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Intra-industry Trade in Services and Eurozone Convergence

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Abstract

This paper investigates the effect of monetary union membership on intra-industry trade (IIT) in services. IIT is a highly salient phenomenon for monetary union members because it promotes economic cycle synchronisation, thereby reducing the costs of sharing a currency. An increase in IIT following monetary union entry represents an endogeneity effect, where members come to resemble an Optimum Currency Area ex-post. While this effect has been widely studied in goods trade, services differ fundamentally from goods and now account for the fastest-growing share of output and trade in advanced economies, making the endogeneity effect in services equally important. Despite this, IIT in services has not been studied as extensively, primarily due to data availability issues. We examine this relationship using the BPM5 and BPM6 services trade data for the European Union from 1999 to 2022. IIT is measured with the Grubel-Lloyd index and analysed using a structural gravity model. Our findings indicate that Eurozone membership is weakly associated with higher IIT in services, particularly at the four-digit level.

1. Introduction

The balance between the costs and benefits of participating in a monetary union largely depends on the level of economic convergence and integration of its members. If the participating economies succeed in synchronising their economic cycles, the benefits of the common currency are more likely to outweigh the costs. However, if member countries have highly heterogeneous economic structures, they remain vulnerable to asymmetric shocks. In case of a shock, the inability of monetary union member countries to implement individual monetary policies shifts the burden of economic shock management onto fiscal policy (Frankel & Rose, 1998). This can potentially reduce the overall advantages of monetary union membership.

Economic synchronisation is central to the Optimum Currency Area (OCA) theory, which outlines the conditions under which regions benefit from adopting a common currency. According to OCA theory, criteria such as trade openness, labour mobility, and economic cycle synchronisation are essential for mitigating the costs of losing independent monetary policies (McKinnon, 1963; Mundell, 1961). However, these criteria are not static. The endogeneity hypothesis by Frankel and Rose (1998) posits that the very act of participating in a monetary union may lead to greater trade and economic synchronisation over time, suggesting that some OCA criteria may be met ex-post.

Traditionally, economic synchronisation has been associated with the level of openness and intensity of trade between economies (Frankel & Rose, 1998). More recent research, however, identifies intra-industry trade (IIT) as the main driver of economic cycle synchronisation among trade partners (Beck, 2019; Jambor & Carlos Leitao, 2016; Kawecka-Wyrzykowska, 2017). IIT drives economic synchronisation more effectively than total trade intensity because it involves trade in similar goods or services within the same industry, aligning production structures and exposing the economies to shared industry-specific shocks (Beck, 2019; Jambor & Carlos Leitao, 2016; Kawecka-Wyrzykowska, 2017). While inter-industry trade stimulates specialisation according to comparative advantage and can magnify asymmetric shocks, IIT encourages synchronisation because the industries are matched in terms of cycles and demand patterns (Beck, 2019; Frankel & Rose, 1998). This ensures that economies involved in IIT are similarly affected by global or regional shocks, hence consolidating economic convergence.

The growing importance of services in the global economy cannot be overstated, as services now "represent the largest and fastest-growing part of the global economy," accounting for nearly a quarter of world trade (European Commission, 2024, para. 3). However, most studies on IIT have focused on goods (Aggarwal, 2023), largely due to the availability of detailed data on trade categories like the Harmonized System and Combined Nomenclature. Services, on the other hand, have been studied less frequently because of measurement difficulties despite their likely relevance for IIT calculations (Lee & Lloyd, 2002).

This thesis contributes to the literature by focusing on lIT in services within the Eurozone, extending the application of OCA theory by adding services and presenting empirical evidence on how Eurozone membership affects economic integration. Recognising that European Union (EU) membership, which includes a commitment to eventually join the Eurozone, is a necessary precursor to full Eurozone integration—and that some EU countries currently maintain their currencies under fixed or quasi-fixed exchange rate regimes—this study examines the extent to which both forms of membership steer IIT in services in the same direction, albeit to different degrees. Given the direct economic implications of full Eurozone membership, our primary focus is on the Eurozone effect. Therefore, the research question addressed is: *What is the effect of Eurozone membership on intra-industry trade in services?*

Our findings indicate that Eurozone membership is weakly associated with a higher G-L index for IIT in services, particularly in the detailed four-digit services categories. While statistical significance is marginal, these results indicate that trade in services responds endogenously to monetary union membership, that is, part of the OCA criteria are met ex-post, contributing to integration and economic cycle synchronisation among members after joining a common currency. However, the effect is not robust across all models, and further research is needed to confirm the causal relationship.

The structure of this thesis is as follows: after a review of the literature—which covers the OCA criteria, the endogeneity of OCA, and the dynamics of IIT both in goods and services—we describe our methodology, detailing the measurement of IIT using the Grubel-Lloyd (G-L) index and its analysis through the Structural Gravity Model. Next, we present the data used, followed by an analysis of the findings. Finally, we discuss the limitations of our study and conclude with the insights gained from our research.

2. Literature review

In this section, we review the key literature that informs our study. First, we describe the foundational principles of OCA theory, such as how factor mobility and trade openness support monetary integration (Section 2.1). Next, we focus on the endogeneity hypothesis to show how economic integration can influence, and be influenced by, business cycle alignment (Section 2.2). Finally, we discuss IIT, first in goods (Section 2.3) and then in services (Section 2.4), emphasising its role in business cycle synchronisation and overall economic stability.

2.1. Optimum Currency Area Criteria

The Optimum Currency Area theory was mainly developed by Mundell (1961) and McKinnon (1963), with further contributions from Kenen (1969), as cited in Dellas and Tavlas (2009) and Kunroo (2015). The theory identifies several key characteristics that help determine whether it is suitable for two or more economies to form a currency union.

Mundell (1961) highlights factor mobility as a key feature of an OCA. He argues that national currencies and flexible exchange rates are not always the best option if national borders do not match economic regions. The most important characteristic of an OCA is the level of labour mobility and/or wage and price flexibility within the region. High internal factor mobility (such as capital and labour) and low external factor mobility are essential for a successful currency union. If labour and capital can move freely within the area, economies can adjust to shocks without needing exchange rate changes. Mundell also highlights the impact of asymmetric shocks. If different regions within a currency area experience economic changes differently, flexible exchange rates normally help absorb the impact. However, in a currency union, this adjustment is not possible, making labour mobility or other economic adjustments essential.

McKinnon (1963) adds another key element by focusing on openness to trade. He defines an OCA as a region where a single currency with a flexible external exchange rate can best (1) maintain full employment, (2) balance international payments, and (3) keep prices stable while controlling inflation. He argues that the level of openness and/or trade integration is crucial when deciding whether a currency union is beneficial. Highly open economies with large tradable goods sectors benefit from a fixed exchange rate or a shared currency with trading partners, as exchange rate changes can lead to greater price instability. In contrast, more closed economies with a larger non-tradable goods sector may find flexible exchange rates more useful, as they allow adjustments in relative prices. McKinnon also highlights the size of an economy as an important factor in determining an OCA. Larger economies tend to be more diversified and have more internal trade, making them better suited to independent monetary policies and flexible exchange rates. On the other hand, smaller, highly open economies benefit from the price stability that a fixed exchange rate or shared currency provides, as they lose less by giving up exchange rate flexibility.

Kenen (1969), as cited in Dellas and Tavlas (2009) and Kunroo (2015), introduces further criteria to refine the OCA theory. One key factor is the similarity of economic structures between two economies. If economies have similar production and consumption patterns, they are more likely to react in the same way to external shocks, reducing the need for separate monetary policies. Another important characteristic is the degree of product diversification. A more diverse economy is less vulnerable to sector-specific shocks, making it more stable within a currency union. Finally, Kenen highlights the importance of fiscal integration. A currency union works better if there are fiscal policies, such as centralised financial transfers, to help member economies adjust to asymmetric shocks. Without fiscal integration, individual regions may struggle during economic downturns, leading to instability.

As summarised by Kunroo (2015), more recent developments in the OCA theory include the following: (1) effectiveness and credibility of monetary policy, (2) endogeneity versus specialisation hypothesis (see Section 2.2), (3) nature of shocks and synchronisation of business cycles, (4) labour market frictions, (5) real convergence, (6) political factors, and (7) alternative exchange rate regimes. While the literature on OCA theory continues to evolve, a comprehensive review of all recent contributions falls beyond the scope of this study.

2.2. Endogeneity of Optimum Currency Area

Among the more recent developments in OCA theory, the endogeneity hypothesis is particularly relevant to our research. In their 1998 article *The Endogeneity of Optimum Currency Area Criteria*, Frankel and Rose suggest that the degree of trade between countries and the synchronisation of economic cycles—two key linkages in the OCA framework—are interrelated. Countries that trade more may have more synchronised economic cycles. If demand shocks and inter-industry trade dominate, economic cycles are likely to be more aligned among the currency union members. This is because economies whose trade structure is mostly composed of IIT tend to produce and trade similar products and are therefore made up of comparable industries. Because of this, they are likely to experience shared industry-specific technology or demand shocks, which translate into similar economic developments. However, economic cycles may diverge with an increase in trade if countries specialise according to their unique comparative advantage, which makes them susceptible to asymmetric, industry-specific shocks. Analysing data on 20 industrialised countries over 30 years, the authors find evidence for the first hypothesis. Their results indicate that countries which trade more have more synchronised economic cycles.

Since Frankel and Rose (1998), numerous studies have explored the relationship between trade and business cycle synchronisation across different contexts. Inklaar et al. (2005), using data from 21 OECD countries between 1970 and 2003, confirm a positive effect of trade on business cycle co-movement, though they argue that Frankel and Rose overestimated its magnitude. Additionally, they do not find a significantly more positive effect of IIT on business cycle synchronisation than on total trade. Instead, they argue that IIT is highly correlated with trade between industries.

Silvestre and Mendonça (2007) find a positive relationship between trade intensity and business cycle synchronisation among EU member states, though this is statistically significant only until 1985. They suggest that, because of political coordination and economic integration since then, other interdependent factors have become more explanatory for business cycle co-movement. Similarly, Schiavo (2008) finds a positive association between trade intensity and economic cycle synchronisation in the Eurozone, using data on Eurozone countries and their trade partners. His results also show that Eurozone membership is positively correlated with trade intensity, reinforcing the idea that monetary unions may foster deeper economic integration.

By contrast, Tawadros (2008) finds little evidence for such a relationship in ASEAN countries over a 45-year period. The only statistically significant results in his study indicate a negative association, leading him to conclude that increased trade in these economies drives specialisation based on comparative advantage rather than fostering synchronisation, challenging the endogeneity hypothesis of OCAs. However, more recent findings by Gammadigbe and Dioum (2022) support OCA endogeneity in the West African ECOWAS region. Using data from 15 countries between 1990 and 2018, they find that greater trade intensity correlates with reduced business cycle differences, suggesting that increased trade fosters synchronisation in West Africa.

Beyond trade intensity, some studies highlight trade structure, particularly IIT, as a more critical determinant of business cycle synchronisation. Kurihara (2006) finds that while trade positively correlates with economic cycle synchronisation in APEC countries, trade structure explains this correlation better than trade volume. Specifically, economies with higher IIT exhibit stronger business cycle co-movement. Beck (2019) reinforces this idea using data from 29 EU countries (1999–2011), showing that IIT is a robust determinant of business cycle synchronisation. He finds that when IIT is included in the regression, total trade loses explanatory power, indicating that the composition of trade matters more than its magnitude.

Research since the 1998 Frankel and Rose paper (Gammadigbe & Dioum, 2022; Inklaar et al., 2005; Schiavo, 2008; Silvestre & Mendonça, 2007) indicates that trade intensity is associated with economic cycle synchronisation, though this relationship is not universal across the world (Tawadros, 2008). More specifically, higher IIT is associated with more harmonious economic cycles (Beck, 2019; Kurihara, 2006). This indicates that endogeneity can exist between trade and economic cycle synchronisation, a key OCA criterion. However, rather than trade intensity and cycle synchronisation alone being endogenous, IIT in particular plays a vital role in helping a region approach an OCA.

2.3. Intra-Industry Trade in Goods

As discussed in Section 2.2, the effect of trade on economic convergence depends on its structure. While trade intensity influences business cycle synchronisation, research suggests that IIT plays a more decisive role (Beck, 2019; Kurihara, 2006). IIT enhances economic convergence by aligning trade structures and reducing asymmetric shocks, making it an important factor for business cycle synchronisation and monetary integration.

Faruqee (2004) employs a gravity model to analyse trade flows under the European Monetary Union (EMU) (1992–2002), finding that the euro boosted intra-area trade by about 10%. Countries with higher levels of IIT experienced faster trade growth, likely because IIT is particularly sensitive to relative price changes and exchange rate variability, suggesting that the monetary stability provided by the EMU played an important role. Similarly, Firdmuc (2004) uses a gravity model among OECD countries in the 1990s to demonstrate that IIT fosters business cycle convergence by exposing nations to similar industry-specific shocks, supporting the endogenous OCA hypothesis, which contends that trade links, rather than overall trade intensity alone, drive synchronisation.

Kawecka-Wyrzykowska (2017) quantifies IIT between Poland and Eurozone countries (1999–2014), concluding that higher IIT is associated with synchronised business cycles and a reduced likelihood of asymmetric shocks. This finding indicates that as Poland's share of IIT increases, its economic structure becomes more aligned with that of the euro area—a necessary condition for convergence. Likewise, Dautovic et al. (2014) focus on CESEE economies (1998–2010), arguing that IIT aligns trade structures and synchronises business cycles, thereby mitigating asymmetric shocks and contributing to real convergence among EU candidate and potential candidate countries.

From a broader European perspective (2000–2014), Steinert and Althammer (2024) confirm that IIT, rather than total trade intensity, is more strongly correlated with economic synchronisation, underscoring the importance of integrated pan-European supply chains. This insight aligns with Frankel and Rose's (1998) hypothesis that trade intensity, particularly when it reflects IIT, can foster deeper economic integration within the EU.

In East Asia, Li (2017) (1980–2016) reinforces this idea by showing that IIT plays a stronger role in business cycle synchronisation than overall trade intensity, a finding that builds on Shin and Wang's (2003) (1976–1997) observation that it is the shared industry-specific shocks—not merely the volume of trade—that drive convergence. Cortinhas (2007) (1962–1996) further supports this view in the ASEAN context, highlighting that significant correlations between IIT and business cycle harmonisation are pivotal for achieving economic integration and regional currency stability.

2.4. Intra-Industry Trade in Services

While IIT in goods has been extensively explored, there is relatively limited research on IIT in services. However, in theory, services should be included in IIT measurements (Lee & Lloyd, 2002). With economies increasingly shifting from manufacturing to service-based industries, services have become the largest and fastest-growing sector of the global economy (European Commission, 2024).

The available literature on IIT in services highlights product differentiation, economies of scale, and the role of multinational corporations (MNCs) as key drivers of IIT. Lee and Lloyd (2002) examine IIT in services for 20 OECD countries (1992–1996) and find that higher per capita income significantly increases IIT, whereas overall economic size (GDP) has no significant effect. Their findings suggest that trade imbalances strongly influence IIT and may bias unadjusted IIT measures downward if not accounted for. The study also emphasises that product differentiation, rather than economies of scale, plays a primary role in driving IIT in services.

The role of foreign direct investment (FDI) in promoting IIT is widely recognised. Li et al. (2003) analyse IIT in insurance services across 26 countries (1995–1996) and find that FDI, income similarity, and trade intensity positively influence IIT. In contrast, trade imbalances, differences in market openness, and financial market size reduce it. Sichei et al. (2007) investigate IIT in services between South Africa and the US (1994–2002) and find that US FDI positively influences IIT, reinforcing the idea that MNCs complement, rather than substitute, trade. However, their study also highlights that larger income gaps and smaller market size hinder IIT, as firms in smaller economies struggle to innovate and benefit from economies of scale. Moshirian et al. (2005) extend this analysis to financial services (1997–1999), noting that while economies of scale and product differentiation are important, US MNCs' international activities can lower IIT in banking services by reducing the demand for financial services from other firms.

Market conditions, such as income levels and market size, also play a crucial role in shaping IIT. Studies find that income similarity between trading partners enhances IIT, as demonstrated by Li et al. (2003) and Leitão (2012). Conversely, large income disparities and limited market size restrict IIT, as evidenced by Sichei et al. (2007) in the South Africa-US context.

Research into specific service sectors further refines the understanding of IIT. Leitão (2011, 2012) studies IIT in tourism services between Portugal and its trading partners, finding that geographical proximity and shared borders promote IIT, alongside traditional factors like product differentiation and economies of scale. Similarly, Blašková and Škultéty (2015) examine IIT in air transport services (2000–2011), showing that IIT levels fluctuate across country pairs and time periods, reflecting broader economic and policy changes. Their use of alternative IIT measures, such as the Greenaway-Hine-Milner-Elliot method, highlights the evolving nature of trade patterns in air transport services.

Studies on IIT in services have explored factors like income levels, FDI, trade intensity, and market openness, often focusing on specific sectors such as finance, insurance, and tourism. However, the role of broader structural factors, like monetary unions, in shaping IIT in services remains underexplored. One key challenge is the lack of detailed and consistent data on services trade, which is less comprehensive than merchandise trade data. Studies (e.g., Blašková & Škultéty, 2015; Lee & Lloyd, 2002; Li et al., 2003; Moshirian et al., 2005; Sichei et al., 2007) have highlighted these data limitations. However, recent advancements in data collection have improved this situation, providing more detailed datasets, as discussed in the data section.

In terms of methodology, the Leitão (2012) paper is the closest to our thesis, by applying both the G-L index for measuring IIT and the gravity model to analyse its determinants in the tourism services sector. The G-L index has been used in other studies, including Lee and Lloyd (2002) for multilateral services trade, Li et al. (2003) for insurance services, Moshirian et al. (2005) for financial services, Sichei et al. (2007) for IIT between South Africa and the US, and Blašková and Škultéty (2015) for air transport. Regarding the gravity model, components of the gravity model have been applied by Li et al. (2003) and Moshirian et al. (2005), focusing on factors like per capita income, market openness and trade intensity. This thesis extends these methodologies to study IIT in services within the Eurozone, combining the G-L index with a gravity model framework.

Given the literature on OCA endogeneity and IIT, we postulate that membership of a monetary union raises the level of IIT in services. Hence, our hypotheses are as follows:

H1: Eurozone membership is positively associated with the Grubel-Lloyd index for intra-industry trade in services.
H2: European Union membership is positively associated with the Grubel-Lloyd index for intra-industry trade in services, but to a lesser degree than full Eurozone membership.

3. Methodology

In section 3, we outline our methodology for analysing IIT in services. We begin by defining and measuring IIT, drawing from the foundational works of Grubel and Lloyd (1975) and Fontagné and Freudenberg (1997), while adapting these concepts to the service sector (Section 3.1). We then introduce the structural gravity model as our primary analytical framework, explaining its theoretical foundations (Section 3.2) and modifications for our research (Section 3.3). Finally, we discuss our alternative (Section 3.4) and additional model specifications (Section 3.5).

3.1. Measuring Intra-Industry Trade

Grubel and Lloyd (1975, pp. 4–5) defined industries according to the goods they produce. Consequently, the export and import of similar goods is viewed as IIT. Fontagné and Freudenberg similarly define IIT as the "simultaneous exports and imports within industries" (Fontagné & Freudenberg, 1997, p. 9). For our purposes, we adapt this definition to services by defining IIT as the simultaneous imports and exports of services within a service category—a definition which has been used in previous research on IIT in services. Lee and Lloyd define the industry "by the nature of the service" (Lee & Lloyd, 2002, p. 4). Similarly, Sichei et al. (2007, p. 2) follow Grubel and Lloyd by defining the industry according to the type of services traded. While some studies do not explicitly define "industry," research on trade in services within specific sectors implicitly defines industry by the type of service. These sectors include tourism (Leitão, 2011, 2012), air transport (Blaškova & Škultety, 2015), and "non-merchandise primary insurance services" (Li et al., 2003, p. 4), among others.

Various authors have proposed measures of IIT. However, our theoretical framework primarily draws from the works of Grubel and Lloyd (1975) and Greenaway et al. (1995), which have become the standard approaches for measuring IIT (Brkic, 2014; Černoša, 2012; Jambor & Carlos Leitao, 2016; Molendowski & Polan, 2013). We use the standard G-L index to measure the relative amount of IIT within specific industries (Grubel & Lloyd, 1975). The G-L index (GLI_i) is given by:

$$GLI_i = \frac{X_i + M_i - |X_i - M_i|}{X_i + M_i} \tag{1}$$

Where X_i and M_i are the value of the exports and imports of an industry, valued in the home country's currency, and i = 1, ..., n, where n is the number of industries at a chosen level of aggregation. The index ranges from 0 to 1. A value of 0 indicates no IIT, meaning all trade is inter-industry—there are only imports or only exports in that category between these trade partners. A value of 1 indicates all trade is intra-industry, meaning there is equal volume of imports and exports in that category between these trade partners.

As summarised by Brülhart (2002), the G-L index has four key limitations. First, defining an "industry" is contentious, and statistical classifications are often imperfect, with the three-digit level used more for practicality than accuracy. This issue may be particularly problematic for limited services trade data. Second, the G-L index may be biased by a country's overall trade imbalance, as significant surpluses or deficits negatively skew the values of the G-L index, distorting the measure of IIT. Although Aquino (1978) proposed modifications to mitigate such an imbalance, these methods are debated and often disregarded. Third, the G-L index does not account for the absolute size of trade flows or industry size, suggesting it should be combined with trade openness measures or trade volumes. Lastly, the G-L index is static, capturing trade patterns for only one year, prompting the development of marginal IIT measures to track changes over time.

3.2. Structural Gravity Model

The structural gravity model is a well-established framework for explaining bilateral trade flows, inspired by Newton's law of gravitation (Vargas, 2023; Yotov et al, 2016, p. 12). However, the equation is modified into a more general form for use in economic research. This form has been widely applied in explaining flow variables such as FDI, immigration and trade (Yotov et al, 2016, p.12). In the trade context, the trade flows (X_{ij}) replace the force of attraction, the incomes of the trade partners (Y_i, Y_j) replace the masses of objects in the Newtonian equation, and e^{β_0} takes the place of the gravitational constant. Nevertheless, the analogy with the law of gravitation is not strict. The size of the economy does not necessarily have the power of one ($\beta_{1,2} \stackrel{?}{=} 1$), and the economic distance between the trade partners (D_{ij}) is not necessarily squared ($\beta_3 \stackrel{?}{=} 2$). Instead, the exponents are estimated from the data and represented by β_1, β_2, and β_3 in the model.

This trade gravity model can be modified to account for parameters other than physical proximity between the trade partners. They usually include dummy variables for trade partners that share a border, have sea access, a common language, historical ties, and other research variables of interest (Z_1, Z_2, Z_n). These independent variables may have varying impacts (β_4, β_5, β_{n+3}) on the dependent variable.

In our model, $f(X_{ij})$ represents the expected trade flow based on the incomes of the trade partners (Y_i, Y_j), distance (D_{ij}), and additional trade determinants. It expresses the systematic component of trade, allowing for modifications and estimation. The equation takes the form:

$$f(X_{ij}) = \frac{Y_i^{\beta_1} Y_j^{\beta_2}}{D_{ij}^{\beta_3}} \times e^{\beta_0 + \beta_4 Z_1 + \beta_5 Z_2 + \dots + \beta_{n+3} Z_n} \tag{2}$$

When transforming this equation by taking the natural logarithm of both sides, the equation can be expressed as follows:

$$\begin{aligned} ln(f(X_{ij})) = \ & \beta_0 + \beta_1 ln(Y_i) + \beta_2 ln(Y_j) - \beta_3 ln(D_{ij}) + \\ & + \beta_4 Z_1 + \beta_5 Z_2 + \dots + \beta_{n+3} Z_n \end{aligned} \tag{3}$$

3.3. Basic Model Specification

3.3.1. Dependent Variable

In our case, the dependent variable ($f(X_{ij})$) is the IIT in services measured by the G-L index for trade between reporter country i and its trade partner j in services category k in year t ($GLI_{ij,\,k,\,t}$). We focus on IIT rather than overall trade because IIT, in particular, has been shown to influence business cycle synchronisation between trade partners (Beck, 2019; Frankel & Rose, 1998; Kurihara, 2006), which is central to the economic effects of monetary unions.

Since the gravity model follows the analogy of the law of gravity, the left-hand side variable is expected to be, like the gravitational force, a variable with no upper threshold. Measuring the extent of IIT with the G-L index, therefore, presents a problem, as the value of the G-L index ranges from 0 to 1. To address this, we employ the logistic transformation (logit(x) = ln(x/(1−x))). Usually, the logistic transformation is applied to probabilities, which also range from 0 to 1. Following Leitão (2012), we apply the logistic transformation to the G-L index. Since the index is bounded between 0 and 1, similar to a probability, the transformation maps it onto an unbounded scale, making it more compatible with the gravity model. The resulting variable is often referred to as log-odds; however, because we are transforming the G-L index rather than a probability, we refer to it as a transformed dependent variable.

$$transformed\ dependent\ variable\ = ln(\frac{GLI}{1-GLI}) \qquad (4)$$

This works because the gravity model expects the left side of the equation to range from 0 with no upper bound. In the multiplicative form of the gravity model, the dependent variable is GLI/(1-GLI), which ranges from 0 when the G-L index is 0 to infinity as the G-L index approaches 1, analogous to gravitational force. In the logarithmic form of the gravity model, the transformed dependent variable (ln(GLI/(1-GLI)) appears on the left side of the equation and ranges from negative to positive infinity. Because the dependent variable is undefined when the G-L index is 0 or 1, in an alternative set of regressions, instead of dropping these observations, we replace 0 with the minimum non-zero value in the sample and 1 with the maximum value that is less than 1.

3.3.2. Independent Variables

We measure the size of the economy by the real gross domestic product (GDP) for countries i and j in the year t ($GDP_{i,\ t}$, $GDP_{j,\ t}$). We use country-pair time-invariant fixed effects (μ_{ij}) following the recommendation of the World Trade Organization (Yotov et al. 2016, p. 21). The country-pair fixed effects subsume all economic distance variables that do not change over time, such as the distance between trade partners, the presence of a common border, sea access, a common language, historical ties and other similar variables. Additionally, we include category-time fixed effects ($\mu_{k,t}$), which subsume all service industry-specific global trends over time.

To control for reporter and partner exchange rate regimes other than the Eurozone, we build on the methodology of Klein and Shambaugh (2006). They successfully employ exchange rate regime dummy variables in a gravity model to estimate the effect of fixed pegs and currency union membership on trade. While dummy variables distinguish discrete categories, they do not capture the graded nature of exchange rate arrangements. To address this, we construct an exchange rate regime ordinal variable for the reporter ($XRA_{i,t}$) and partner countries ($XRA_{j,t}$). We do this in two alternative ways. First, we use the exchange rate regime classifications provided by the IMF (International Monetary Fund, 2004). The IMF classifies exchange regimes into 7 de facto arrangement categories. We use this for our exchange regime ordinal variable, which ranges from 1 for a currency board to 7 for a freely floating exchange rate regime. When a country is a Eurozone member, then the exchange rate regime ordinal variable is 1 (same as for a currency board). If for a given country the IMF does not classify the exchange rate arrangement, then the exchange rate regime ordinal variable is 0, and a dummy variable for unclassified exchange rate regimes takes the value of 1. In the second approach, we aggregate the 7 IMF exchange rate regimes into 3 broader categories—fixed peg, soft peg, and freely floating arrangements.

Finally, the main variable of interest is the Eurozone membership dummy ($EUZ_{ij,t}$), which takes the value of 1 for observations where reporter i and trade partner j in year t are both Eurozone members. This variable is central to our analysis. We use this variable to capture the impact of monetary union membership on IIT in services. The estimate of that effect, represented by β_3, is what we are interested in.

The primary regression specification in logarithmic form is therefore:

$$ln(\frac{GLI_{ij,k,t}}{1-GLI_{ij,k,t}}) = \beta_0 + \beta_1 ln(GDP_{i,t}) + \beta_2 ln(GDP_{j,t}) + \\ + \beta_3 EUZ_{ij,t} + \beta_n XRA_{i,t} + \beta_m XRA_{j,t} + \mu_{ij} + \mu_{k,t} + \varepsilon_{ij,k,t} \quad (5)$$

3.4. Alternative Model Specification with Control Variables

In an alternative regression specification, we decompose the economic size variable previously measured by GDP into GDP per capita and population for both the reporter and partner country ($GDPpc_{i,t}$, $POP_{i,t}$ and $GDPpc_{j,t}$, $POP_{j,t}$), as done, e.g., by Faruqee (2004). In addition, we include several control variables to account for other country-specific influences on the level of IIT in services that are independent of monetary union membership.

Trade openness ($OPEN_{i,t}$, $OPEN_{j,t}$) controls for differing levels of trade barriers. As trade openness can vary over time, country-pair fixed effects in the basic regression specification are not sufficient to account for differences in trade openness. Therefore, we include the trade openness measure as a control variable. Similar approaches to including trade openness have been explored in the literature, with Rasoulinezhad and Wei (2017) using composite trade intensity as an alternative measure of trade openness.

The Human Development Index ($HDI_{i,t}$, $HDI_{j,t}$) and the Economic Freedom Index ($EF_{i,t}$, $EF_{j,t}$) control for overall economic development and opportunities within a country. As a society develops economically, its economic activity shifts from the primary agricultural sector to the secondary industrial production sector, and later to the tertiary services sector (World Bank, 2021). Consequently, more economically developed and free countries are likely to have larger service sectors and, as a result, more trade in services, including IIT in services. Previous studies, such as Tang et al. (2024), have incorporated the HDI and components of economic freedom into their analysis, while Sonora (2013) specifically utilised the Fraser Institute's Economic Freedom Index to examine economic freedom's impact.

The secondary regression specification is therefore:

$$ln(\frac{GLI_{ij,k,t}}{1-GLI_{ij,k,t}}) = \beta_0 + \beta_1 ln(GDPpc_{i,t}) + \beta_2 ln(GDPpc_{j,t}) + \beta_3 ln(POP_{i,t}) + \beta_4 ln(POP_{j,t}) + \\ + \beta_5 OPEN_{i,t} + \beta_6 OPEN_{j,t} + \beta_7 EF_{i,t} + \beta_8 EF_{j,t} + \beta_9 HDI_{i,t} + \beta_{10} HDI_{j,t} + \\ + \beta_3 EUZ_{ij,t} + \beta_n XRA_{i,t} + \beta_m XRA_{j,t} + \mu_{ij} + \mu_{k,t} + \varepsilon_{ij,k,t} \tag{6}$$

3.5. Additional Model Specifications for Robustness

To ensure the robustness of our results, we test additional specifications of our dependent variable, $f(GLI_{ij,k,t})$. While our primary model specification assumes the function $f(GLI_{ij,k,t})$ is the logistic transformation of the G-L index, which maps it to an unbounded scale, a possible alternative assumption is that the function $f(GLI_{ij,k,t})$ is the exponent of the G-L index ($f(GLI_{ij,k,t}) = exp(GLI_{ij,k,t})$). This is similar to the dependent variable used by Akram and Mahmood (2012). When we take the natural logarithm of both sides of the regression equation, this results in:

$$GLI_{ij,k,t} = \beta_0 + \beta_1 ln(GDP_{i,t}) + \beta_2 ln(GDP_{j,t}) + \\ + \beta_3 EUZ_{ij,t} + \beta_n XRA_{i,t} + \beta_m XRA_{j,t} + \mu_{ij} + \mu_{k,t} + \varepsilon_{ij,k,t} \tag{7}$$

The second additional specification assumes a dependent variable function of $f(GLI_{ij,k,t}) = GLI_{ij,k,t}$. This approach maintains a simpler interpretation of results and is commonly used in empirical work (e.g., Faustino & Peixoto, 2013). However, since the dependent variable (GLI) remains bounded between 0 and 1, this specification may lead to biased coefficient estimates when values approach the extreme ends of the distribution. In the logarithmic form, the regression equation is:

$$ln(GLI_{ij,k,t}) = \beta_0 + \beta_1 ln(GDP_{i,t}) + \beta_2 ln(GDP_{j,t}) + \\ + \beta_3 EUZ_{ij,t} + \beta_n XRA_{i,t} + \beta_m XRA_{j,t} + \mu_{ij} + \mu_{k,t} + \varepsilon_{ij,k,t} \tag{8}$$

Because the dependent variable is undefined when the G-L index is 0, in an alternative set of regressions, instead of dropping these observations, we replace 0 with the minimum non-zero value in the sample, similar to what we did for the transformed dependent variable.

In addition to the three different dependent variable specifications, we vary our analysis using two levels of services category trade data (three-digit and four-digit service categories) and two exchange rate regime groupings (the original 7 IMF and 3 broader exchange rate regime categories). We estimate the results in the basic gravity model specification and the specification including additional control variables. This results in 24 different regressions where the variable of interest is the Eurozone dummy variable ($EUZ_{ij,t}$). These results are discussed in Section 5.2 of this thesis.

Finally, we replace the Eurozone dummy variable ($EUZ_{ij,t}$) with a dummy variable for EU membership ($EU_{ij,\,t}$), where the value is 1 when both countries are EU members and 0 otherwise. We estimate all of the previous 24 regression specifications again. These results are discussed in Section 5.3 of this thesis.

4. Data

In this section, we provide an overview of the data sources and variables used in our analysis. Given that we use the G-L index to measure IIT, we require detailed data on trade in services. We obtain it from Eurostat (Section 4.1). In addition to trade data, we incorporate other essential variables, including exchange rate regime classifications from the IMF and GDP data from the United Nations Statistics Division (Section 4.2).

4.1. Trade in Services Data

To calculate the G-L index, we need detailed data on trade in services, categorised by both reporting and partner countries as well as by service type. For this, we use Eurostat (Eurostat, 2014a, 2014b, 2024), which provides two key datasets on international trade in services:

1. *BPM5 (Balance of Payments Manual, 5th edition)*: Covers 1985–2013 (Eurostat, 2014a, 2014b). The data were retrieved in October 2024.
2. *BPM6 (Balance of Payments Manual, 6th edition)*: Covers 2010–2022, with minimal data available for 2023 (Eurostat, 2024). The data were retrieved in October 2024.

The Eurostat datasets are compiled from national enterprise surveys, International Transaction Systems, and administrative records, and the data are adjusted for statistical discrepancies. The Balance of Payments and International Investment Position, including trade in services, was compiled using the BPM5 up to 2012. From 2013 onward, the methodology was updated to follow the BPM6, which introduced more detailed and refined standards. This change aligned with the broader international accounting frameworks outlined in the 2008 System of National Accounts and the 2010 European System of National and Regional Accounts. The transition was formalised through European Commission Regulation 555/2012, which replaced earlier rules to improve the accuracy and consistency of data.

The disaggregation level of the BPM6 dataset is considerable: it comprises 41 three-digit classification categories (e.g. SC1 for *sea transport*) and 51 four-digit classification level categories (e.g., SC11 for *sea transport for passengers*). Further breakdowns are available up to the six-digit level, although the number of observations drops significantly at that level. There are around 275 thousand observations at the three-digit classification level, covering 39 reporter countries and 67 partners, and around 300 thousand observations at the four-digit level, covering 36 reporters and 67 partners. See Appendix A.

A key challenge in this study is the change in classification between the BPM5 and the BPM6. To address this, we employed the United Nations' official correspondence table (United Nations, n.d.) to map the BPM5 records into the BPM6 categories. We validated the conversion by applying the correspondence table to the BPM5 data for 2010–2012, when both systems were in use, and comparing the resulting values with the original BPM6 data for the same period. After conversion, we retained 41 unique three-digit and 51 unique four-digit categories.

Some categories had a direct 1:1 mapping, while others required adjustments due to reclassification or new categories in the BPM6. Of the 259,757 observations overlapping between the two datasets, 43% matched exactly, with most mismatches arising where the BPM5 data lacked the BPM6 counterparts. The correlation coefficients between matched trade values in the BPM5 and BPM6 datasets were 0.91 for exports and 0.89 for imports at the three-digit level, and 0.94 for exports and 0.91 for imports at the four-digit level.

The number of observations and unique reporter-partner pairs at each category level, along with the fraction of successfully matched observations, supports using the three-digit and four-digit levels in our regression analysis. Further details on the conversion, category mappings, and statistical comparisons are in Appendix B.

4.2. Other Variables

In addition to trade data, we compiled a range of economic and institutional variables from multiple sources. De facto exchange rate regime classifications—used in all regression specifications—were obtained from the International Monetary Fund (n.d.). For the basic regressions, we used GDP data from the United Nations Statistics Division (n.d.). The alternative regression specifications incorporated additional variables: GDP per capita (UNdata, 2025), population (United Nations Population Division, 2024), trade openness (World Bank Group, 2025), the Index of Economic Freedom (Heritage Foundation, 2025), and the Human Development Index (United Nations Development Programme, 2024). For details on data coverage and measurement units, see the summary in Table 1.

Data Series	Source	Coverage	Measure	Retrieval Date
Exchange rate regime	International Monetary Fund, n.d.	194 jurisdictions, 1999–	De facto exchange rate classification	November 2024
Real GDP	United Nations Statistics Division, n.d.	UN member states & territories, 1970–	Constant 2015 US$	November 2024
GDP per capita, PPP	UNdata, 2025	247 countries & areas, 1970–	Constant 2017 international $ per capita	February 2025
Population	United Nations Population Division, 2024	195 countries & territories, 1950–	Total population	February 2025
Trade openness	World Bank Group, 2025	217 economies, 1960–	Exports + imports as % of GDP	February 2025
Index of Economic Freedom	Heritage Foundation, 2025	184 countries, 1995–	Composite score 0–100	February 2025
Human Development Index	United Nations Development Programme, 2024	193 countries & territories, 1990–	Composite index 0–1	February 2025

Table 1. This table, created by the authors, summarises the data sources, coverage, measurement units, and retrieval dates for all key variables used in our regressions.

5. Analysis of Results

In this section, we present the results of our empirical analysis of IIT in services within the Eurozone and the EU. We begin with Section 5.1, which provides descriptive statistics. In Section 5.2, we report the results from the structural gravity model estimation, focusing on the effects of Eurozone membership. Finally, Section 5.3 presents robustness checks and sensitivity analyses to assess the stability of our findings.

5.1. Descriptive Statistics

In our dataset, the trade balance is predominantly characterised by values close to zero, with a median of zero for both category level 3 and level 4 observations, and mean values of 3 and -1 for levels 3 and 4, respectively. The G-L index averages 0.42 for the level 3 classification and 0.36 for the level 4 classification, indicating a moderate overlap in exports and imports, though the wide range from 0 to 1 suggests that the situation differs significantly across services categories. 25% of observations have a G-L index of 0 on the level 3 classification and 32% on the level 4 classification. This is the case when there are only imports or only exports in a given year t in the services category k between reporter i and trade partner j.

We calculated the G-L index and merged this data with GDP data, as outlined in the methodology section. The partner GDP figures imply that larger economies appear more frequently as trade partners, as the mean and median partner GDP are larger than the mean and median reporter GDP. See Table 2 below for further details and Appendix C for additional variables included in our regressions.

Variable	Units	Mean	SD	Min	Q1	Median	Q3	Max
Category level 3 observations								
Exports	million EUR	98	669	0	0	3	22	50,098
Imports	million EUR	94	659	0	0	2	20	102,302
Balance	million EUR	3	462	-97,000	-2	0	3	27,321
G-L index	0–1	0.42	0.35	0	0	0.40	0.73	1
Reporter GDP	million USD	770,551	1,769,151	4,047	54,298	234,783	528,802	16,974,618
Partner GDP	million USD	1,200,467	2,852,643	3,569	168,780	364,602	1,175,600	21,236,276
Category level 4 observations								
Exports	million EUR	30	168	0	0	1	9	12,825
Imports	million EUR	32	187	0	0	1	9	28,103
Balance	million EUR	-1	174	-24,318	-2	0	2	9,859
G-L index	0–1	0,36	0,35	0	0	0,29	0,67	1
Reporter GDP	million USD	692,712	1,535,400	4,047	55,137	233,172	528,802	16,974,618
Partner GDP	million USD	1,264,675	2,964,195	3,569	0	381,082	1,213,294	21,236,276

Table 2. This table, created by the authors, presents descriptive statistics for key trade and economic variables categorised into level 3 and level 4 observations. The variables include exports, imports, trade balance, the G-L index, and GDP figures for both the reporting and partner countries. All monetary values are expressed in millions of EUR (for trade variables) or USD (for GDP). The statistics include the mean, standard deviation (SD), minimum (Min), first quartile (Q1), median, third quartile (Q3), and maximum (Max).

5.2. Results from the Structural Gravity Model Estimation

To investigate the effect of Eurozone membership on IIT in services, we estimated 24 regression specifications to test robustness across service aggregation, exchange rate regimes, additional controls, and alternative dependent variables.

First, we ran regressions at both the three-digit (Category 3) and four-digit (Category 4) service levels. Second, we tested two exchange rate regime schemes: the IMF's original classification (Section A) and an aggregated version with four groups (fixed peg, soft peg, freely floating, and other; Section B). Third, we employed three dependent variables—the logistically transformed G-L index (Section 5.2.1), the untransformed G-L index (Section 5.2.2), and the natural logarithm of the G-L index (Section 5.2.3).

Half of these regressions followed the basic model specification, and Table 3 below presents their results.

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				***Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)***			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Dependent Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Logistic transformation	0.0462	0.2010	0.0734	0.0773	0.0421	0.2577	0.0785	0.0603
G-L index	0.0090	0.1498	0.0163	0.0195	0.0066	0.3046	0.0156	0.0275
Ln of G-L index	0.0435	0.0495	0.0579	0.0299	0.0457	0.0455	0.0641	0.0175

Table 3. This table, created by the authors, summarises the regression results for the basic model specification and presents the beta coefficients and p-values for the Eurozone dummy variable. The regressions use three different dependent variables: the logistically transformed G-L index, the unaltered G-L index, and the natural logarithm of the G-L index. The regressions are varied by service category and exchange rate regime classification. The effects of reporter and partner GDP, exchange rate regimes, country-pair fixed effects, and year fixed effects are included in the models but not reported here.

The other half incorporated alternative explanatory variables, including decomposed reporter and partner GDP into GDP per capita and population, trade openness, the HDI, and the economic freedom index. The results of these extended regressions are summarised in Table 4.

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				*Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)*			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Dependent Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Logistic transformation	0.0355	0.3250	0.0525	0.0466	0.0330	0.3730	0.0590	0.0265
G-L index	0.0073	0.2398	0.0170	0.0145	0.0053	0.4087	0.0162	0.0213
Ln of G-L index	0.0376	0.0906	0.0525	0.0466	0.0409	0.0728	0.0590	0.0265

Table 4. This table, created by the authors, summarises the regression results for the alternative model specification and presents the beta coefficients and p-values for the Eurozone dummy variable. The regressions use three different dependent variables: the logistically transformed G-L index, the unaltered G-L index, and the natural logarithm of the G-L index. The regressions are varied by service category and exchange rate regime classification. The effects of reporter and partner GDP per capita, population, trade openness, the HDI, the economic freedom index, exchange rate regimes, country-pair fixed effects, and year fixed effects are included in the models but not reported here.

5.2.1. Logistically Transformed Dependent Variable

The regression results using the transformed dependent variable, based on the basic gravity model specification, are presented in Table 3. Eurozone membership has a statistically significant effect on the transformed dependent variable (at the 10% level) only for Category 4 data. However, the effect remains consistently positive across the basic gravity model specifications and for both the three-digit and four-digit industry data.

Table 4 introduces decomposed variables for reporter and partner GDP (per capita and population), along with additional control variables such as trade openness, the HDI, and the economic freedom index. The results show a similar trend, with Eurozone membership being statistically significant at the 5% level for Category 4 data. In this case, Eurozone membership is associated with a 5.25% to 5.90% increase in the transformed dependent variable (GLI) for Category 4.

Appendix E (Tables E.1–E.2), where G-L index values of 0 were replaced with the minimum non-zero value in the data sample, and G-L index values of 1 were replaced with the maximum value less than 1, confirms the directional consistency of the Eurozone membership effect, with coefficients remaining positive across specifications. However, statistical significance diminishes.

In summary, the gravity model regressions using the transformed dependent variable do not support the hypothesis, as Eurozone membership does not exhibit a strongly statistically significant effect on IIT.

5.2.2. G-L Index as the Dependent Variable

When the G-L index is the dependent variable, the effect of Eurozone membership remains consistently positive across all basic gravity model specifications for both three-digit and four-digit industry data (Table 3). However, it meets the common threshold of statistical significance ($p < 0.05$) only for Category 4 data. In practical terms, based on Category 4 data, when both trade partners are Eurozone members, the G-L index is, on average, approximately 0.0156 to 0.0163 higher compared to cases where only one or neither partner is a member.

In Table 4, where reporter and partner GDP are decomposed into GDP per capita and population, with additional control variables, the results remain broadly consistent. For Category 4 data, the Eurozone dummy retains a positive sign and is statistically significant at the 5% level, with coefficients ranging from 0.0162 to 0.0170. This suggests that when both trade partners are Eurozone members, the G-L index is, on average, 0.0162 to 0.0170 higher than when only one or neither partner is a member. While the effect is also positive for Category 3 data, it is not statistically significant.

Overall, the gravity model regressions with the G-L index as the dependent variable partially support the hypothesis that Eurozone membership is associated with higher levels of IIT.

5.2.3. Natural Logarithm of GLI as the Dependent Variable

The effect of Eurozone membership on ln(GLI) as the dependent variable remains consistently positive across all basic gravity model specifications for both three-digit and four-digit industry data (Table 3). The results reach the common statistical significance threshold ($p < 0.05$) in all four cases. The estimated coefficients range from 0.0435 to 0.0641, suggesting a modest but positive association with IIT. In practical terms, when both trade partners are Eurozone members, the G-L index is, on average, 4.35% to 6.41% higher compared to cases where only one or neither partner is a member.

In Table 4, where reporter and partner GDP are decomposed into GDP per capita and population, with additional control variables, the results remain consistent. The Eurozone dummy retains a positive sign, with coefficients ranging from 0.0376 to 0.0590, indicating that when both trade partners are Eurozone members, the G-L index is, on average, 3.76% to 5.90% higher compared to cases where only one or neither partner is a member. In Category 3, these results are statistically significant at the 10% level, while for Category 4, they are statistically significant at the 5% level.

Appendix E (Tables E.5–E.6), where G-L index values of 0 were replaced with the smallest non-zero value in the dataset, confirms the directional consistency of the Eurozone membership effect, with coefficients remaining positive across specifications. However, statistical significance weakens.

Overall, the results from the gravity model regressions with the dependent variable ln(GLI) support our hypothesis that Eurozone membership is associated with higher levels of IIT.

5.3. Robustness Checks and Sensitivity Analysis

We conducted a robustness test by analysing EU membership in addition to Eurozone membership. In this test, we replaced the Eurozone dummy variable with an EU membership dummy variable while keeping all other factors unchanged. This approach was taken because joining the EU is a prerequisite for eventual Eurozone integration, requiring a commitment to work toward adopting the euro. Given this relationship, we expect EU membership to have similar (positive) effects on IIT.

Tables 5 and 6 correspond to Tables 3 and 4, respectively, but with the EU dummy replacing the Eurozone dummy. Table 5 shows the basic model specification regressions.

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				***Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)***			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Dependent Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Logistic transformation	0.0637	0.1430	0.0959	0.0190	0.0642	0.1400	0.0981	0.0163
G-L index	-4.00e-04	0.9615	-0.0120	0.1297	-8.00e-04	0.9164	-0.0122	0.1234
Ln of G-L index	0.0440	0.0778	0.0673	0.0098	0.0451	0.0719	0.0693	0.0085

Table 5. This table, created by the authors, summarises the regression results for the basic robustness check model specification and presents the beta coefficients and p-values for the EU dummy variable.

The regressions use three different dependent variables: the logistically transformed G-L index, the unaltered G-L index, and the natural logarithm of the G-L index. The regressions are varied by service category and exchange rate regime classification. The effects of reporter and partner GDP, exchange rate regimes, country-pair fixed effects, and year fixed effects are included in the models but not reported here.

Table 6 presents the extended regressions incorporating alternative explanatory variables, including decomposed GDP, trade openness, the HDI, and the economic freedom index.

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				***Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)***			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Dependent Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Logistic transformation	-0.0022	0.9620	0.0506	0.0663	0.0008	0.9860	0.0545	0.0504
G-L index	-0.0152	0.0547	-0.0109	0.0163	-0.0155	0.0504	-0.0193	0.0151
Ln of G-L index	0.0074	0.7798	0.0506	0.0663	0.0106	0.6907	0.0545	0.0504

Table 6. This table, created by the authors, summarises the results for the alternative robustness check model specification and presents the beta coefficients and p-values for the EU dummy variable. The regressions use three different dependent variables: the logistically transformed G-L index, the unaltered G-L index, and the natural logarithm of the G-L index. The regressions are varied by service category and exchange rate regime classification. The effects of reporter and partner GDP per capita, population, trade openness, the HDI, the economic freedom index, exchange rate regimes, country-pair fixed effects, and year fixed effects are included in the models but not reported here.

5.3.1. Logistically Transformed Dependent Variable

The effect of EU membership on the transformed dependent variable is statistically significant at the 5% level for four-digit industry data, as shown in the basic gravity model specification (Table 5). Based on Category 4 data, EU membership is associated with an increase in the transformed dependent variable ranging from 0.0959 to 0.0981. This indicates that when both trade partners are EU members, the transformed dependent variable (GLI) is between 9.59% and 9.81% higher compared to cases where neither or only one partner is an EU member.

In Table 6, where reporter and partner GDP are decomposed into GDP per capita and population with additional control variables, the effect of EU membership on the transformed dependent variable is statistically significant at the 10% level only for four-digit industry data.

Appendix E (Tables E.3–E.4), where G-L index values of 0 were replaced with the minimum non-zero value in the data sample, and G-L index values of 1 were replaced with the maximum value less than 1, directly contradicts these findings, showing negative and statistically significant coefficients for the EU dummy.

Overall, the results from the gravity model regressions using the transformed dependent variable do not support our hypothesis that EU membership is associated with higher IIT.

5.3.2. G-L Index as the Dependent Variable

The effect of EU membership on the G-L index as the dependent variable is consistently negative across the basic gravity model specifications and three-digit and four-digit industry data, though the results are not statistically significant (Table 5).

In Table 6, where reporter and partner GDP are decomposed into GDP per capita and population, and additional control variables are included, the EU dummy consistently shows a negative sign. The results are statistically significant at the 10% level for three-digit industry data and at the 5% level for four-digit industry data. This indicates that when both trade partners are EU members, the G-L index is approximately 0.00109 to 0.00193 lower compared to cases where only one or neither partner is an EU member.

Overall, the results from the gravity model regressions with the dependent variable being the G-L index are not consistent with our hypothesis that EU membership is associated with more IIT.

5.3.3. Natural Logarithm of GLI as the Dependent Variable

The effect of EU membership on ln(GLI) as the dependent variable is consistently positive across the basic gravity model specifications for both three-digit and four-digit industry data (Table 5). The results are statistically significant at the 10% level for three-digit industry data and at the 1% level for four-digit industry data. In practical terms, when both trade partners are EU members, the G-L index is between 4.40% and 6.93% higher compared to cases where only one or neither partner is a member.

In Table 6, where reporter and partner GDP are decomposed into GDP per capita and population, and additional control variables are included, the results remain broadly consistent. The EU dummy retains a positive sign; however, these results are only statistically significant for Category 4 data at the 10% level.

Appendix E (Tables E.7–E.8), where G-L index values of 0 were replaced with the minimum non-zero value in the data sample, contradicts these findings, showing negative and statistically significant coefficients for the EU dummy.

In short, the results from the gravity model regressions with ln(GLI) as the dependent variable are not entirely consistent with our hypothesis that EU membership is associated with more IIT.

6. Discussion

In this section, we explore the association between Eurozone and EU membership with the level of IIT in services (Section 6.1) and contrast our findings with existing literature on economic integration and OCA theory (Section 6.2). We then discuss the theoretical and practical implications of our findings (Section 6.3).

6.1. Eurozone/European Union Membership and Intra-Industry Trade in Services

In the introduction, we argued that IIT is crucial for the monetary integration of currency union members because it supports business cycle synchronisation and therefore reduces the costs of giving up a sovereign currency. In this paper, we investigate the endogeneity effect of joining a monetary union, which may increase IIT in services ex-post. We find that Eurozone membership is associated with a higher IIT. This relationship is particularly evident in the four-digit service categories data. For example, in models using the natural logarithm of the G-L index, Eurozone membership is associated with a 4–6% increase in IIT for four-digit services, though statistical significance was marginal (e.g., 10% in some specifications). These findings do not refute the endogeneity hypothesis and may suggest that adopting a single currency may foster economic integration in the services sector. However, these results vary considerably in effect size and statistical significance across the model specifications.

The variation in results across the different transformations of the G-L index can be partially explained by how each method handles the bounded nature of the index (ranging from 0 to 1). The logistic transformation, which is designed to map the G-L index onto an unbounded scale (Leitão, 2012), yields fragile results (significant only at 5–10% for four-digit sectors), particularly when the index values are near the lower or upper bounds (0 or 1). This causes instability in the estimated effect of Eurozone membership on IIT because small variations in the data disproportionately affect the results.

In contrast, the logarithmic transformation uses a more compressed scale of the G-L index than the logistic transformation, reducing the impact of extreme values and allowing for a more stable relationship between Eurozone membership and IIT. As a result, the logarithmic transformation produced more consistently significant Eurozone effects (5–10% levels), with coefficients indicating a 4–6% increase in IIT for detailed four-digit services.

Finally, the untransformed G-L index, although used in research because of its simple interpretation (Akram & Mahmood, 2012), conflicts with the trade gravity model, which expects an unbounded dependent variable. Thus, this specification produces weaker results (5% significance only for four-digit data), with only marginal significance in some specifications. This suggests that a more compressed scale of the dependent variable produces more consistent estimates. Therefore, the choice of transformation plays an important role in determining the robustness of the results when estimating the effect of Eurozone membership on IIT.

Compared to the Eurozone membership, EU membership alone does not meaningfully show an association with higher IIT in services. Results were inconsistent across regression functional forms. While models with ln(GLI) as the dependent variable showed weak positive associations between EU membership and IIT (1–10% significance for four-digit sectors), linear and logistic dependent variable specifications often produced negative or insignificant coefficients. Part of this can be explained, as previously, by the differences in the dependent variable, but another key factor lies in the varying degrees of commitment among EU members toward euro adoption.

Although EU membership entails a theoretical commitment to eventually joining the Eurozone, in practice, not all EU members are moving toward euro adoption. Some EU countries maintain exchange rate arrangements that do not comply with the convergence criteria required for Eurozone membership. For example, the IMF classifies the de facto exchange rate regimes of Poland and Sweden as freely floating, while Czechia, Hungary, and

Romania maintain managed float exchange rate regimes (International Monetary Fund, n.d.). These countries are not aligning their economic policies and structures with the Eurozone members and are not in practice approaching Eurozone membership. In contrast, the Eurozone member countries have a common currency and therefore the same monetary policy, which fosters economic integration and a higher level of IIT. While we included EU membership as a proxy for approaching Eurozone membership, in practice, EU membership is heterogeneous in terms of commitment to euro adoption. Therefore, EU membership is a flawed proxy for monetary integration and produces unstable results with regard to the association between monetary union membership and the level of IIT in services.

Our findings also indicate that, in several regression specifications, partner GDP and GDP per capita have a greater and more statistically significant effect on IIT than the respective reporter variables (see Appendix D). One possible explanation for this asymmetry is that reporters, mostly wealthier EU countries, exhibit relatively homogeneous GDP per capita compared to the rest of the world, which includes both significantly richer and poorer economies. Variation among trade partners outside the EU is more pronounced than within the EU and therefore has a more significant effect on IIT.

Among partner variables, GDP per capita has a more pronounced positive association with IIT than population. This finding aligns with the absorption hypothesis, first introduced by Alexander (1952, 1959), which suggests that larger domestic populations consume a greater share of domestically produced goods and services, limiting the extent of trade and reducing IIT. In contrast, wealthier trade partners may have more diversified consumption patterns and production structures, facilitating greater IIT. These results reinforce the idea that economic structure and market size play an important role in determining trade patterns, complementing institutional factors such as monetary union membership.

6.2. Comparison with Existing Literature

Our findings partially differ from the existing literature on IIT and economic integration. Although economic integration is widely believed to boost IIT in goods—evidenced by a range of studies that document enhanced trade flows, increased business cycle synchronisation, and structural realignment among monetary union member countries, whether in the context of the Eurozone, EU, or broader European integration processes and regional agreements (Beck, 2019; Cortinhas, 2007; Dautovic et al., 2014; Faruqee, 2004; Fidrmuc, 2004; Kawecka-Wyrzykowska, 2017; Kurihara, 2006; Li, 2017; Shin & Wang, 2003; Steinert & Althammer, 2024)—our results indicate that the effect of economic integration on IIT in services are notably weaker.

Several factors may explain why our results differ from the existing literature. First, services trade inherently differs from goods trade. Services face more regulatory barriers, such as licensing requirements and legal restrictions, that hinder cross-border IIT (Shepherd & Hoekman, 2020). Furthermore, unlike goods, which can be standardised, exchanged in large quantities and be a part of a vertically specialised supply chain, many services are non-tradable or location-dependent, customised and difficult to replicate across markets, reducing the potential for intra-industry specialisation.

Additionally, differences in coverage may also play a role in the observed discrepancies. Studies such as those by Moshirian et al. (2005) and Blašková and Škultéty (2015) focus on specific sectors or bilateral trade relationships, limiting the generalisability of their findings to broader regional contexts like the Eurozone. Differences in economic structures and trading patterns across EU countries and service categories may influence the extent to which an association with IIT in services is observed.

6.3. Theoretical and Practical Implications

Our findings contribute to the ongoing discussion on the endogeneity of OCA criteria, particularly with respect to IIT. Frankel and Rose's (1998) hypothesis suggests that monetary union participation leads to greater economic synchronisation and trade integration over time. If this holds, Eurozone membership should be linked to higher levels of IIT. We find partial support for this idea, as Eurozone membership appears to have a net integration effect. This suggests that joining a monetary union, such as the Eurozone, could enhance trade integration in services and better align business cycles across member states. However, the absence of consistently strong statistical significance highlights the need for further research to confirm this relationship.

In addition, the integration effect of joining a monetary union appears more pronounced in countries with large service sectors, as IIT in services fosters structural alignment. This pattern may indicate that service-oriented economies are particularly well-positioned to benefit from monetary union membership, assuming that complementary policies are in place to address sector-specific barriers.

7. Limitations

Our research has several limitations that warrant consideration. First, the transition from the BPM5 to the BPM6 services categorisation system—including differences in how service categories are defined and reported across years and countries—may have introduced inconsistencies in service trade measurements. While our fixed effects approach—including reporter-partner country-pair time-invariant fixed effects, which account for all economic distance variables that do not change over time, and category-time fixed effects, which capture all global trends specific to each service category—helps control for systematic differences in classification and reporting, these controls cannot fully account for asynchronous changes in data granularity between countries. Additionally, although advances in data collection have improved the measurement of services IIT, significant gaps remain compared to goods trade data. In our dataset, the number of observations decreased notably at finer sectoral levels, reflecting inconsistent reporting across countries. These inconsistencies may obscure the observed Eurozone effects, highlighting the need for more robust and consistent statistics to draw clearer conclusions.

Second, we do not include exporter-product-time and importer-product-time fixed effects, which are often used to control for multilateral resistance in pooled trade data (Yotov et al., 2016, p. 23). We also omit reporter- and partner-time fixed effects, which can capture unobserved, time-varying country-specific factors. The absence of these fixed effects means our estimates may not fully isolate the effects of monetary union membership and could attribute unrelated economic shifts to it. Moreover, although our empirical approach accounts for various structural factors, the relatively simple model may not capture all dynamic adjustments in service trade flows.

Third, we do not examine the heterogeneous progression of EU members toward Eurozone accession. Countries like Poland and Romania are at different stages of meeting convergence criteria, and their preparedness for monetary union may shape pre-adoption trade patterns. By omitting analysis of how partial progress toward euro adoption influences IIT, we overlook potential intermediate integration mechanisms.

Lastly, our method likely underestimates the Eurozone's effect on IIT in services. This is because the Eurozone's founding countries (Austria, BeNeLux, Finland, France, Germany, Ireland, Italy, Portugal, and Spain) adopted the Euro in 1999—the same year the IMF began publishing its de facto exchange rate arrangement reports. As a result, our dataset contains no observations from before the Euro's introduction, preventing us from comparing IIT before and after Euro adoption for these countries. Furthermore, since we include country-pair fixed effects in our regressions, any impact of Eurozone membership on IIT among the founding countries is absorbed by these reporter-partner fixed effects rather than attributed to the Eurozone membership variable. Given that the Eurozone founding members are large economies relative to their trade partners, our data limitations likely lead to a significant underestimation of the true effect of Eurozone membership on IIT in services.

8. Conclusions

Throughout this paper, we have strived to answer the research question: *What is the effect of Eurozone membership on IIT in services?* While the results are inconclusive, they suggest that Eurozone membership is associated with a weak but positive effect on IIT in services, particularly in more detailed four-digit service sectors. Our research does not provide conclusive evidence to reject the endogeneity hypothesis, which suggests that countries may come to resemble an OCA after joining a monetary union. It appears that trade in services behaves similarly to trade in goods, with IIT in services being higher when trade partners are members of the Eurozone.

Despite these findings, challenges in measuring services trade and inconsistencies in the data complicate the interpretation. Variations in results across different transformations of the G-L index, particularly due to its bounded nature, highlight the importance of methodological choices in determining the robustness of the results.

By examining the relationship between Eurozone membership and IIT in services, we contribute to the broader discussion on economic integration and trade dynamics within the Eurozone. While our findings are not robust enough to draw firm conclusions, they indicate that Eurozone membership may foster some level of integration in services trade. Further research is needed to refine these results, address data limitations, and explore other factors, such as the heterogeneous progress of EU members towards full monetary union, that may influence IIT in services.

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10. Appendices

Appendix A. Detailed Overview of the BPM6 Dataset by Category Fineness Level

Figure A.1 summarises the BPM6 dataset, showing around 275,000 observations at the three-digit level and around 300,000 at the four-digit level across service categories. Figure A.2 shows around 35,000 reporter-partner country combinations at the three-digit level and nearly 40,000 at the four-digit level.

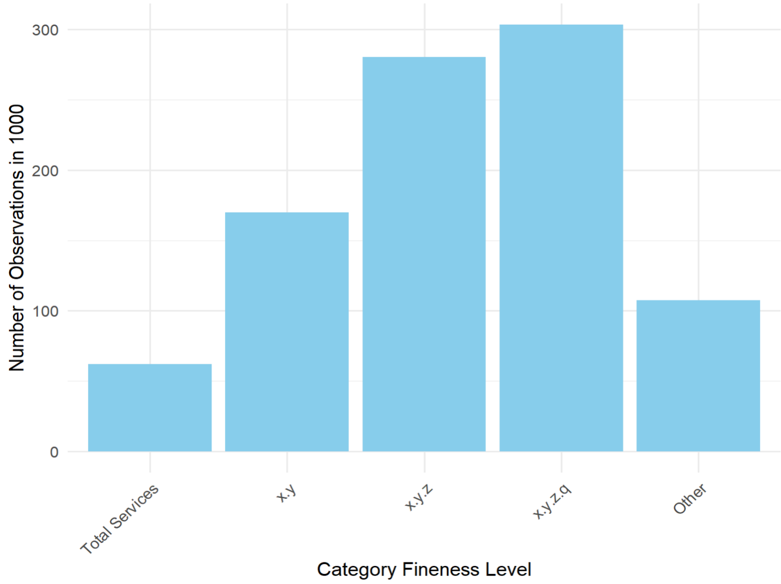

Figure A.1. The number of observations by service category fineness level in the BPM6 dataset, graph created by the authors in R using data from Eurostat (2024).

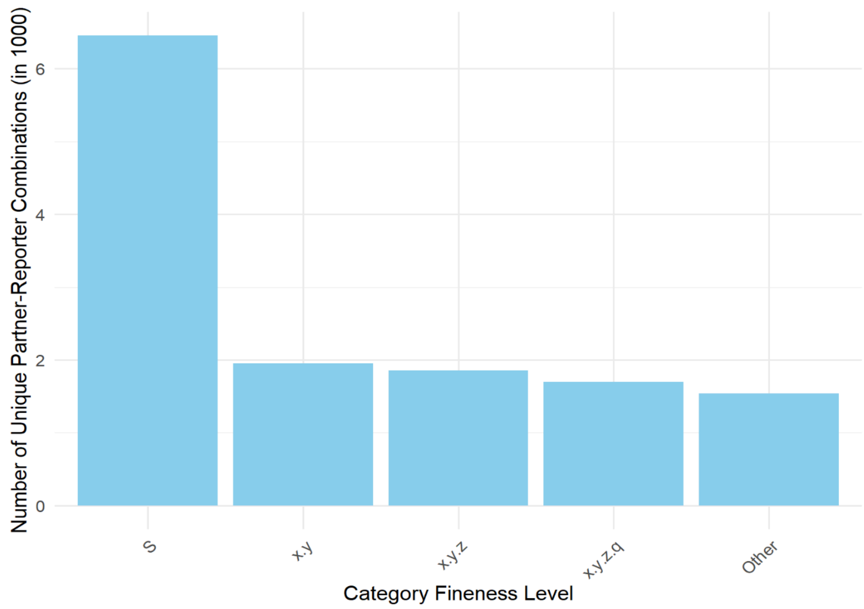

Figure A.2. The number of unique reporter-partner country combinations by service category fineness level in the BPM6 dataset, graph created by the authors in R using data from Eurostat (2024).

Appendix B. Conversion from the BPM5 to the BPM6 Service Categories

In 2010, the classification system for services trade changed from BPM5 to BPM6. The BPM5 dataset covers 1985–2013, while BPM6 spans 2010–2023. Although BPM6 was officially introduced in 2010, trade data continued to be recorded under BPM5 through 2012. Figure B.1 shows the number of observations from 1999 to 2022, illustrating the gradual adoption of BPM6.

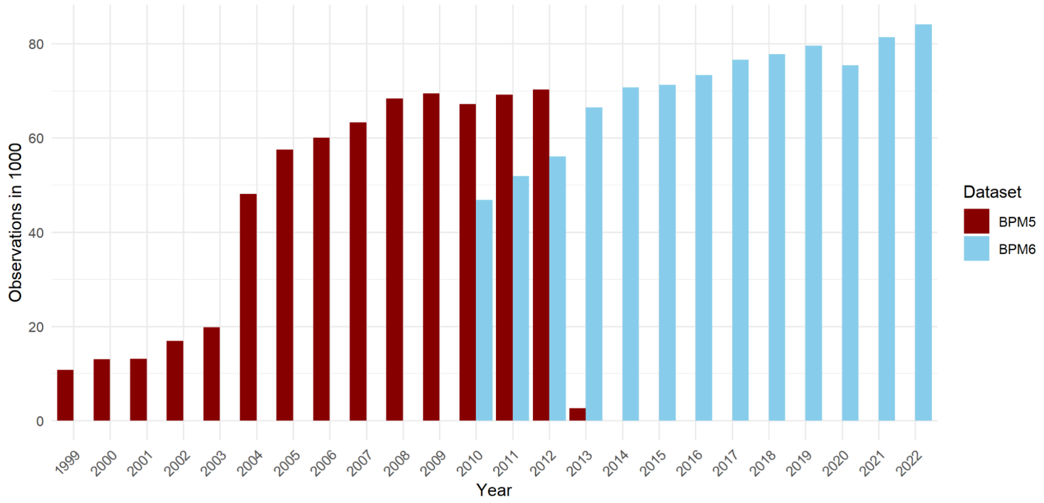

Figure B.1. Comparison of the number of observations by year and dataset, graph created by the authors in R using data from Eurostat (2014a, 2014b, 2024).

Initially, BPM6 had fewer observations than BPM5, but reporting levels became comparable over time. Figure B.2 highlights the significant increase in unique reporter-partner country combinations under BPM6.

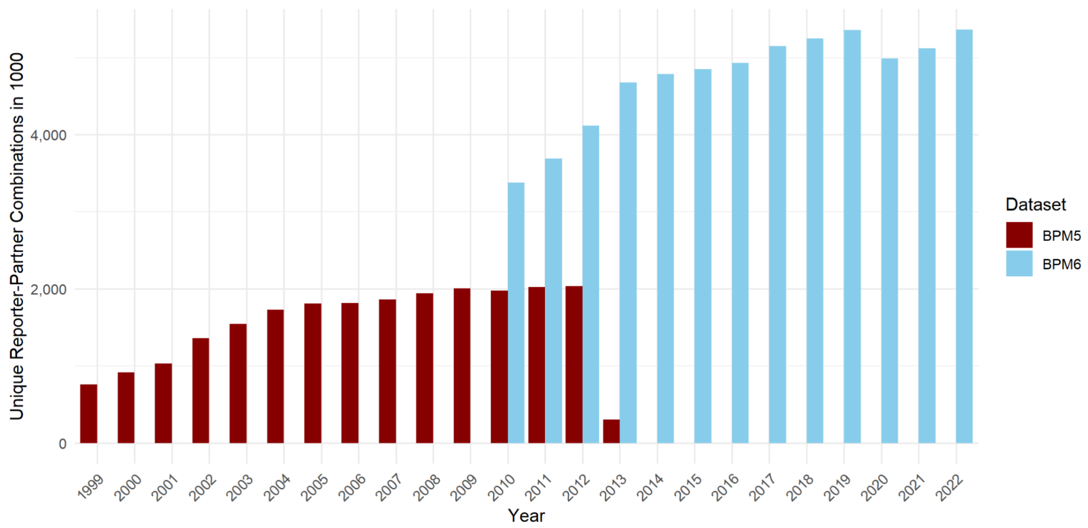

Figure B.2. Comparison of the number of unique reporter-partner combinations by year and dataset, graph created by the authors in R using data from Eurostat (2014a, 2014b, 2024).

Since we intended to use both datasets, we first examined the similarities between the two services' trade classification systems. Our analysis focused on observations from 2010 to 2012. Although some BPM5 services trade data were available for 2013, their number was insufficient for a meaningful comparison. To conduct the analysis, we converted the 2010–2012 BPM5 data from the Eurostat dataset into the BPM6 classification system using the official United Nations BPM5-to-BPM6 correspondence table (United Nations, n.d.).

Several BPM5 service categories corresponded directly (1:1) with BPM6 categories. For instance, in the BPM5 classification system, code 207 represents *1.1.1 passenger sea transport* (United Nations, 2002), which aligns precisely with SC11 in BPM6, denoting *passenger transport by sea*. However, not all categories map directly between the two systems. For example, BPM6 introduced a new category, SC11Z, which represents *passenger transport by sea payable by border, seasonal, and other short-term workers*—a category with no equivalent in BPM5. Conversely, BPM5's *communication services* category (245), which comprised *postal and courier services* (246) and *telecommunications services* (247), was eliminated in BPM6. Instead, *postal and courier services* (246) were reclassified under *transport* (SC), while *telecommunications services* (247) were reassigned to *telecommunications, computer, and information services* (SI). These reclassifications and structural changes led to variations in the number of observations recorded for specific service categories between BPM5 and BPM6.

After converting the 2010–2012 BPM5 data from the Eurostat (2014b) dataset into the BPM6 classification system, we merged it—by year, reporter, partner, and BPM6 category—with the corresponding 2010–2012 BPM6 data from Eurostat (2024). In the resulting dataset, out of 259,757 observations, 112,901 (43%) were successfully matched between BPM5 and BPM6. The majority of mismatches (104,285) were BPM5 observations with no corresponding BPM6 match, while significantly fewer BPM6 observations (42,571) lacked a BPM5 counterpart. This aligns with the overall trend observed in Figure B.1, where BPM6 had fewer observations than BPM5 in 2010–2012.

Examining the proportion of successfully matched observations (Figure B.3), we observe that matching accuracy improves over time. Furthermore, BPM6 categories comprising two symbols (e.g. SC for transport or SF for insurance and pension services) and four symbols (e.g. SC11 for *sea transport for passengers* or SF11 for *direct life insurance*) exhibit the highest proportion of successfully matched observations. In contrast, categories reporting only the *total value of services trade* have the lowest matching rates, while three-symbol categories (e.g. SC1 for *sea transport* or SF1 for *direct insurance*) fall in between.

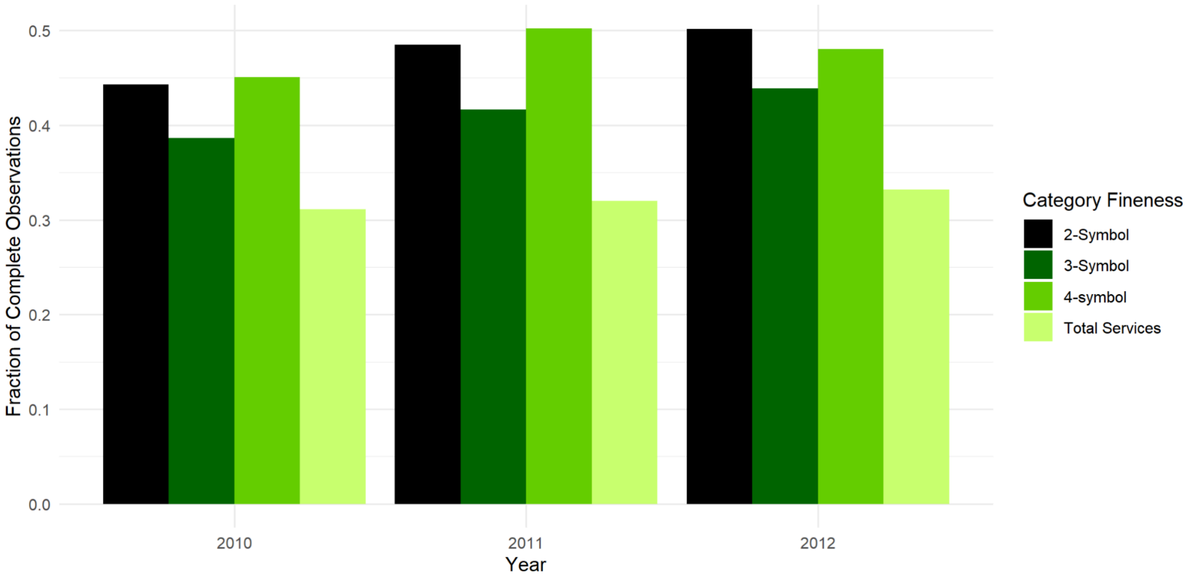

Figure B.3. The fraction of complete observations by year and services category fineness, graph created by the authors in R using data from Eurostat (2014b, 2024).

The correlation coefficient for successfully matched trade values was 0.95 for both imports and exports at the two-symbol category level, 0.91 for exports and 0.89 for imports at the three-symbol level, and 0.94 for exports and 0.91 for imports at the four-symbol level.

The number of observations and unique reporter-partner pairs at each category level, along with the fraction of successfully matched observations between BPM5 and BPM6, supports the use of three-symbol and four-symbol classification levels in our regression analysis. Additionally, for most observations, the difference between matched trade values was close to zero. This pattern holds for both three-symbol and four-symbol service categories (Figure B.4).

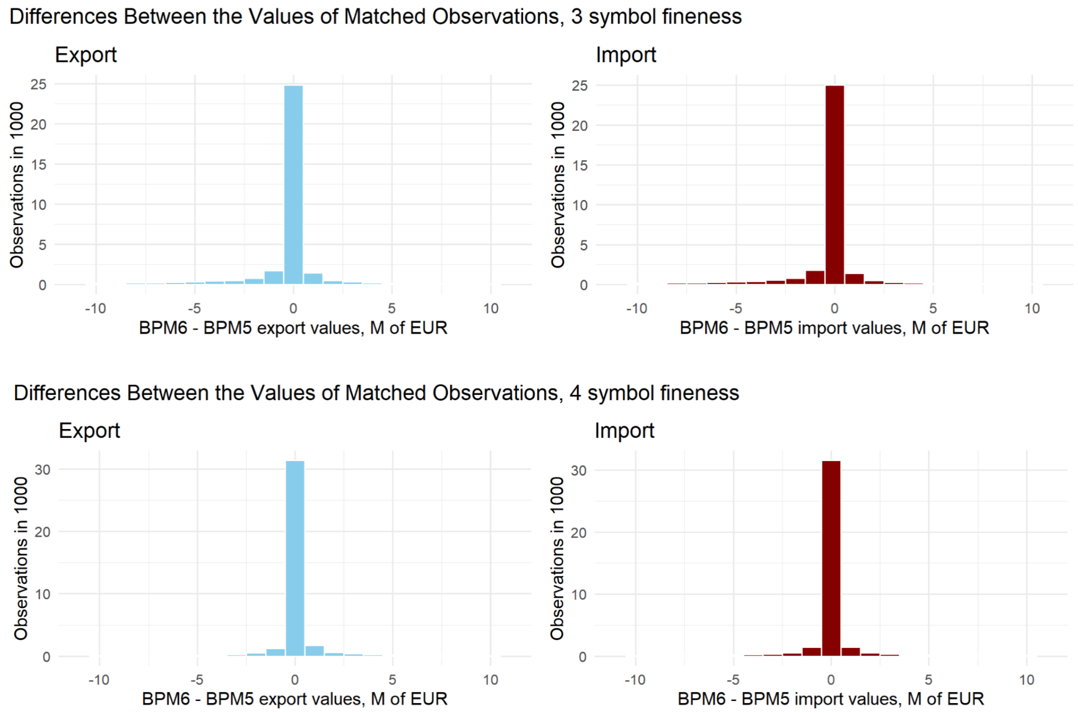

Figure B.4. Histograms of the difference between the export and import values in millions of EUR from the BPM5 and BPM6 datasets on 3-symbol and 4-symbol services category fineness levels, graph created by the authors in R using data from Eurostat (2014b, 2024).

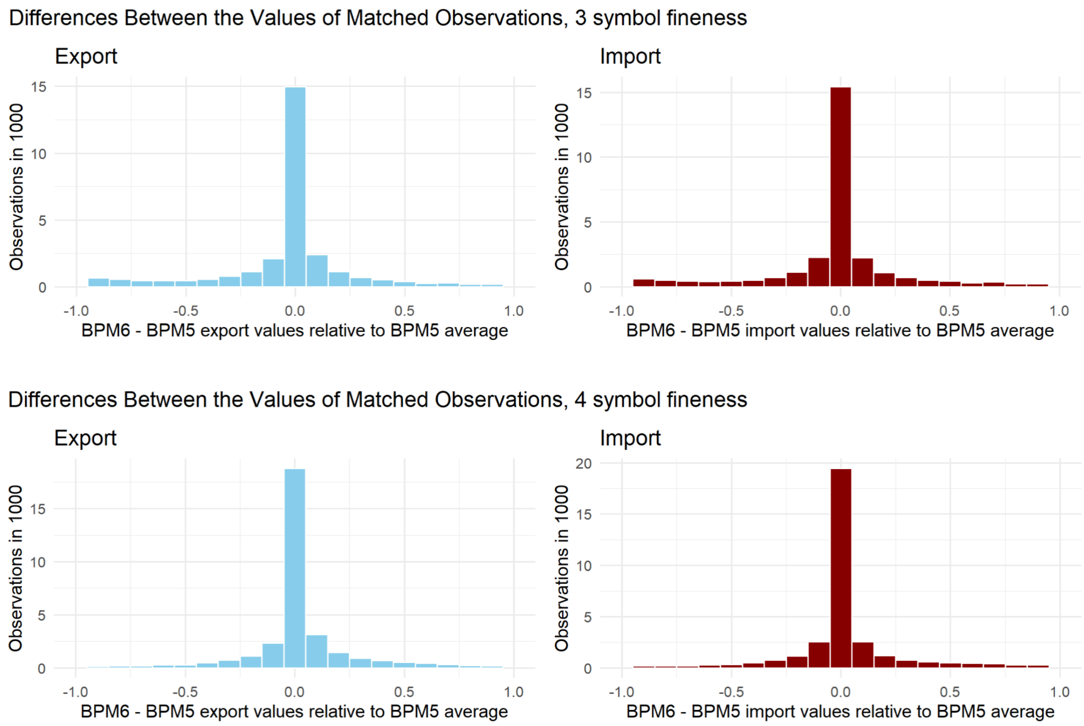

Figure B.5. Histograms of the difference between the export and import values from the BPM5 and BPM6 datasets relative to the BPM5 average on 3-symbol and 4-symbol services category fineness levels, graph created by the authors in R using data from Eurostat (2014b, 2024).

Appendix C. Descriptive Statistics for Additional Variables

This table presents descriptive statistics for additional variables in our regressions, categorised into level 3 and level 4 observations. It includes GDP per capita, population, trade openness, the HDI, and the economic freedom index for reporting and partner countries. The statistics shown are the mean, standard deviation (SD), minimum (Min), first quartile (Q1), median, third quartile (Q3), and maximum (Max). Created by the authors.

Variable	Units	Mean	SD	Min	Q1	Median	Q3	Max
Category level 3 observations								
Reporter GDPpc	USD	38,850	13,720	12,437	28,130	39,034	48,557	120,648
Partner GDPpc	USD	38,301	20,461	2,522	24,120	37,886	49,259	120,648
Reporter Population	thousands	226,98	37,661	318	5,313	9,863	19,777	317,115
Partner Population	thousands	67,222	175,213	33	5,451	16,426	63,734	1,425,423
Reporter HDI	0–1	0,88	0,04	0,72	0,85	0,89	0,91	0,97
Partner HDI	0–1	0,85	0,09	0,45	0,82	0,88	0,92	0,97
Reporter Freedom	0–100	69	6	51	64	69	73	84
Partner Freedom	0–100	69	9	25	63	69	75	90
Reporter Openness	% of GDP	108	43	18	75	102	138	312
Partner Openness	% of GDP	104	75	18	57	79	130	443
Category level 4 observations								
Reporter GDPpc	USD	38,062	12,928	12,771	27,524	37,620	48,301	118,155
Partner GDPpc	USD	39,323	20,107	2522	25,461	39,034	50,150	120,648
Reporter Population	thousands	21,396	33,389	318	5,392	9,917	19,689	317,115
Partner Population	thousands	65,530	171,236	33	5,480	11,540	63,509	1,425,423
Reporter HDI	0–1	0,88	0,04	0,72	0,85	0,88	0,91	0,96
Partner HDI	0–1	0,86	0,09	0,45	0,83	0,89	0,92	0,97
Reporter Freedom	0–100	69	6	51	64	69	73	83
Partner Freedom	0–100	69	9	25	64	70	75	90
Reporter Openness	% of GDP	110	41	22	78	104	144	312
Partner Openness	% of GDP	105	74	18	58	81	130	443

Appendix D. Complete Regression Results

The following tables (D.1–D.6) present the full regression results for the basic and alternative regression specifications with the Eurozone dummy variable.

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				***Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)***			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Reporter GDP	0.2489	1.74e-06	0.0572	0.3560	0.2459	2.77e-06	0.0605	0.3317
Partner GDP	0.2544	7.19e-07	0.0566	0.3563	0.2521	1.10e-06	0.0601	0.3304
Eurozone dummy	0.0462	0.2010	0.0734	0.0773	0.0421	0.2577	0.0785	0.0603
N Obs.	336,951		288,696		336,951		288,696	

Table D.1. This table, created by the authors, presents the regression results for the logistic transformation of the G-L index by services category, incorporating reporter-partner pair fixed effects and year fixed effects. The effects of reporter and partner exchange rate regimes are included in the model but not reported here. The reporter and partner GDPs are transformed using ln. Both reporter and partner GDPs are positive and statistically significant for 3-digit data ($p < 0.001$), with a 1% GDP increase linked to a ~0.25% rise in the transformed dependent variable.

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				***Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)***			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Reporter GDP per capita	0.1007	0.1880	-0.0674	0.1993	0.1014	0.1860	-0.0632	0.2293
Partner GDP per capita	0.3218	1.29e-05	-0.1143	0.0381	0.3170	1.92e-05	-0.1146	0.0385
Reporter population	0.1336	0.2680	-0.0682	0.4383	0.1418	0.2390	-0.0506	0.5650
Partner population	0.1256	0.2960	-0.0972	0.2703	0.1351	0.2600	-0.0792	0.3693
Eurozone dummy	0.0355	0.3250	0.0525	0.0466	0.0330	0.3730	0.0590	0.0265
N Obs.	326,158		298,213		326,158		298,213	

Table D.2. This table, created by the authors, presents the regression results for the logistic transformation of the G-L index by services category, incorporating reporter-partner pair fixed effects and year fixed effects. The reporter and partner exchange rate regimes, trade openness, the HDI, and the economic freedom index are included in the model but not reported here. The reporter and partner

GDP per capita and population are transformed using ln. Partner GDP per capita is significant (p < 0.001 for 3-digit and p < 0.05 for 4-digit data), with a 1% increase raising the transformed dependent variable by ~0.32% (3-digit) or decreasing it by ~0.11% (4-digit). Reporter GDP per capita and population effects are statistically insignificant.

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				***Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)***			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Reporter GDP	0.0626	6.00e-14	0.0411	2.12e-05	0.0612	2.65e-13	0.0407	2.68e-05
Partner GDP	0.0717	< 2.20e-16	0.0515	5.01e-08	0.0704	< 2.20e-16	0.0511	7.26e-08
Eurozone dummy	0.0090	0.1498	0.0163	0.0195	0.0066	0.3046	0.0156	0.0275
N Obs.	472,639		451,927		472,639		451,927	

Table D.3. This table, created by the authors, presents the regression results for the G-L index by services category, incorporating reporter-partner pair fixed effects and year fixed effects. The effects of reporter and partner exchange rate regimes are included in the model but not reported here. The reporter and partner GDPs are transformed using ln. Both reporter and partner GDP have strong, positive, and significant effects (p < 0.001). Doubling GDP increases the G-L index by ~0.04–0.06 (reporter) and ~0.05–0.07 (partner).

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				***Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)***			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Reporter GDP per capita	0.0143	0.3007	0.0296	0.0666	0.0140	0.3087	0.0293	0.0687
Partner GDP per capita	0.1095	3.39e-16	0.0828	7.58e-07	0.1081	8.64e-16	0.0825	8.00e-07
Reporter population	0.0415	0.0579	0.0487	0.03650	0.0399	0.0684	0.0470	0.0440
Partner population	0.0478	0.0280	0.0563	0.0148	0.0464	0.0333	0.0547	0.0182
Eurozone dummy	0.0073	0.2398	0.0170	0.0145	0.0053	0.4087	0.0162	0.0213
N Obs.	450,506		434,346		450,506		434,346	

Table D.4. This table, created by the authors, presents the regression results for the G-L index by services category, incorporating reporter-partner pair fixed effects and year fixed effects. The reporter and partner exchange rate regimes, trade openness, the HDI, and the economic freedom index are included in the model but not reported here. The reporter and partner GDP per capita and *population are transformed using ln. Partner GDP per capita is significant ($p < 0.001$), increasing the G-L index by ~0.0008–0.0011 per 1% rise. The reporter's GDP per capita is only weakly significant. Population effects are generally positive, with partner population consistently significant at $p < 0.05$. Partner characteristics exert a stronger influence than reporter characteristics.*

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				***Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)***			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Reporter GDP	0.1016	8.00e-04	0.0068	0.8544	0.1024	8.00e-04	0.0107	0.7743
Partner GDP	0.0868	0.0040	-0.0158	0.6691	0.0881	0.0038	-0.0118	0.7505
Eurozone dummy	0.0435	0.0495	0.0579	0.0299	0.0457	0.0455	0.0641	0.0175
N Obs.	352,604		305,952		352,604		305,952	

Table D.5. This table, created by the authors, presents the regression results for the natural logarithm of the G-L index by services category, incorporating reporter-partner pair fixed effects and year fixed effects. The effects of reporter and partner exchange rate regimes are included in the model but not reported here. The reporter and partner GDPs are transformed using ln. Reporter and partner GDP have robust and significant effects (reporter: $p < 0.001$; partner: $p < 0.01$) for Category 3. A 1% increase in GDP raises the G-L index by ~0.10% (reporter) and ~0.09% (partner).

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				***Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)***			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Reporter GDP per capita	0.0072	0.8686	-0.0674	0.1993	0.0094	0.8296	-0.0632	0.2293
Partner GDP per capita	0.0482	0.2619	-0.1143	0.0381	0.0466	0.2804	-0.1146	0.0385
Reporter population	-0.021	0.7613	-0.0682	0.4383	-0.0093	0.8928	-0.0506	0.5650
Partner population	-0.0364	0.5975	-0.0972	0.2703	-0.0239	0.7290	-0.0792	0.3693
Eurozone dummy	0.0376	0.0906	0.0525	0.0466	0.0409	0.0728	0.0590	0.0265
N Obs.	340,875		298,213		340,875		298,213	

Table D.6. This table, created by the authors, presents the regression results for the natural logarithm of the G-L index by services category, incorporating reporter-partner pair fixed effects and year fixed effects. The reporter and partner exchange rate regimes, trade openness, the HDI, and the economic freedom index are included in the model but not reported here. The reporter and partner GDP per *capita and population are transformed using ln. Partner GDP per capita is significant at $p < 0.05$ for 4-digit data, though with a negative effect of ~0.11% on the G-L index. Reporter GDP per capita and population effects are not significant.*

As shown in Tables D.1–D.6, the effects of reporter and partner GDP on the dependent variable are generally statistically significant and consistently positive. However, there is no clear indication as to whether the reporter or partner GDP has a more pronounced effect. In the alternative regression specification, partner GDP per capita consistently has a more statistically significant effect on the dependent variable than reporter GDP per capita. Meanwhile, neither the reporter nor the partner population shows a consistent or statistically significant effect on the dependent variable.

The following tables (D.7–D.12) present the full regression results for the basic and alternative regression specifications with the EU dummy variable.

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				***Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)***			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Reporter GDP	0.2466	2.37e-06	0.0533	0.3916	0.2429	3.83e-06	0.0550	0.3807
Partner GDP	0.2517	1.03e-06	0.0522	0.3970	0.2488	1.59e-06	0.0540	0.3841
EU dummy	0.0637	0.1430	0.0959	0.0190	0.0642	0.1400	0.0981	0.0163
N Obs.	336,951		288,696		336,951		288,696	

Table D.7. This table, created by the authors, presents the regression results for the logistic transformation of the G-L index by services category, incorporating reporter-partner pair fixed effects and year fixed effects. The effects of reporter and partner exchange rate regimes are included in the model but not reported here. The reporter and partner GDPs are transformed using ln. The effects of reporter and partner GDP are positive and statistically significant for 3-digit industry data ($p < 0.001$). A 1% increase in GDP is associated with a ~0.24%–0.25% rise in the transformed dependent variable. For 4-digit data, the effects remain positive but are not statistically significant.

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				***Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)***			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Reporter GDP per capita	0.1015	0.1830	-0.0604	0.2540	0.1019	0.1830	-0.0564	0.2880
Partner GDP per capita	0.3228	1.24e-05	-0.1106	0.0458	0.3173	1.91e-05	-0.1117	0.0447
Reporter population	0.1217	0.3120	-0.0449	0.6183	0.1327	0.2700	-0.0272	0.7629
Partner population	0.1137	0.3420	-0.0740	0.4118	0.1260	0.2920	-0.0558	0.5366
EU dummy	-0.0022	0.9620	0.0506	0.0663	0.0008	0.9860	0.0545	0.0504
N Obs.	326,158		298,213		326,158		298,213	

Table D.8. This table, created by the authors, presents the regression results for the logistic transformation of the G-L index by services category, with reporter-partner pair and year fixed effects. The reporter and partner exchange rate regimes, trade openness, the HDI, and the economic freedom index are included in the model but not reported here. The reporter and partner GDP per capita and population are transformed using ln. Partner GDP per capita is significant at $p < 0.001$

for 3-digit data and at p < 0.05 for 4-digit data. A 1% increase in partner GDP per capita is associated with a ~-0.11%−0.32% change in the transformed dependent variable. Population effects are inconsistent and not significant.

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				***Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)***			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Reporter GDP	0.0622	8.84e-14	0.0401	3.39e-05	0.0607	3.71e-13	0.0394	4.79e-05
Partner GDP	0.0713	< 2.2e-16	0.0506	8.91e-08	0.0699	< 2.20e-16	0.0499	1.46e-07
EU dummy	-4.00e-04	0.9615	-0.0120	0.1297	-8.00e-04	0.9164	-0.0122	0.1234
N Obs.	472,639		451,927		472,639		451,927	

Table D.9. This table, created by the authors, presents the regression results for the G-L index by services category, incorporating reporter-partner pair fixed effects and year fixed effects. The effects of reporter and partner exchange rate regimes are included in the model but not reported here. The reporter and partner GDPs are transformed using ln. Reporter and partner GDP are robustly positive and highly significant (p < 0.001). Doubling GDP increases the G-L index by ~0.04–0.06 (reporter) and ~0.05–0.07 (partner).

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				***Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)***			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Reporter GDP per capita	0.0129	0.3490	0.0278	0.0848	0.0125	0.3636	0.0274	0.0901
Partner GDP per capita	0.1089	5.23e-16	0.0820	9.96e-07	0.1074	1.47e-15	0.0813	1.33e-06
Reporter population	0.0275	0.2153	0.0283	0.2344	0.0264	0.2348	0.0268	0.2616
Partner population	0.0339	0.1250	0.0360	0.1280	0.0330	0.1365	0.0346	0.1452
EU dummy	-0.0152	0.0547	-0.0109	0.0163	-0.0155	0.0504	-0.0193	0.0151
N Obs.	450,506		434,346		450,506		434,346	

Table D.10. This table, created by the authors, presents the regression results for the G-L index by services category, incorporating reporter-partner pair fixed effects and year fixed effects. The reporter and partner exchange rate regimes, trade openness, the HDI, and the economic freedom *index are included in the model but not reported here. The reporter and partner GDP per capita and population are transformed using ln. Partner GDP per capita is consistently positive and significant (p < 0.001), with a 1% increase raising the G-L index by ~0.0008–0.0011. Reporter GDP per capita is marginally significant (p < 0.1) only for 4-digit data. Population effects are positive but not significant.*

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				***Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)***			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Reporter GDP	0.0997	0.0011	0.0041	0.9128	0.0995	0.0012	0.0065	0.8618
Partner GDP	0.0846	0.0053	-0.0189	0.6099	0.0850	0.0055	-0.0164	0.6604
EU dummy	0.0440	0.0778	0.0673	0.0098	0.0451	0.0719	0.0693	0.0085
N Obs.	352,604		305,952		352,604		305,952	

Table D.11. This table, created by the authors, presents the regression results for the natural logarithm of the G-L index by services category, incorporating reporter-partner pair fixed effects and year fixed effects. The effects of reporter and partner exchange rate regimes are included in the model but not reported here. The reporter and partner GDPs are transformed using ln. Reporter and partner GDP have robust, statistically significant effects (p < 0.001) for 3-digit data. A 1% increase in GDP is associated with a ~0.10% rise in the G-L index for the reporter and a ~0.08–0.09% rise for the partner.

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				***Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)***			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Reporter GDP per capita	0.0089	0.8375	-0.0604	0.2540	0.0109	0.8025	-0.0564	0.2880
Partner GDP per capita	0.0495	0.2499	-0.1106	0.0458	0.0474	0.2743	-0.1117	0.0447
Reporter population	-0.0261	0.7059	-0.0449	0.6183	-0.0132	0.8486	-0.0272	0.7629
Partner population	-0.0415	0.5460	-0.074	0.4118	-0.0277	0.6868	-0.0558	0.5366
EU dummy	0.0074	0.7798	0.0506	0.0663	0.0106	0.6907	0.0545	0.0504
N Obs.	340,875		298,213		340,875		298,213	

Table D.12. This table, created by the authors, presents the regression results for the natural logarithm of the G-L index by services category, incorporating reporter-partner pair fixed effects and *year fixed effects. The reporter and partner exchange rate regimes, trade openness, the HDI, and the economic freedom index are included in the model but not reported here. The reporter and partner GDP per capita and population are transformed using ln. Partner GDP per capita has a negative, statistically significant effect ($p < 0.05$) for 4-digit data, with a 1% increase linked to a ~0.11% decline in the G-L index. The reporter GDP per capita and both population variables are not statistically significant.*

As seen in Tables D.7–D.12, the effects of reporter and partner GDP on the dependent variable are generally statistically significant and consistently positive, although there is no clear indication of whether reporter or partner GDP has a more pronounced effect. The reporter's GDP per capita is neither consistently positive nor statistically significant. While partner GDP per capita is more often statistically significant than reporter GDP per capita, it is not consistently positive. Reporter and partner populations do not exhibit a clear or statistically significant effect on the dependent variable.

Appendix E. Additional Robustness Checks

The following tables present additional robustness checks with the logistically transformed G-L index as the dependent variable, where 0 and 1 in the G-L index are replaced with the minimum non-zero value and the maximum value less than 1, respectively (E.1–E.4).

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				***Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)***			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Reporter GDP	0.9224	9.40e-13	1.0145	1.27e-10	0.9020	4.99e-12	1.0046	2.04e-10
Partner GDP	1.0911	< 2.20e-16	1.2633	2.69e-16	1.0701	< 2.20e-16	1.2520	5.90e-16
Eurozone dummy	0.1049	0.2952	0.2013	0.1113	0.0679	0.5113	0.1836	0.1581
N Obs.	472,639		451,927		472,639		451,927	

Table E.1. This table, created by the authors, presents the regression results for the logistic transformation of the G-L index by services category, incorporating reporter-partner pair fixed effects and year fixed effects. The effects of reporter and partner exchange rate regimes are included in the model but not reported here. The reporter and partner GDPs are transformed using ln.

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				***Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)***			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Reporter GDP per capita	0.1353	0.5309	0.7019	0.0083	0.1324	0.5381	0.6964	0.0086
Partner GDP per capita	1.6959	3.16e-16	2.1665	7.79e-15	1.678	6.36e-16	2.1636	9.54e-15
Reporter population	0.6604	0.0637	1.1807	0.0041	0.6221	0.0812	1.1277	0.0061
Partner population	0.8168	0.0208	1.3982	0.0006	0.7792	0.0279	1.3449	0.0010
Eurozone dummy	0.0973	0.3349	0.2274	0.0704	0.0654	0.5307	0.2093	0.1054
N Obs.	450,506		434,346		450,506		434,346	

Table E.2. This table, created by the authors, presents the regression results for the logistic transformation of the G-L index by services category, incorporating reporter-partner pair fixed effects and year fixed effects. The reporter and partner exchange rate regimes, trade openness, the HDI, and the economic freedom index are included in the model but not reported here. The reporter and partner GDP per capita and population are transformed using ln.

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				*Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)*			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Reporter GDP	0.9139	1.41e-12	0.9955	2.14e-10	0.8936	4.99e-12	0.9826	3.92e-10
Partner GDP	1.0841	< 2.20e-16	1.2467	4.88e-16	1.0631	< 2.20e-16	1.2325	1.23e-15
EU dummy	-0.1764	0.1752	-0.4212	0.0022	-0.1857	0.1553	-0.4288	0.0020
N Obs.	472,639		451,927		472,639		451,927	

Table E.3. This table, created by the authors, presents the regression results for the logistic transformation of the G-L index by services category, incorporating reporter-partner pair fixed effects and year fixed effects. The effects of reporter and partner exchange rate regimes are included in the model but not reported here. The reporter and partner GDPs are transformed using ln.

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				*Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)*			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Reporter GDP per capita	0.1004	0.6430	0.6469	0.0150	0.0949	0.6605	0.6369	0.0163
Partner GDP per capita	1.6801	7.52e-16	2.1389	1.88e-14	1.6589	1.7519e-15	2.1298	2.1298
Reporter population	0.3361	0.3473	0.6884	0.1027	0.3025	0.3990	0.6370	0.6370
Partner population	0.4949	0.1653	0.9082	0.0310	0.4618	0.1970	0.6370	0.0427
EU dummy	-0.3785	0.0050	-0.5308	0.0002	-0.3882	0.0041	-0.5424	0.0001
N Obs.	450,506		434,346		450,506		434,346	

Table E.4. This table, created by the authors, presents the regression results for the logistic transformation of the G-L index by services category, incorporating reporter-partner pair fixed effects and year fixed effects. The reporter and partner exchange rate regimes, trade openness, the HDI, and the economic freedom index are included in the model but not reported here. The reporter and partner GDP per capita and population are transformed using ln.

The following tables present additional robustness checks with the natural logarithm of the G-L index as the dependent variable, where 0 in the G-L index is replaced with the minimum non-zero value (E.5–E.8).

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				***Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)***			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Reporter GDP	0.7685	3.90e-12	0.8501	2.59e-10	0.7526	1.17e-11	0.8417	4.12e-10
Partner GDP	0.9718	< 2.20e-16	1.1612	< 2.20e-16	1.1511	< 2.20e-16	1.1511	< 2.20e-16
Eurozone dummy	0.0082	0.9227	0.1113	0.3374	-0.0218	0.8024	0.0967	0.4188
N Obs.	472,639		451,927		472,639		451,927	

Table E.5. This table, created by the authors, presents the regression results for the natural logarithm of the G-L index by services category, incorporating reporter-partner pair fixed effects and year fixed effects. The effects of reporter and partner exchange rate regimes are included in the model but not reported here. The reporter and partner GDPs are transformed using ln.

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				***Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)***			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Reporter GDP per capita	0.1355	0.4742	0.5612	0.0150	0.1315	0.4856	0.5533	0.0160
Partner GDP per capita	1.6584	<2.2e-16	2.1593	<2.2e-16	1.6491	<2.2e-16	2.1657	<2.2e-16
Reporter population	0.8040	0.0099	1.2170	0.0008	0.7586	0.0148	1.1478	0.0015
Partner population	0.9881	0.0013	1.4871	3.14e-05	0.9415	0.0022	1.4159	0.0001
Eurozone dummy	0.0060	0.9437	0.1382	0.2314	-0.0209	0.8130	0.1229	0.3016
N Obs.	450,506		434,346		450,506		434,346	

Table E.6. This table, created by the authors, presents the regression results for the natural logarithm of the G-L index by services category, incorporating reporter-partner pair fixed effects and year fixed effects. The reporter and partner exchange rate regimes, trade openness, the HDI, and the economic freedom index are included in the model but not reported here. The reporter and partner GDP per capita and population are transformed using ln.

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				*Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)*			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Reporter GDP	0.7635	4.64e-12	0.8346	3.91e-10	0.7489	1.31e-11	0.8246	6.85e-10
Partner GDP	0.9687	< 2.2e-16	1.1484	< 2.2e-16	0.9526	< 2.2e-16	1.1367	< 2.2e-16
EU dummy	-0.2290	0.0628	-0.4556	0.0010	-0.2375	0.0555	-0.4637	0.0010
N Obs.	472,639		451,927		472,639		451,927	

Table E.7. This table, created by the authors, presents the regression results for the natural logarithm of the G-L index by services category, incorporating reporter-partner pair fixed effects and year fixed effects. The effects of reporter and partner exchange rate regimes are included in the model but not reported here. The reporter and partner GDPs are transformed using ln.

	Regressions with IMF Exchange Rate Regime Classifications (Section A)				*Regressions with IMF Hard Peg, Soft Peg, Floating, and Unclassified Exchange Rates (Section B)*			
	Category 3		**Category 4**		**Category 3**		**Category 4**	
Variable	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**	**Beta**	**p-value**
Reporter GDP per capita	0.0979	0.6061	0.5018	0.0297	0.0920	0.6269	0.4899	0.0332
Partner GDP per capita	1.6403	<2.20e-16	2.1290	<2.2e-16	1.6293	<2.2e-16	2.1306	<2.2e-16
Reporter population	0.5019	0.1027	0.7393	0.0428	0.4587	0.1360	0.6681	0.0675
Partner population	0.6881	0.0246	1.0117	0.0054	0.6438	0.0357	0.9384	0.0100
EU dummy	-0.3835	0.0026	-0.5464	0.0001	-0.3954	0.0021	-0.5626	0.0001
N Obs.	450,506		434,346		450,506		434,346	

Table E.8. This table, created by the authors, presents the regression results for the natural logarithm of the G-L index by services category, incorporating reporter-partner pair fixed effects and year fixed effects. The reporter and partner exchange rate regimes, trade openness, the HDI, and the economic freedom index are included in the model but not reported here. The reporter and partner GDP per capita and population are transformed using ln.