 2019) has been employing networks to study strategic alliances. Gulati (1998) defines strategic alliances as

> "voluntary arrangements between firms involving exchange, sharing, or codevelopment of products, technologies, or services. They can occur as a result of a wide range of motives and goals, take a variety of forms, and occur across vertical and horizontal boundaries."

Thorelli (1986) discusses the factors affecting the position of a firms in a network and the links, that is the interaction between the positions. The social network, within which most firms are embedded in, shapes the strategic alliances (Gulati, 1998). Furthermore, the literature provides other definitions of strategic alliances based on a theoretical background or a specific context. For example, Eisenhardt and Schoonhoven (1996) provide a resource-based view of strategic alliances as "cooperative relationships driven by a logic of strategic needs and social resources opportunities", while in marketing strategic alliances are defined as "formal agreements between two or more firms that focus on downstream value chain activities" (Watts and Koput, 2019).

Investments in a foreign market can take different modes, including joint ventures (JVs), mergers and acquisitions (M&As), or greenfield investments. A JV consists in an establishment of a new business entity through an arrangement between the business partners. M&As involve a consolidation of assets where, in the case of a merger two companies are merged in a single entity, while in the case of acquisition one company takes over the target company. Greenfield investments consist in establishing a new business entity in a foreign country from scratch. Thus, only in the case of JVs, and partially in the case of a merger, we could detect a voluntary and

cooperative behaviour identifying an alliance between firms. Indeed, literature tends to limit alliances, whether equity or nonequity-based, to cases where firms cooperate while maintaining their identity and ownership. Consequently, it distinguishes them from acquisition where a firm acquires ownership and control of the target firm (Tseng and Koy, 2024). For example, the case of greenfield investment may seem excluded from the concept of alliance. In fact, with whom would the alliance be formed if the company does not have a partner? Consequently, we need a broader definition of alliances to include all the types of entry modes in a foreign market. We employ the following definition of alliances

> Agreement between two or more parties to cooperate for a positive amount of time to achieve a desired goal, which does not need to be shared or unique.

In Section 2, we provide a conceptualization of this definition which allows us to describe FDI as networks of alliances. If we regard each FDI as dyadic, we omit the structural complexities due to the possibility to extend the network through FDI (i.e. new alliances). By deciding to expand its network, the ultimate controlling parent may assess the opportunity to invest in the same country where it is already present or in another country, directly or leveraging on its current investments. Therefore, investment decision can be conditioned on the structure of the network. Furthermore, by extending the network across the borders of different countries, each firm in the network may have a specific status given by the presence in a particular country.

We employ these concepts to observe how the network of foreign direct investments in Europe has changed in the 2000-2010. The 2000–2010 decade marked a pivotal period for European integration, with the euro introduction and the Eastern Enlargement as main events.

Since the amount of detailed information needed to construct a network which is consistent through the years is remarkable, we limit our analysis to Japanese investments in Europe in the 2000-2010 decade since we can retrieve the necessary information from the Toyo Keizai's Overseas Japanese Companies database. We emphasize that we analyse Japanese investments in Europe not only as the establishment of an affiliate/subsidiary in one of the European countries, but also as the realization of a group of firms sharing a common ownership across different European countries. Therefore, the *galaxy* of Japanese affiliates spreading across Europe is the social group under investigation in this analysis. [1]

Specifically, our focus centres on exploring how Japanese investors integrated their European investments to leverage the opportunities arising from the Eastern enlargement. Japanese investors could decide to establish the new investment in Eastern Europe directly or through one of its affiliates mainly present in Western Europe. Furthermore, once an investment is established in Eastern Europe, it could serve as the basis for further linkages to new investments across Europe. We hypothesise that such linkages are more likely to occur within the Eastern

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[1] In the rest of the article, we will use the terms subsidiary and affiliates interchangeably.

European region rather than extending to Western Europe, reflecting the differing status of firms in these two regions during the period in question.

The rest of the paper is organized as follows. Section 2 explores our definition of alliance and how it applies to network analysis. Section 3 provides a concise overview of the European integration project during the 2000-2010 decade, while Section 4 examines Japanese investments in Europe in brief. Section 5 describes the Toyo Keizai's Overseas Japanese Companies database. Section 6 presents the results of the network analysis. Section 7 concludes.

2. Conceptualization of alliance

In this section, we identify and outline the key components of our definition of alliance.

1) **Agreement**: Agreement refers to any implicit or explicit voluntary arrangement agreed by two or more parties. The meaning of implicit agreement will be explained with an example when we define the parties to the agreement in 2).

2) **Parties**: We employ the term parties, and not firms or entities, to emphasize the variegated nature of the potential subjects to the agreement. For example, the definition accounts for a standard case of two firms (the parties) deciding to form a joint venture (the agreement). However, we must account that a firm may establish or extend its existing network through acquisitions or greenfield investments. Let's consider first the case of an acquisition. A firm acquires the ownership and control of a target firm. Therefore, what would the agreement be in this case? And between which parties? Let's start from the second concept. The parties can be the acquiring firm and the management of the acquired firm. The firm entering a foreign market through acquisition may rely on the existing management because of its specific knowledge of the market. Therefore, in this case the agreement is the manifestation of the willingness of the two parties to cooperate (we will return to this example below). On the other hand, in the case of a greenfield investment there is not an existing management or employees to work with. However, in this case as well parties to an agreement can be identified. From one side, we have the investing firm, and from the other side we have the government of the country welcoming the investment. The nature of the agreement and the commitment of the parties can be affected by the different motives of the FDI. For example, Dunning (1998) identifies four main motives for FDI: resource-seeking, market-seeking, efficiency-seeking, and strategic asset-seeking. For instance, in the case of efficiency seeking, the investor can extend its network to a country with low labour cost committing to increase employment and/or share the state of art in the beneficiary country while the government can commit itself, for example, to improve its infrastructure, to liberalize its market, or to join a larger free market. Generally, the government of the country which is one party to the agreement represents the territory and its community where the investment is established. However, the local community may have a different opinion on the investment. If it considers that the investment may harm its territory – the case of an investment which can negatively impact on the environment can help to frame this example – it may openly oppose it. In such a case, will the foreign firm go ahead with its investment project given that it has the approval of the government, or will the foreign firm suspend it because of the implications to operate in a territory which opposes it? Consequently, we consider that an investment which is

realized in a territory is also the outcome of an implicit agreement between the firm and the local community.

3) **Temporal length**: We refer to a positive amount of time to emphasize that it can range from just one-period (which could be measured in minutes, hours, days, years etc.) to an infinite amount of time, meaning that the alliance continues perpetually. Naturally, the duration of the alliance also depends on the costs incurred by the parties. If we consider the standard case of a joint venture between two firms, there are relevant costs including the partner search cost or the legal cost which may commit the firms to the alliance for a relevant time. Let's continue the example illustrated earlier of a cross-border acquisition. The existing management decided to continue to cooperate. However, the duration can be very short because the cost borne by the existing management can be extremely low if they can immediately find a new position outside the acquired company. This example leads also to the fact that *a*) the amount of time can be finite, that is the alliance can be terminated, and *b*) the alliance can be discontinued, that is it can survive but with a different party. We borrow the terms of intended termination and unintended termination from the literature (Makino *et al.*, 2007). Makino *et al.* (2007) refer to the termination of international joint ventures (IJVs) which is defined as "either the suspension of the structure or the suspension of the existing business domain of an IJV". The former refers to the switch from a shared ownership mode to a different organizational mode. The latter refers to either discontinuity or changes in its strategies, core business processes, or key products and markets. In this context, intended termination refers to the termination of the IJV because its purpose was achieved. In contrast, unintended termination refers to the termination of the IJV due to situations not anticipated by the partners at the moment of forming the alliance. The alliance may continue as long as both parties benefit from it. Divestment may also occur. Divestment marks the end of the alliance. As it has been argued in the literature, the social network of alliances is dynamic (Gulati, 1995; Gulati, Nohria, Zaheer, 2000), as new alliances are formed while existing alliances may be terminated. For an engaging graphical representation of dynamic firm networks, you may refer to Porto (2024) who employs a bipartite network approach to illustrate the evolution of Japanese affiliates in Italy between 1972 and 2019.

4) **Goal**: The parties enter into an agreement to achieve an objective. As we pointed it out in the definition, the goal does not need to be shared or unique. However, the parties need to form the alliance to attain it. For example, firms may form an alliance with another firm with the goal of appropriating the state-of-art of processes or technology from the other firm. Evidently, this cannot be a unique or shared goal since the firm detaining the knowledge may be unwilling to transfer it. Therefore, in this case the other firm has its own objective. For example, it needs the alliance because the partner firm is located in a country with lower labour costs. In the case of a greenfield investment of an efficiency-seeking firm, the local government may welcome the investment with the goal of offsetting the trade deficit it records with the country of origin of the firm or revitalizing an industrial area. And as we have argued, unless the parties have agreed on termination time or condition, or unexpected contingencies have arisen, the parties can continue cooperating to achieve their goals.

3. The European integration project in the decade 2000-2010

The 2000–2010 decade marked a pivotal period for European integration. In 2002, the euro was introduced as physical currency across twelve member states, replacing their national currencies. This transition deepened economic ties but also introduced new challenges in coordinating macroeconomic policies. By 2004, after a lengthy accession process that began in the 1990s, ten countries – Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia – joined the EU. These nations, which transitioned from communist regimes and centrally planned economies, had to meet stringent criteria to align with EU standards.[2] In 2007, Bulgaria and Romania joined the EU, adding to the roster of nations with smaller territories, modest populations and lower income levels compared to existing members. To address governance challenges from the Eastern Enlargement, the Treaty of Nice (2001) introduced institutional reforms. However, the integration process faced a setback when the proposed Treaty establishing a Constitution for Europe was rejected by referendums in France and the Netherlands in 2005. The Treaty of Lisbon, adopted in 2009, incorporated many of the Constitution's objectives while ensuring broader acceptance. Towards the end of the decade, the euro faced its most significant challenge during the European debt crisis, highlighting weaknesses in the eurozone's fiscal coordination mechanisms.

Scholar across various fields have analysed the impact of the Eastern Enlargement. In the economic field, Thissen *et al.* (2013) analyses intraregional European trade flows at NUTS-2 region[3] level and reports that over the period 2000-2010 the amount and value of trade with Central and Eastern European regions increased significantly. In terms of foreign direct investment, Egger and Pfaffermayr (2004) find anticipation effects on FDI flows for not only the Single Market but also the 1995 enlargement and the Europe Agreements between the EU and the Central and Eastern European (CEE) countries with the positive effect lasting from announcement until formal establishment. Bevan and Estrin (2004) show that announcements about proposals on EU accession had an impact on FDI to the CEE countries. Cieslik and Ryan (2004) point that CEE countries entry into the EU has been considered by Japanese investors in 1990s and thus that these countries should not expect increased FDI inflows after EU accession, whereas Medve-Bálint (2014) shows that the EU has actively influenced foreign capital inflows to CEE countries both before and after enlargement. Jones *et al.* (2018) find that EU membership significantly impacted FDI in the CEE countries, more than doubling the number of projects established in these countries compared to the period before the accession negotiations began. Jones *et al.* (2020) also investigates the motives for FDI location, and they find "evidence that the differences in the motives between the CEECs and EU15 are narrowing over time, but they are pronounced, and it is argued that they will persist".

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[2] These conditions are known as Copenhagen criteria which, adopted in 1993, include political criteria, economic criteria and institutional/legal criteria that form the essential conditions a candidate country must comply with to join the EU. The economic criteria require the existence of a functioning market economy and the capacity to cope with competitive pressure and market forces within the EU. https://neighbourhood-enlargement.ec.europa.eu/enlargement-policy/glossary/accession-criteria_en

[3] NUTS stands for Nomenclature of territorial units for statistics. It's a classification developed by the EU to reference countries' regions for statistical purposes.

To our knowledge, no previous studies have investigated FDI in Europe as a network of affiliates of an ultimate controlling parent company. In this study, we focus on Japanese FDI in Europe in 2000-2010 represented as the network of Japanese affiliates in Europe.

4. Japanese investments in Europe

Japan has a long history of investing in Europe dating back to the 1980s, when the then European Community (EC) adopted protectionist measures, such as non-tariff barriers (NTBs), to curb the flow of exports from Japan into the EC. The increased protectionism in Europe against Japanese exports was at the basis of a wave of Japanese FDI in Europe in the manufacturing sectors. Despite concerns from local producers, Japanese FDI was favoured by most of EC members which competed with each other to attract it. In fact, Japanese investment was considered as an opportunity to support employment in the domestic economy and a way to offset the Japanese trade surplus. However, Japanese investment was also at the centre of a dispute between the EC and Japan. The issue with Japanese investment during those years revolved around the type and the purpose of the investment: it mainly took the form of assembling plants which were set up to circumvent the protectionist measures. In this regard, Ishikawa (1990) reports that Willy de Clercq, the then Vice-President of the Commission, observed in 1987 that

> "[…] whenever the Community opens an anti-dumping inquiry or imposes antidumping duties on a product, plants for assembling the product which is subject of the inquiry or anti-dumping duty miraculously spring up in abundance in the Community".

The UK emerged as the top destination of Japanese FDI in Europe. The success of the UK in attracting Japanese FDI is based on various reasons. At the beginning of the 1980s, the UK had already built a reputation as a good host for Japanese FDI due to the free trade and openness orientation of the government (Sekiguchi 1982). The JETRO 1991 Survey, as reported in Sachwald (1995), identified the possibility to hire English speaking people, the quality of infrastructure, the favourable conditions for distribution and good quality of labour as main drivers for Japanese investment in the UK.[4]

Figure 1 shows the number of newly established Japanese manufacturing affiliates in the UK, Western Europe, and Central and Eastern Europe between 1987 and 2009.[5] Between 1987 and 2000, the UK received the largest number of this kind of investments. In 1990, Japan established 49 new manufacturing affiliates in the UK, corresponding to the 36% of the total newly established Japanese manufacturing affiliates in Western Europe; in 2000, half of the newly established Japanese manufacturing affiliates in Western Europe were set up in the UK. Since 2000, the gap between the UK and Germany as hosts of newly established Japanese

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[4] Since Japanese firms invested in the US, Japanese management gained experience in the US market. Therefore, the shared English language and the cultural proximity between the US and the UK were seen as a strong incentive to establish affiliates in the UK.

[5] In Figure 1, Western Europe includes the EU15 members minus the UK. Central and Eastern European Countries include Poland, Czech Republic, Slovakia, Hungary, Romania, Lithuania, Bulgaria, Slovenia.

manufacturing affiliates has narrowed. During these years, we observe the rise of Central and Eastern European countries as main destination of Japanese investments. In particular, Poland, Czech Republic, Slovakia, and Hungary have emerged as main destinations of Japanese FDIs.
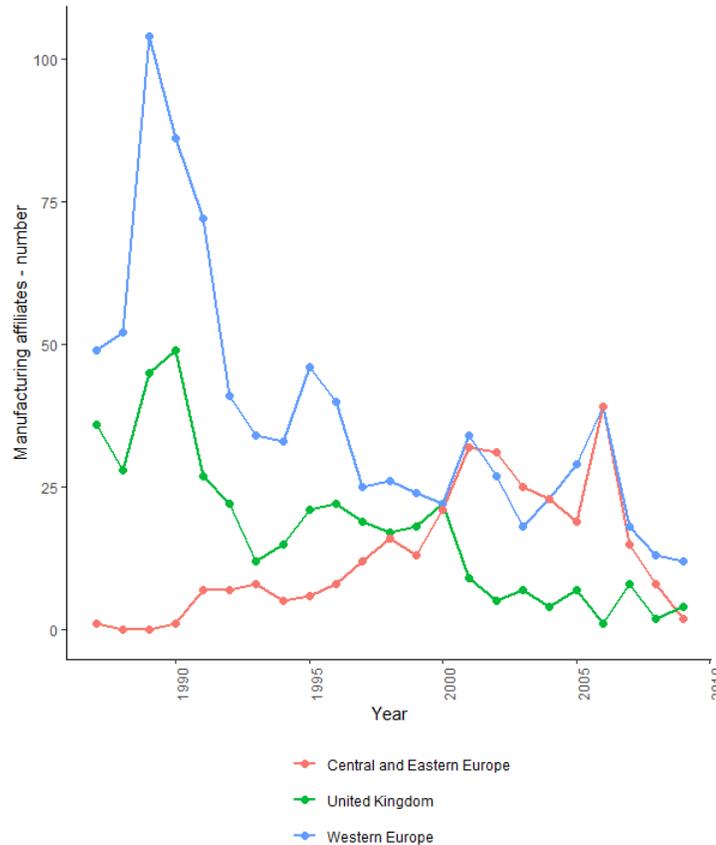

Figure 1. Number of Newly Established Japanese Manufacturing Affiliates in Europe, 1987 – 2009

Note. The figures only indicate manufacturing bases and not independent R&D or design centres. Western Europe includes the EU15 members minus the UK. Central and Eastern European Countries includes Poland, Czech Republic, Slovakia, Hungary, Romania, Lithuania, Bulgaria, Slovenia. Author's elaboration of data from JETRO: Japanese Manufacturing Affiliates in Europe and Turkey – 2010 Survey, December 2010, p. 4.

Recently, Brexit, the withdrawal of the United Kingdom from the EU, raised concerns of the Japanese government over the feasibility of the European cross-border organization of Japanese value-chains (Ministry of Foreign Affairs of Japan 2016) and it has been indicated by Japanese-affiliated companies in the UK as their biggest operational challenge (JETRO 2022). Porto and Wierzbowska (2023) argue it may lead to the strengthening of Eastern Europe as a *new gateway* to Europe for Japanese firms.

5. Data description

The data used for the following analysis have been collected from the Toyo Keizai's Overseas Japanese Companies database (hereafter referred to as "OJC database"). The Toyo Keizai is a private firm that has been building the OJC database through a questionnaire survey submitted to Japanese companies for more than 40 years. In 2020, the OJC database includes 32,456 overseas Japanese companies and 5,261 parents. The OJC database contains information regarding overseas affiliates and subsidiaries of Japanese company, including invested area, capital, purpose for establishment, number of employees, sector, name and share of each Japanese equity-owner. In case of joint venture, the database also reports the share of the local partner even though the respondents are not required to disclose the identity of the local partners.

In 1996, Makino and Delios (1996) reported that the Toyo Keizai survey was gaining greater acceptance among academic researchers. Nielsen *et al.* (2017) highlighted the Toyo Keizai dataset's prominence in empirical research on FDI location choices. The database has been also used by Delios and Beamish (1999), Lu (2002), Yamawaki (2006), and more recently Cieslik and Ryan (2002, 2023), Porto and Wierzbowska (2023), Porto (2024).

For this analysis, we have collected data for 2000 and 2010. In 2000, we have 890 Japanese affiliates in the UK, which represents the country with the highest number of Japanese affiliates, followed by Germany with 605. The number of affiliates in the UK represented 27.6% of all Japanese affiliates in Europe.[6] This share decreased to 22.26% in 2010. In Germany, the share increased from 18.8% in 2000 to 19% in 2010. Therefore, we observe the largest decrease in share for the UK between 2000 and 2010 while in Germany the share increased, resulting in Germany catching up to the UK as main location for Japanese affiliates. The Netherlands and France are the other two largest countries hosting Japanese affiliates. Interestingly, between 2000 and 2010 we observe the increase in the share of Japanese affiliates in the new members of the EU such as Czech Republic and Poland, and in Turkey (Table 1).

Table 1. Share of Japanese Affiliates in Europe by Country (%)

Country	2000	2010	Country	2000	2010
UK	27.61	22.26	Turkey	0.65	1.07
Germany	18.80	19.00	Norway	0.50	0.65
Netherlands	12.22	11.62	Greece	0.31	0.48
France	10.67	10.75	Romania	0.31	0.40
Italy	5.71	6.02	Slovakia	0.25	0.71
Belgium	4.53	4.33	Slovenia	0.09	0.25
Spain	4.44	4.72	Bulgaria	0.06	0.11
Switzerland	2.05	2.04	Cyprus	0.03	0.03
Sweden	1.80	2.06	Croatia	0.03	0.17
Austria	1.61	1.53	Malta	0.03	0.03
Hungary	1.52	1.64	Serbia	-	0.11

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[6] Excluding Russia, Ukraine, and Belarus.

Poland	1.40	2.55	Estonia	-	0.06
Ireland	1.33	1.13	Lithuania	-	0.06
Portugal	1.02	0.93	Latvia	-	0.06
Czech Rep.	0.93	2.69	Monaco	-	0.03
Luxembourg	0.74	0.54	Montenegro	-	0.03
Denmark	0.68	1.05	Bosnia	-	0.06
Finland	0.65	0.85			

Note: Authors' elaboration based on the data from the Toyo Keizai's Overseas Japanese companies database.

6. Network Analysis

Table 2 and Figure 2 explain how we managed the data from the OJC database using fictious data. Table 2 records the network of fictitious parents and subsidiaries/affiliates in a region. We identify the network relations with the first two columns. With this information, we can trace back all the relations to the ultimate controlling parent. Since, in our case, all the ultimate controlling parents are from Japan (making Japan the ultimate investing country), we assign a different shape to better distinguish them from the affiliates in the plot. Figure 2 provides the corresponding network plot for the data in Table 2.[7] We can observe that "Parent 1" and "Parent 2" are both parents to "Affiliate A". "Affiliate A" is also parent of "Affiliate X". However, to be noted, compared to the definition of the OECD (2015), the parent-affiliate network description used here is looser, as the analysis does not include information about the controlling share. For example, according to the OECD, we could also state that "Parent 2" is a director investor in both "Affiliate A" and "Affiliate B". However, based on a 50% ownership threshold,

a) "Parent 2" would control "Affiliate B" if it owns more than 50% of the voting equity in "Affiliate B".
b) "Parent 2" would only have influence on "Affiliate B" if it owns 50% or less of the voting equity in "Affiliate B".

In turn, this would imply that in case (a), "Affiliate Y" and "Affiliate Z" are also affiliates of "Parent 2" through "Parent 2"'s control of "Affiliate A", and "Parent 2" is said to have an indirect ownership interest in "Affiliate Y" and "Affiliate Z". On the contrary, in case (b), if the ownership tie is weak "Affiliate Y" and "Affiliate Z" would not be considered as affiliates of "Parent 2". Additionally, "Affiliate Y" and "Affiliate Z" are also called fellow enterprises because there is no direct investor relationship between them, but they are controlled by the same direct investor, "Affiliate B". Furthermore, in case (a), as stated by the OECD, even though there is no direct investment relationship between the two, any transactions between them are relevant

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[7] Data have been analysed with R (R Core Team 2022). The following packages have been used for the analysis: "readxl" (Wickham & Bryan 2023) to import data stored in Excel files; "openxlsx" (Schauberger & Walker 2020) to export results as an Excel file; "ggplot2" (Wickham 2016) to plot Figure 1; "tidyr" (Wickham *et al.* 2023) and "dplyr" (Wickham *et al.* 2023) for data management; "ergm" (Hunter *et al.* 2008), "statnet" (Handcock *et al.* 2018), and "igraph" (Csárdi & Nepusz 2006; Csárdi *et al.* 2024) for network analysis; "RColorBrewer" (Neuwirth 2022) for colour palettes.

to direct investment because such transactions are likely to result from the influence that "Parent 2" has on both of their operations. The description of these relations is one of the possible alternatives based on the ownership ratio. However, here we describe the network based on relationship information reported in the OJC database which we consider representing one of the realizations of the alliances between the parties as described in Section 2. Finally, from Figure 2, we can observe that we have two groups: one formed by "Parent 1" and "Parent 2", since "Parent 1" is also a direct investor in "Affiliate A", and another group formed by "Parent 3" which has no ties with the other group.

Table 2. Fictitious network of firms

| Parent	Affiliate	Country Parent	Country Affiliate
Parent 1	Affiliate A	CountryParent	Country1
Affiliate A	Affiliate X	Country1	Country3
Parent 2	Affiliate A	CountryParent	Country1
Parent 2	Affiliate B	CountryParent	Country2
Affiliate B	Affiliate Y	Country2	Country3
Affiliate B	Affiliate Z	Country2	Country3
Parent 3	Affiliate C	CountryParent	Country1
Parent 3	Affiliate D	CountryParent	Country2
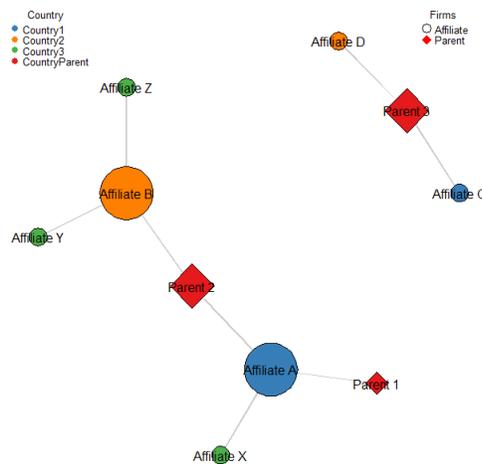
Figure 2. Fictitious network plot of data in Table 2

6.1 Japanese affiliates network in Europe

Figure 3 and Figure 4 depict the network of Japanese affiliates in Europe for the years 2000 and 2010, respectively. The network size increased from 4,411 in 2000 to 4,764 in 2010. The red diamond shape represents a Japanese parent firm, while the circular shape represents Japanese

affiliates in Europe. The size of the shape is scaled by $\log_{10}(degree)$ of the vertices. The colours correspond to Japan and European countries where the firms are located.[8] We have assigned the same colour to countries with only a few Japanese affiliates to reduce the number of colours needed. The labels correspond to firms with a degree centrality greater than 20.
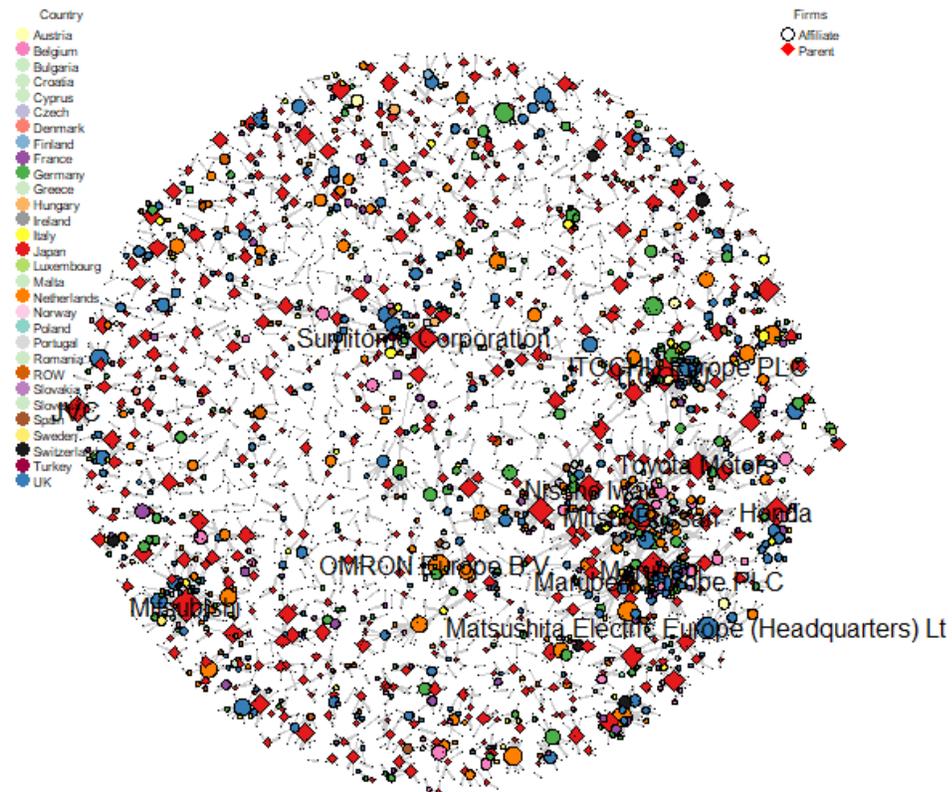

Figure 3. Network of Japanese investments in Europe, 2000
Note. Authors' elaboration based on the data from the Toyo Keizai's Overseas Japanese Companies database.

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[8] We also have very few firms from countries outside Europe and Japan. These firms are subsidiaries of Japan in, for example, United States, Singapore, Hong Kong, Australia, and Brazil. We grouped all of them as rest of the world (ROW).
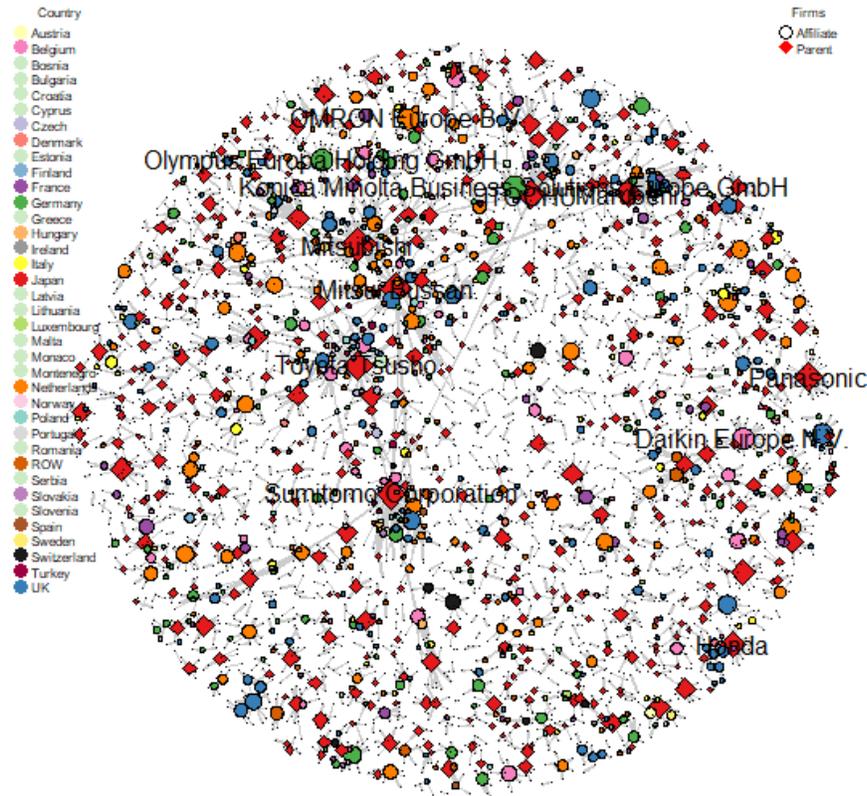
Figure 4. Network of Japanese investments in Europe, 2010

Note. Authors' elaboration based on the data from the Toyo Keizai's Overseas Japanese Companies database.

Vertex degree is a measure of centrality. The degree of a node is the number of ties it has with other nodes. The greater the number of direct ties of a node, the greater the prominence of the node. In 2000, there are 13 firms with vertex degree greater than 20. Among these, four firms are European subsidiaries located in Netherlands (OMRON Europe B.V.) and in the UK (Itochu Europe PLC, Marubeni Europe PLC, and Matsushita Electric Europe (Headquarters) Ltd.). The remaining firms are Japanese parent companies. Specifically, three of them are large companies – Honda, JVC, and Toyota Motors – while the other six are *sogo shosha*: Itochu, Marubeni,

Mitsubishi, Mitsui Bussan, Nissho Iwai, and Sumitomo Corporation. [9] If we investigate Japanese affiliates with degree greater than 10, it results that 10 are located in the Netherlands, 9 in the UK, and 3 in Germany.

In 2010, we have 11 firms with vertex degree greater than 20. Among these, four firms are European subsidiaries located in Belgium (Daikin Europe N.V.), Germany (Konica Minolta Business Solutions Europe GmbH and Olympus Europa Holding GmbH), and Netherlands (OMRON Europe B.V.). The remaining firms are Japanese parent companies. Most of them are *sogo shosha* such as Itochu, Marubeni, Mitsubishi, Mitsui Bussan, Sumitomo Corporation, and Toyota Tsusho. The other one is Panasonic. However, the degree of Panasonic may be not accurate due to the absence of detailed information in the description of the relations with its affiliates in the database.[10] If we investigate Japanese affiliates with degree greater than 10, it results that 10 affiliates are located in the Netherlands, 8 in the UK, 4 in Germany, and 2 in Belgium in 2010 (Table 3).

Table 3. Degree of Japanese Affiliates in Europe by Country

Year	Degree	Belgium	Germany	Netherlands	UK
2000	d > 20	-	-	1	3
	d > 15	-	2	4	4
	d > 10	-	3	10	9
2010	d > 20	1	2	1	-
	d > 15	1	2	3	1
	d > 10	2	4	10	9

Note. Authors' elaboration based on the data from the Toyo Keizai's Overseas Japanese Companies database.

Table 4 reports the centrality of a European country in the Japanese affiliate European cross-border network. This is determined by counting how many Japanese affiliates in Europe have a parent firm in a European country, and vice versa. Therefore, we exclude from this count any cases where a parent firm and its affiliates are located in the same country, all ties with Japanese parents and all ties with parents from the Rest of the World countries (equation 1).

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[9] The term *sogo shosha* is often translated as general trading companies. Ryan (2017) proposes as alternative translation "diversified trading conglomerate". Japan Foreign Trade Council, Inc. (2012) considers 10 companies as *sogo shosha* immediately after the World War II: Ataka & Co., Itochu Corporation (C. Itoh & Co.), Kanematsu-Gosho Ltd., Marubeni Corporation, Mitsubishi Corporation, Mitsui & Co., Ltd., Nichimen Corporation (Nichimen Co., Ltd.), Nissho Iwai Co., Ltd., Sumitomo Corporation (Sumitomo Shoji Kaisha) and Tomen Corporation (Toyo Menka Kaisha Limited). Today, Japan Foreign Trade Council, Inc. (2012) classifies as *sogo shosha* only Itochu Corporation, Marubeni Corporation, Mitsubishi Corporation, Mitsui & Co., Ltd., Sojitz Corporation (established by the merger between Nissho Iwai and Nichimen in 2004), Sumitomo Corporation and Toyota Tsusho Corporation (established by the buy-out of the former *sogo shosha* Tomen).

[10] For some affiliates only the information regarding the Japanese parent is reported. In some cases, it is the correct representation of the network. In other cases, the detailed information is missing and only the Japanese parent is reported. In this case, the vertex degree of the Japanese parent company is overstated.

$$n = \sum e_{ij}, \qquad \forall\, i \neq j, and\ i,j \neq \{Japan, ROW\} \quad (1)$$

where e represents the edge between firms, i and j represent the countries where the firms are located.

For example, in 2000, YKK Holding Europe B.V., a subsidiary of the Japanese company YKK located in the Netherlands, was parent of YKK (UK) Ltd. in the UK, YKK Belgium N.V. in Belgium, YKK Denmark A/S in Denmark, and so on. We count each time it is a parent of a Japanese affiliate in another European country. This operation is repeated for all the Japanese affiliates in the Netherlands, and the results are summed up in the column labelled "Total parents" in Table 4. On the other hand, Agrovista B.V., a Japanese affiliate located in the Netherlands, had Marubeni Europe PLC (located in the UK) as its parent. Similarly, AIWA Nederland B.V., another Japanese affiliate located in the Netherlands, had AIWA Europe Ltd. (also located in the UK) as its parent. In other words, we sum up all Japanese affiliates in the Netherlands which have a parent in another European country. The outcome is reported in the column labelled "Total affiliates" in Table 4. Table 4 summarizes this information for all the countries. As expected, the UK, Germany, and the Netherlands have the largest total number. However, we can observe a difference between the UK and the Netherlands on one side, and Germany on the other side. For the Japanese affiliates in the UK and in the Netherlands, the weight of them being parents to affiliates in other European countries is much more relevant than the reverse. In contrast, for Germany, its cross-border network is more evenly partitioned. This difference may be due to the different economic structure of these countries, where the first two countries are more service-based economies compared to Germany which is the largest manufacturing country in Europe.[11] Compared to 2000, we observe two notable expansions in the cross-border network of Japanese affiliates in Europe. Firstly, Belgium records more than a doubling in the number of its affiliates acting as parents to affiliates in other European countries. This may be a consequence of the European Union's strengthening and the recognition of Brussels as the political centre of the European politics by Japanese multinationals. Secondly, we observe an increase in the cross-border network for the Japanese affiliates located in CEE. However, within this region, there are some differences. The total number has increased most for Poland, Czech Republic, Slovakia, and Slovenia. In the first three countries, the cross-border network growth is primarily due to their firms being affiliated to Japanese affiliates in other European countries. In Slovenia, the total number is also affected by the growth of its affiliates acting as parents to affiliates in other European countries. For Hungary, the total number of cross-border connections has remained almost unchanged between the two years. However, its composition has slightly changed by including affiliates being parent to Japanese affiliates in other European countries. Finally, for Bulgaria and Romania, the cross-border network did not

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[11] According to EUROSTAT, in 2023 Germany recorded the highest value of sold industrial production, equivalent to 27% of the EU total, followed by Italy (14%), France (12%), Spain (8%), Poland (6%) and the Netherlands (4%). Source: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Industrial_production_statistics#Overview (accessed 28 October 2024).

develop during this period. These countries joined the EU later (in 2007) than the other CEE members (in 2004).

Table 4. Number parent and affiliate firms in the European cross-border network of Japanese affiliates

Country	Year	Number Affiliates in Europe having parent in Country	Number Parents in Europe having affiliate in Country	Total	Country	Year	Number Affiliates in Europe having parent in Country	Number Parents in Europe having affiliate in Country	Total
UK	2000	257	93	350	Greece	2000	0	10	10
	2010	218	93	311		2010	0	12	12
Germany	2000	166	116	282	Portugal	2000	0	22	22
	2010	192	141	333		2010	0	14	14
Netherlands	2000	263	54	317	Poland	2000	0	30	30
	2010	315	42	357		2010	1	58	59
France	2000	21	117	138	Czech Rep.	2000	0	21	21
	2010	27	123	150		2010	1	42	43
Italy	2000	14	90	104	Hungary	2000	0	31	31
	2010	14	99	113		2010	2	28	30
Belgium	2000	60	45	105	Slovakia	2000	0	2	2
	2010	137	47	184		2010	0	12	12
Spain	2000	7	69	76	Slovenia	2000	0	3	3
	2010	2	75	77		2010	4	7	11
Switzerland	2000	26	24	50	Bulgaria	2000	0	1	1
	2010	21	25	46		2010	0	1	1
Sweden	2000	3	31	34	Romania	2000	0	5	5
	2010	7	33	40		2010	0	3	3
Denmark	2000	3	12	15	Croatia	2000	1	1	2
	2010	6	16	22		2010	4	6	10
Finland	2000	0	10	10	Malta	2000	0	0	0
	2010	0	16	16		2010	0	0	0
Ireland	2000	1	17	18	Cyprus	2000	0	0	0
	2010	0	10	10		2010	0	0	0
Austria	2000	15	29	44	Norway	2000	0	10	10
	2010	6	25	31		2010	1	15	16
Luxembourg	2000	3	3	6	Turkey	2000	0	6	6
	2010	1	7	8		2010	0	16	16

Note. Authors' elaboration based on the data from the Toyo Keizai's Overseas Japanese Companies database.

6.2 Exponential random graph model with dyadic predictors

The descriptive network analysis (Section 5) is complemented by investigating the effects of the Eastern enlargement on FDI through the formation of homophilous ties or heterophilous ties

among Japanese affiliates established in Europe. There exists a rich literature in international business that delves into the concepts of homophily (where firms prefer interaction with firms sharing similar attributes or similar status) and heterophily (involving dissimilar attributes or lower status) as social mechanisms in the formation of alliances among firms (e.g., Gulati 1995; Chung et al. 2000; Ahuja et al. 2009; Granados and Knoke 2013; Collet and Philippe 2014). However, our work differs in two main respects. Firstly, we do not focus on a particular sector but rather on the entire network of Japanese ultimate investing parents in a specific geographic area – namely, Europe. Secondly, we test the formation of homophilous ties or heterophilous ties by using an exponential random graph model (ERGM). Social network studies of individuals' relationship have employed ERGM to model homophily to account for same gender, country, education, recruitment site (Cao *et al.* 2024), same gender and interest (Xiong *et al.* 2020). Bomiriya *et al.* 2023 extends homophily modelling with ERGM to bipartite networks as well. ERGM is a statistical model that estimates the effects of covariates on network ties, while also identifying parsimonious parameters that describe dependence in relational data (Cranmer & Desmarais, 2011). ERGM allows modelling the probability of observing a particular network configuration (*y*) based on the characteristics of the network and the parameters (θ) of the network to be estimated from the data. It can take the following general form (Statnet Development Team 2024):

$$\Pr(Y = y) = \frac{\exp[\theta^T g(y)] \, h(y)}{k(\theta)} \qquad (2)$$

Where

- *Y* represents the random variable for the state network.
- *y* is a specific realization of the network.
- θ represents a vector of parameters to be estimated with *T* denoting the transpose.
- *g(y)* represents a vector of network statistics, such as the number of edges, for the network *y*.
- $\exp[\cdot]$ represents the exponential function.
- *h(y)* is a reference measure used to incorporate additional constraints or weights on the network configurations.
- $k(\theta)$ is the normalizing constant which ensures that the probabilities sum to 1 over all possible network configurations.

ERGMs predict the probability of a tie between actors *i* and *j* conditional on the rest of all other ties in the network by using a Monte Carlo Markov Chain maximum-likelihood estimation. Since the observed network is considered a single realization from a multivariate distribution, there is no need to assume that actors or ties within the network behave independently (Cranmer & Desmarais, 2010). For a general introduction to these models see Robinson *et al.* (2007) and Cranmer & Desmarais (2010).

We use an ERGM model with dyadic predictors. We construct a dyadic interaction predictor variable which assigns firms in the dataset to one of the following four groups based on their geographic location: "Japan", "EU15", "CEE" and "Other Europe". Specifically:

- "Japan" includes Japanese parent companies.[12]
- "EU15" encompasses Japanese affiliates located in one of the European Union members at the time of the 1995 enlargement (basically, Western Europe).
- "CEE" comprises Japanese affiliates in Central and Eastern European countries that became EU members in 2004 and 2007.
- "Other Europe" includes Japanese affiliates in the remaining European countries.

By using this partition, we group the firms by characteristics. Our primary interest lies in "EU15" and "CEE" firms. We can assume that since the affiliates in "EU15" are located in Western European members of the EU (most of them are in the UK, Germany, the Netherlands, and France), they are similar in terms of, for example, technology and opportunities to exploit scale economies, given their membership in the Single Market. On the other hand, firms in "CEE" exhibit great similarity among themselves due to their shared experience under the socialist regime. In fact, to lay the basis for the future membership of Eastern European countries, the EU adopted the so-called Copenhagen criteria which a candidate country must satisfy to become a member of the EU. Given that the first year of our data is 2000, we can assume that "CEE" firms in that year significantly differ in characteristic and status from "EU15" firms. However, convergence of "CEE" firms to "EU15" on some characteristics may have occurred by 2010.

Table 5 reports the output of the analysis. Model (1) for 2000 and 2010 corresponds to the null model, which includes only edges. Based on its results, we observe that the overall density of the network remained similar between the two years (0.00020 in 2000 and 0.00018 in 2010). Model (2) for 2000 and 2010 corresponds to the model with dyadic predictors. Our primary interest lies in the connection EU15-EU15, EU15→CEE, CEE-CEE, and CEE→EU15. To be noted that there are no edges EU15→Japan, CEE→Japan, OtherEurope→Japan. Firstly, we observe that the Akaike information criteria (AIC) for Model (2) in 2000 and 2010 are lower than the AIC for the null model in the corresponding years. This indicates that the model better explains the data compared to the baseline model. Secondly, we note that in 2000 there are no edges from CEE. On the contrary, there are edges CEE-CEE, CEE→EU15, and CEE→OtherEurope in 2010 and they are statistically significant. The coefficients for CEE-CEE and CEE→OtherEurope are positive, indicating homophily, while the coefficient for CEE→EU15 is negative, indicating heterophily. The relatively low probability suggests that affiliates from CEE connect less frequently to affiliates in the EU15. Thirdly, the coefficients for EU15-EU15, and EU15→CEE are positive and statistically significant. Particularly, the probability that affiliates from the EU15 connect with other affiliates from the EU15 is very high, indicating strong homophily within the EU15 group. The different signs for EU15→CEE and CEE→EU15 suggest that affiliates from EU15 are more likely to connect with affiliates from CEE, while the contrary is less likely. This is expected since most parent-affiliates in the Japanese network are located in EU15 countries. Finally, we note that coefficients regarding Japan is always positive but, between the two years,

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[12] Given that we have very few Japanese affiliates in ROW, all playing the role of parent firm to affiliates in Europe, we have incorporated these firms in the category "Japan" to reduce the number of categories.

it only increased for Japan→CEE. The findings suggest that Japanese parents are more likely to establish connections with firms in CEE compared to the year 2000. Additionally, Japanese parents may expand their European network by leveraging their existing affiliates in the EU15 region.

Table 5. ERGM output table

	2000		2010	
	(1)	(2)	(1)	(2)
edges	-8.49575***	-11.3535***	-8.6296***	-11.3771***
	(0.01586)	(0.1221)	(0.0157)	(0.1221)
EU15→CEE		2.8887***		2.6854***
		(0.1606)		(0.1460)
Japan→CEE		3.8888***		3.9187***
		(0.1579)		(0.1400)
OtherEurope→CEE		1.6997*		0.6660
		(1.0075)		(1.0074)
EU15-EU15		2.3543***		2.3267***
		(0.1258)		(0.1257)
Japan→EU15		4.0894***		3.9701***
		(0.1238)		(0.1239)
OtherEurope→EU15		1.9519***		1.4296***
		(0.2310)		(0.2457)
EU15→OtherEurope		2.4074***		2.4330***
		(0.1983)		(0.1777)
Japan→OtherEurope		4.0651***		3.8757***
		(0.1629)		(0.1575)
OtherEurope-OtherEurope		3.1350***		2.9856***
		(0.5902)		(0.4636)
CEE-CEE		-		1.7580***
				(0.4261)
CEE→EU15		-		-1.2661**
				(0.5901)
CEE→OtherEurope		-		2.2756***
				(0.4636)
Null Deviance	26966905	26966905	31456311	31456311
	(df = 19452510)	(df =19452510)	(df =22690932)	(df = 22690932)
Residual Deviance	75473	70537	78097	73215
	(df = 19452509)	(df =19452500)	(df = 22690931)	(df = 22690919)
AIC	75475	70557	78099	73241
BIC	75490	70705	78114	73435

Note. a) Numbers in parenthesis are standard errors. b) *p < 0.05; **p < 0.01; ***p < 0.001.

7. Conclusion

By considering foreign direct investments as the realization of a network of alliances, this study investigates the evolution of Japanese parent-affiliates network in Europe during the decade 2000-2010, a period of remarkable changes in the European integration project. First of all, an overall picture of the presence of Japanese affiliates in Europe shows, as expected, that the UK, Germany, and the Netherlands host the largest number of Japanese affiliates. Consequently, they are central in the cross-border network of Japanese affiliates in Europe. However, we can observe a difference between the UK and the Netherlands on one side, and Germany on the other side. For the Japanese affiliates in the UK and in the Netherlands, the weight of them being parents to affiliates in other European countries is much more relevant than the reverse. In contrast, for Germany, its cross-border network is more evenly partitioned. This difference may be due to economic structure of these countries. In fact, Germany has a robust manufacturing sector, particularly in industries like automotive, machinery, and chemicals. On the other hand, the UK and the Netherlands economies are more service-based economies. Particularly, the UK has a significant focus on services, especially finance, insurance, and business services, whereas the Netherlands' services sector has substantial contribution from trade, logistics, and finance.

Secondly, by considering the change in the network between the year 2000 and 2010 which is likely due to the strengthening and expansion of the EU integration project, we find that compared to the year 2000:

1. Belgium attracted more affiliates playing the role of parents in the Japanese network in Europe. This finding may be attributed to the recognition of Brussels as the main centre of European politics.
2. Japanese investments growth in CEE countries took the form of an extension of the network of Japanese affiliates in this area mainly in two ways:

a. Japanese affiliates in CEE countries extended their ties mainly to affiliates in the same country or in countries of the same region (homophily).
b. Japanese affiliates in CEE countries extended their ties less likely to affiliates in the EU15 region (heterophily)

Furthermore, the network to CEE was also extended through ties from affiliates established in the EU15 region regardless of the dissimilar attributes or lower status of the CEE firms. This finding was also statistically significant for the year 2000 and it may result from the inclusion of CEE affiliates in the global value chain established by Japanese firms across Europe. Although the period under investigation is relatively short, the analysis tends to confirm the dynamism of social network of firms and the potential impact of integration policies on it.

Acknowledgments

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