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Aleksandra Szarek-Piaskowska
http://orcid.org/0000-0002-9553-7761
SGH Warsaw School of Economics
aszare@sgh.waw.pl

Elżbieta Czarny
http://orcid.org/0000-0003-2124-2140
SGH Warsaw School of Economics
eczary@sgh.waw.pl

Paweł Folfas
http://orcid.org/0000-0002-6052-7125
SGH Warsaw School of Economics
pfolfa@sgh.waw.pl

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Intra-industry Trade of the EU, USMCA, and their Member States in the Period 2000–2022 – Does Economic Integration Matter?

Abstract

RESEARCH OBJECTIVE: The objective of this paper is to identify the similarities and differences between intra-industry trade (IIT) of European Union and IIT of United States-Mexico-Canada Agreement (USMCA) and their member states. Moreover, we answer the question if more advanced economic integration goes together with more intensive IIT.

THE RESEARCH PROBLEM AND METHODS: We conducted an analysis of IIT disaggregated into 6-digit HS codes using the UN Comtrade database, and employed Grubel-Lloyd indices. We aggregated GL indices for selected countries and selected blocs of countries (here the EU and USMCA) and for the world.

THE PROCESS OF ARGUMENTATION: We chose the EU and USMCA as examples of correlations between economic integration and intra-industry trade because they are some of the most important RTAs in the world and their members fulfil conditions for intensive IIT. We verify the hypothesis that sharing membership in such a grouping is an important factor intensifying bilateral IIT.

RESEARCH RESULTS: We have shown that EU IIT shares were considerably higher than those in the case of the USMCA, and the advantage of the EU grew

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over time. Our empirical study confirms that sharing membership in RTA bloc is an important factor intensifying bilateral IIT. Also, more advanced integration of adjacent countries, especially those that differ little with respect to economic potential, wealth, and culture, helps to increase IIT shares.

CONCLUSIONS, INNOVATIONS, AND RECOMMENDATIONS: We compare the IIT characteristics of the EU and its member states with those of the USMCA bloc and its members in a relatively long and turbulent period (2000–2022). To the best of our knowledge, there was no such analysis of world IIT during this period. Moreover, the correlation between the intensity of intra-industry trade and the advancement of economic integration has not been studied in literature very often.

Keywords:
intra-industry trade, European Union, United States-Mexico-Canada Agreement, economic integration

INTRODUCTION

Simultaneous exports and imports of goods stemming from the same industry in bilateral trade is known as *intra-industry trade* (IIT). IIT is displacing inter-industry trade, especially among the most developed countries and in regional integration groupings. The legal framework for these groupings is provided by regional trade arrangements (RTAs) provide. As IIT is exchange of similar products (imperfect substitutes), it is sensitive to trade barriers. For this reason, IIT development is expected among members of the same RTA bloc. IIT is usually conducted by developed countries with similar economic structures and expanded manufacturing industries producing differentiated goods with many varieties. Citizens of these countries have a similar level of wealth and often share similar preferences because of their common culture, tradition, and habits. IIT is also supported by geographical proximity, which increases the probability of similar tastes of the societies and decreases transportation costs – especially in the case of contiguity (common land borders).

The aim of this paper is to answer the following research questions: (1) What are the characteristics of IIT of the European Union and its member states during the period 2000–2022?; (2) What are the features of IIT of the United States–Mexico–Canada Agreement

(USMCA) grouping and its members during the period 2000–2022?; (3) What are the similarities and differences between IIT of the EU and IIT of the USMCA grouping and their members?; (4) Does more advanced economic integration go together with more intensive IIT?

The EU and USMCA are two of the most important RTA blocs in the world, and their members fulfil conditions for intensive IIT. For this reason, we chose them as examples of correlations between economic integration and IIT. We verify the hypothesis that sharing membership in RTA groupings is an important factor intensifying bilateral IIT. Also, more advanced integration of adjacent countries, especially those that differ little with respect to economic potential, wealth, and culture, helps to increase IIT shares.

There are plenty of studies on IIT in the literature, both theoretical and empirical. We mention only a few relatively new ones. For new theoretical models see for example Afonso et al. (2021). Most empirical studies examine IIT for a selected industry (e.g., Tayyar, 2024), several industries (e.g., Zapata et al., 2023) or all industries (e.g., Souguir, 2024). There are far fewer studies that analyse total IIT with the Grubel-Lloyd index calculated for bilateral trade (e.g., the EU with its main partners: Bernatonytė & Normantienė, 2007; the United States with Canada and Mexico: Ekanayake et al., 2009; Germany and France with the ten largest trade partners: Ito & Okubo, 2011; Mexico with the United States and Canada: Sotomayor, 2012; China with the top ten EU 28 members: Souguir, 2024) or between a country and a group of countries (e.g., new member states of the EU with the EU15 and EU10: Molendowski & Polan, 2013; the EU new member states with the EU15 and among new member states: Czarny & Śledziewska, 2016). There are a few works containing an analysis of total IIT of selected countries with all their trading partners (e.g., 11 EU trading entities: Brülhart & Elliott, 1999; Germany: Smeets, 1999; Lithuania: Bernatonytė & Normantienė, 2007). Global intra-industry trade was analysed, e.g., in Brülhart (2008), Czarny & Śledziewska (2012) and Emlinger and Piton (2014).

Our paper is innovative in so far as we compare the IIT shares of the two most developed RTA groupings in the world in a relatively long and turbulent period (2000–2022), in which there was an economic crisis and pandemics. We are compiling data concerning internal and external IIT of both groupings and their members. Finally,

we compare intensity of bilateral IIT of the selected EU countries and USMCA bloc members with the respective shares of two pairs of developed countries not gathered in one RTA grouping. There is no comparison in literature between the IIT characteristics of the EU and its member states and those of the USMCA grouping and its members. Moreover, the correlation between the intensity of IIA and the advancement of economic integration has not been studied in literature very often. Thus, this paper to some extent fills these research gaps.

This article is organised as follows. We begin by describing our research methods, and then discuss the empirical study results concerning IIT of the EU and USMCA groupings and their members. We also describe in our analysis bilateral IIT of Japan and South Korea as well as IIT of Japan and Australia. Next, we focus on examples of correlations (or lack of correlations) between economic integration and intensity of IIT. This analysis concludes with the findings.

RESEARCH METHODS

We calculate Grubel-Lloyd (GL) indices based on values of exports and imports obtained from the WITS-COMTRADE database. We assume that a proper approximation of an industry is a group of products meant as 6-digit HS code level.

We calculate the GL indices in bilateral trade for all selected country pairs as in formula (1).

(1)

$$GL_{ij} = 1 - \frac{\sum_{b=1}^{k} |X_{ijb} - M_{ijb}|}{\sum_{b=1}^{k} (X_{ijb} + M_{ijb})}$$

where:
i – reporter (reporting country),
j – partner (trading partner),
b – industry (6-digit HS code level),
k – number of industries in total trade (trade in all products),

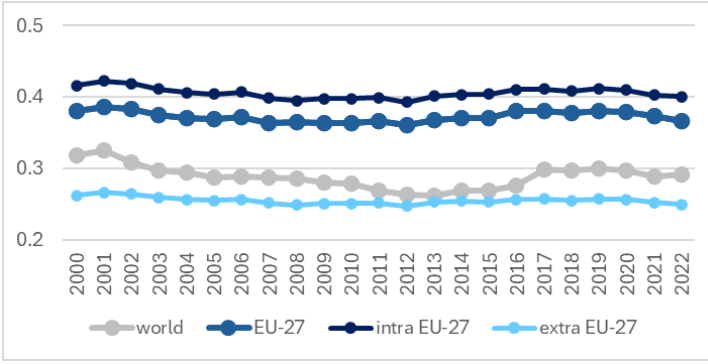
GL_{ij} – Grubel-Lloyd index in bilateral trade between country i and country j,
X_{ijb} – exports from country i to country j of products from industry b,
M_{ijb} – imports to country i from country j of products from industry b.

Next, we aggregate GL indices for selected countries, selected blocs of countries (here: the EU and USMCA grouping) and for the world. In the case of the world IIT indices, the number of reporters varies over time, but throughout the study all developed countries and the majority of developing countries are included.

INTRA-INDUSTRY TRADE OF THE EU AND ITS MEMBER STATES

Throughout, we treat the EU as a grouping consisting of 27 members for the whole period 2000–2022. For greater clarity, we exclude the United Kingdom from the EU members, as this will encapsulate changes in its IIT after Brexit better. In figure 1 we can see that over all of the analysed years, the EU IIT shares were at least 6 p.p. higher than the world average, and in the majority of years the difference was 8 p.p. The intra-EU IIT indices are the highest, and they are the greatest determinant of the high values of the general EU IIT shares. The intra-EU IIT regularly exceeds the extra-EU IIT by 14-16 p.p. (in 18 out of 23 analysed years, this difference is 15 p.p.). Interestingly, the extra-EU IIT shares are constantly lower than the world average. This indirectly proves the importance of factors – mentioned in the introduction – that determine IIT intensity.

Figure 1. Intra-industry trade of the European Union



Source: The authors' own calculations based on United Nations Comtrade database (2024).

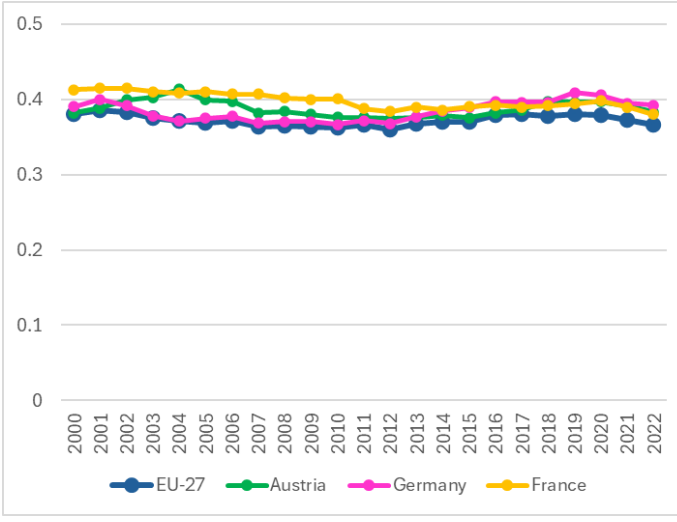
The stability of all three EU IIT indices and the relatively low volatility of the IIT world average is astonishing. There has been little change to these indices despite the turbulent times of economic crisis, accompanied by a collapse of international trade, troubles in the euro area, the Covid pandemic and conflicts and wars in various parts of the world.

Next, we discuss IIT of EU members. We have identified four groups of EU member states:

- countries with IIT shares above the EU average for the whole analysed period (figure 2),
- countries with IIT shares above the EU average for some years (figure 3),
- countries with IIT shares slightly below the EU average for the whole period (figure 4),
- countries with IIT shares noticeably below the EU average for the whole period (figures 5 and 6).

The vertical axes on in figures 2–6 have the same scale, to demonstrate the differences between IIT of selected EU member states and the EU average.

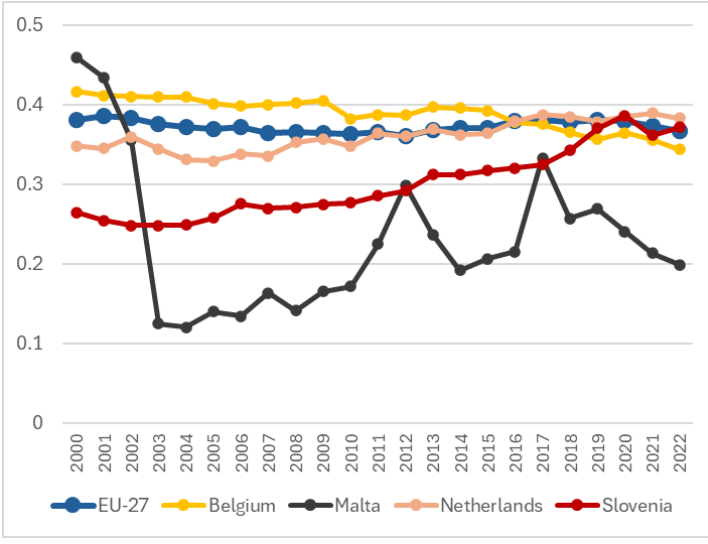
Figure 2. Intra-industry trade of Austria, Germany and France as EU members with the highest IIT shares in the grouping



Source: The authors' own calculations based on United Nations Comtrade database (2024).

As we can see in figure 2, there are three countries with IIT shares exceeding the EU average for the whole analysed period: Austria, Germany and France. Their IIT shares are a little (approximately 1-3 p.p.) higher than the EU average. The common features of these countries are: (1) relatively long land borders with other EU members, (2) belonging to the economic and geopolitical core of the EU (EU–15 and the original eurozone members, countries with high GDP per capita), and (3) countries with relatively high trade potential (especially in trade in hi-tech manufactures). Germany and France are the undisputed economic and geopolitical leaders of the EU, whereas Austria is smaller but highly developed as well.

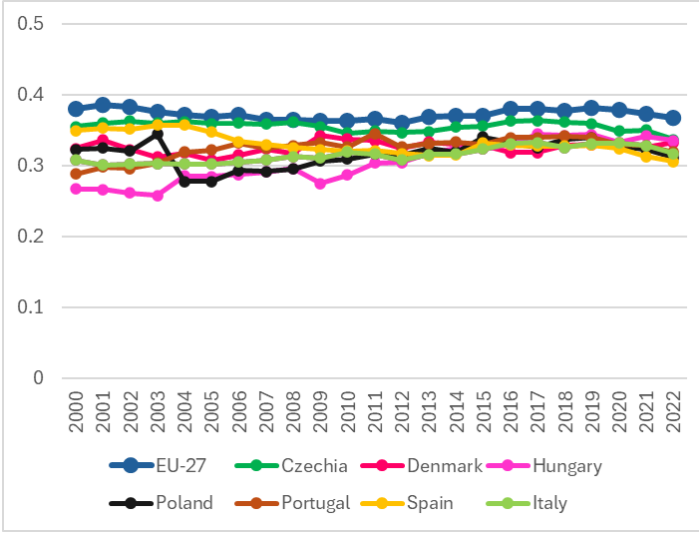
Figure 3. Intra-industry trade of Belgium, Malta, the Netherlands and Slovenia as EU members with more intensive IIT than the grouping's average for some years



Source: The authors' own calculations based on United Nations Comtrade database (2024).

The second group of EU members has IIT shares above the EU average only for some years (figure 3). It consists of Belgium, Malta, the Netherlands and Slovenia. Belgium and the Netherlands are similar to Austria, in particular in terms of wealth and development, even if they are relatively small members of the EU-15 and the eurozone. Slovenia is the first member of this group from among the new member states that joined the EU in 2004 (EU-10) mentioned in our overview. It is surrounded exclusively by EU members and was the first of the EU-10 countries to join the eurozone, joining in 2007. It can be seen as an example of how it is possible to catch up successfully, as its IIT shares increased with time and have surpassed the EU average only in the last years. Finally, Malta's IIT is very specific, with broad fluctuations. The most probable reason is relatively small volume of this trade and its susceptibility to single transactions.

Figure 4. Intra-industry trade of Czechia, Denmark, Hungary, Italy, Poland, Portugal and Spain as EU members with slightly less intensive IIT than the EU average



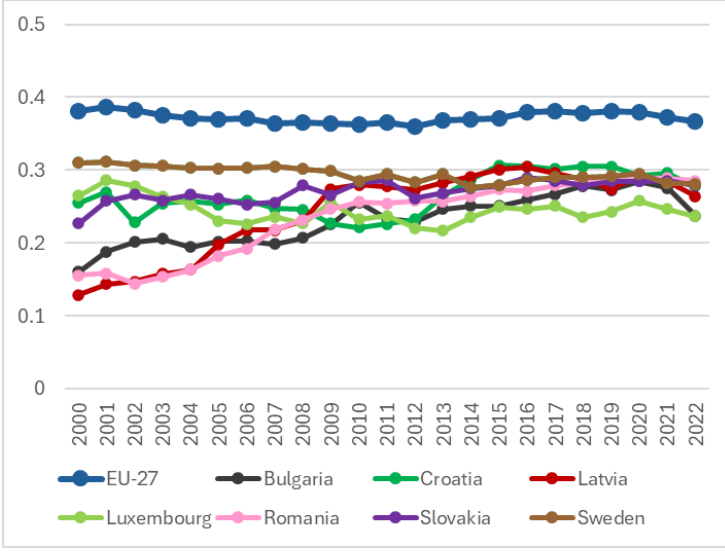
Source: The authors' own calculations based on United Nations Comtrade database (2024).

The group of countries with IIT shares slightly below the EU average (figure 4) comprises some EU-15 (Denmark, Italy, Portugal, Spain) and some of the most economically advanced and relatively large EU-10 countries (Czechia, Hungary, Poland). They can be seen as less developed or integrated in comparison with the leaders of the EU. Italy, Portugal and Spain are still behind for example Germany, even if they are members of the eurozone. Czechia, Hungary and Poland can be seen as countries catching up in respect of IIT intensity with the EU members in the first and the second groups.

The fourth group (figures 5 and 6) consists mainly of peripheral countries of the EU, with exceptions such as Luxembourg and Slovakia. In this group, there are two types of EU member state – relatively small EU-15 economies (Luxembourg, Greece) and relatively small and/or less developed economies of the EU-10 (Latvia, Cyprus, Estonia, Lithuania), EU members since 2007 (Bulgaria and Romania) and members since 2013 (Croatia). Relatively small economic potential makes them unlikely to be equal partners of the leading

EU economies, and this means a low level of capacity to develop IIT. The peripheral location is also accompanied by IIT shares noticeably below the EU average. The intensive export of tourism services characteristic for Cyprus, Greece and Croatia is an additional factor discouraging development of their industries, and this probably detracts IIT intensity.

Figure 5. Intra-industry trade of Bulgaria, Croatia, Latvia, Luxembourg, Romania, Slovakia and Sweden as EU members with noticeably less intensive IIT than the EU average

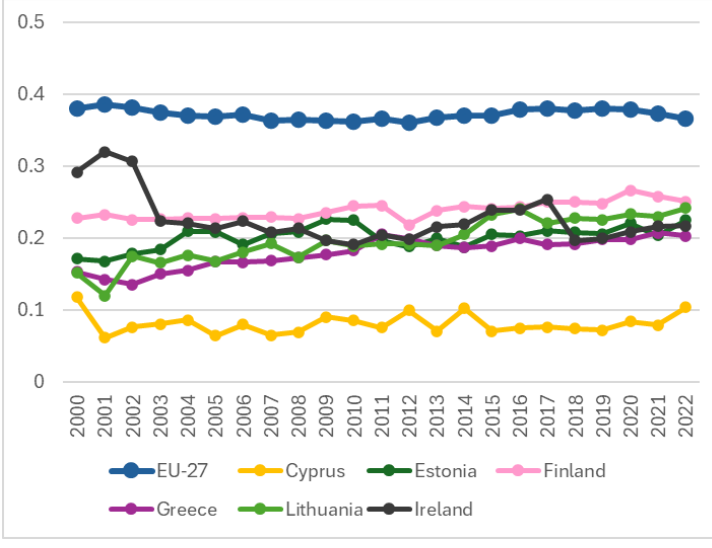


Source: The authors' own calculations based on United Nations Comtrade database (2024).

The presence in that group of Sweden, Finland, Ireland and Slovakia seems to be an exception. All of these countries are relatively well developed, even if the first three are peripheral. The possible reason for their poor level of IIT might be their specialization in export, especially in technology advanced goods, which often have no substitutes or goods that are similar. For instance, in the period 2000–2010, machinery and transport equipment accounted for about 40–50% of Slovakian exports and about 60% from the year 2010. Additionally, in the period 2000–2005, chemical products accounted for 35–45% of Irish exports, and for about 55–65%from the year 2005. In the case of

Swedish and Finnish exports, there is not a very strong specialization in technology advanced goods. Meanwhile, other characteristics of their exports are important, as the share of fuels, ores, wood and other unmanufactured goods in Swedish and Finnish exports was approximately 10–15%. This probably diminished IIT (source The authors' own calculations based on United Nations Comtrade database (2024)).

Figure 6. Intra-industry trade of Cyprus, Estonia, Finland, Greece, Lithuania and Ireland as EU members with noticeably less intensive IIT than the EU average



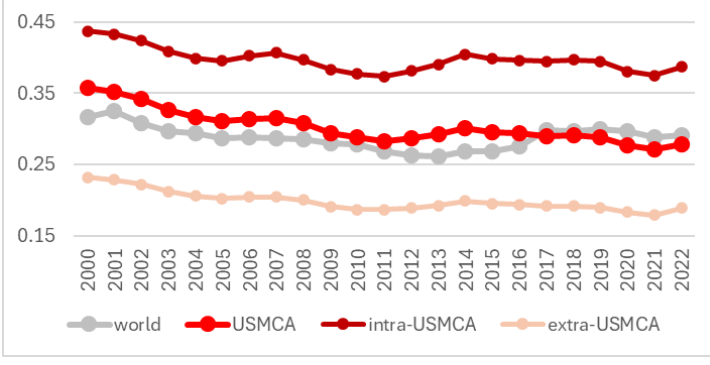
Source: The authors' own calculations based on United Nations Comtrade database (2024).

An analysis of the IIT shares of individual EU member states shows that higher IIT shares are found in the very wealthy and developed member states, which are members of the eurozone, making them the most integrated countries of the EU. They typically have a long land border with other member states. On the contrary, IIT is less developed in smaller, less developed, peripheral or strongly specialized member states.

INTRA-INDUSTRY TRADE OF THE USMCA AND ITS MEMBER STATES

As we can see in figure 7, IIT intensity of USMCA grouping declined from 0.36 in 2000 to 0.28 in 2022. Before 2017, the USMCA IIT shares were higher than the world average, but later they became slightly lower than the global average. Intra-USMCA IIT regularly exceeds extra-USMCA IIT by 19-21 p.p. Extra-USMCA IIT shares are noticeably lower than the world average. This also indirectly proves the importance of the factors mentioned in the introduction – shaping IIT intensity.

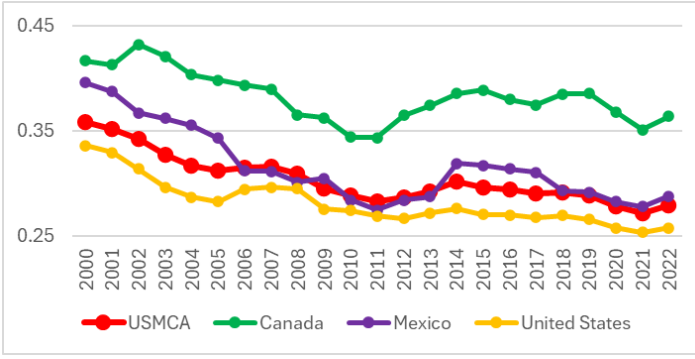
Figure 7. Intra-industry trade of the USMCA



Source: The authors' own calculations based on United Nations Comtrade database (2024).

As far as the IIT shares of the USMCA bloc members are concerned, the data in figure 8 show significant differences between the individual countries. The shares of Canadian IIT are noticeably higher than the USMCA average, and the intensity of American IIT is below the USMCA average. Heavy weight of US IIT is visible by the proximity and similar curvature of the IIT USMCA average and the US IIT shares. The case of Mexico is more complicated. In the past, the shares of Mexican IIT were higher than the USMCA average. Nowadays, they are close to the average. For all USMCA grouping members, IIT shares in 2022 were lower than at the beginning of the 21st century. This downward IIT share trend was reversed in the last year of research (2022).

Figure 8. Intra-industry trade of Canada, the United States and Mexico



Source: The authors' own calculations based on United Nations Comtrade database (2024).

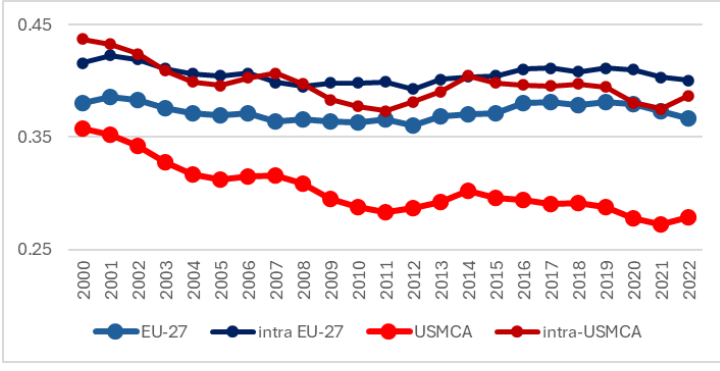
To sum up, in the 21st century there has been a reduction in IIT in the USMCA bloc and its members. Between 2000 and 2022, the smallest decline in IIT occurred in Canada, which was the only USMCA country to exceed the USMCA IIT average throughout the analysed period.

DOES MORE ADVANCED ECONOMIC INTEGRATION GO TOGETHER WITH MORE INTENSIVE INTRA–INDUSTRY TRADE?

In this section, we compare EU IIT and USMCA IIT (figure 9). Throughout the analysed period, the EU IIT shares were considerably higher than those of the USMCA grouping. The EU's advantage ranged between 2 p.p. in the year 2000 and 10 p.p. (2020–21). This means that generally, the advantage of the EU grew over time, even if in the last year of the research it dropped from over 10 p.p. to below 9 p.p. Differences in in IIT within groupings were not as obvious. The EU had an advantage over the USMCA in 17 out of 23 years, but the differences were relatively small. They ranged from −2 in 2000 to +3 (2011, 2020) – from the EU point of view. In 6 analysed years, the intra-USMCA IIT shares were higher than those of the EU. However, the last year with higher USMCA IIT than in the EU was 2014.

In this case, more advanced and longer lasting integration seems to go together with IIT intensity.

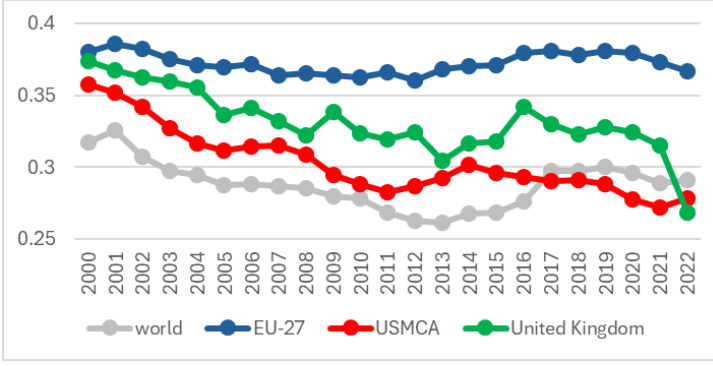
Figure 9. Intra-industry trade of the EU vs. intra-industry trade of USMCA



Source: The authors' own calculations based on United Nations Comtrade database (2024).

In the next step, we add to our comparison the IIT of the UK as the only country that belonged to the most advanced integrated grouping, namely the EU, and then left it during the analysed period. Although the UK ceased to be a member of the EU on 31 January 2020, it left the single market at the end of 2020. Since 2021, trade relations between the UK and the EU have taken the form of a free trade area and have been governed – first temporarily and then officially – by the EU-UK Trade and Cooperation Agreement. From 2000 to 2021, British IIT was less intensive than EU IIT and more intensive than USMCA and world IIT (figure 10). However, in 2022 it fell sharply to below the world and USMCA average. The fall in 2022 was stronger in trade with the EU–27 than with the rest of the world (table 1).

Figure 10. Intra-industry trade of the United Kingdom in comparison to IIT of the EU, IIT of the USMCA and the world IIT



Source: The authors' own calculations based on United Nations Comtrade database (2024).

The data in figure 10 reveal that Brexit – meant as disintegration – is accompanied by a noticeable decline in British IIT. So, in this case less (more) advanced economic integration goes hand in hand with less (more) intensive IIT.

Table 1. Intra-industry trade of the United Kingdom with the world, EU–27 and the rest of the world

Exporter–Importer	2021	2022
United Kingdom–world	0.32	0.27
United Kingdom–EU-27	0.40	0.34
United Kingdom–rest of the world	0.23	0.21

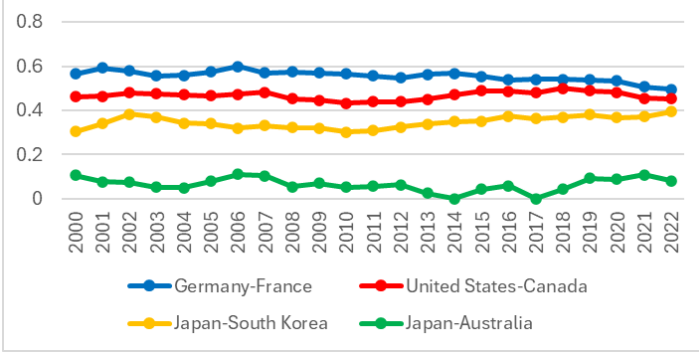
Source: The authors' own calculations based on United Nations Comtrade database (2024).

Finally, we present IIT shares in bilateral trade of Germany-France, United States-Canada, Japan-South Korea and Japan-Australia (figure 11). In this way, we contrast IIT of the two EU members most active in this kind of trade, and IIT of the two most developed members of the USMCA grouping with IIT of developed countries not integrated into a single RTA grouping. These are Japan–South Korea, both of which joined the Regional Comprehensive Economic Partnership (RCEP) in 2022. The RCEP has not been notified by the WTO yet, so according to the WTO Japan and South Korea are not members of the

same free trade area). The data in figure 11 illustrates regularity that more advanced integration goes hand in hand with more intensive IIT (lack of integration goes together with less intensive IIT).

IIT between Germany and France (members of an economic and monetary union) is more intensive than IIT between the United States and Canada (members of a free trade area). Additionally, IIT between countries belonging to the same RTA grouping (Germany–France and United States–Canada) is more intensive than this kind of trade between countries which are not members of the same RTA grouping (Japan–South Korea).

Figure 11. IIT of Germany with France, the United States with Canada, Japan with South Korea, and Japan with Australia



Source: The authors' own calculations based on United Nations Comtrade database (2024).

Additionally, we compare two pairs of countries, Japan–South Korea and Japan–Australia. Despite Japan and Australia creating a free trade area in 2014, IIT between these two countries is much less intensive than between Japan and South Korea. Japan and South Korea are quite close to each other (although they have no common land border), and this is useful in developing IIT, whereas Japan and Australia are located far apart, and this discourages intensification of IIT. However, in this case, economic integration is not accompanied by more intensive IIT.

CONCLUSIONS

Our empirical study confirms that sharing membership in an RTA grouping is an important factor intensifying bilateral IIT. Also, more advanced integration of adjacent countries, especially if they differ little in their economic potential, wealth and culture, helps to increase the level of IIT. We have shown that EU IIT shares were considerably higher than those of the USMCA grouping, and that the advantage of the EU grew over time. Also, in intra-groupings IIT the EU had an advantage over the USMCA grouping in almost 75% of the analysed years. This means that more advanced and longer lasting integration seems to go together with IIT intensity. Simultaneously, an analysis of bilateral IIT of selected members of the two groupings confirmed high shares of IIT in trade between France and Germany, and between the United States and Canada as well. However, these pairs of countries not only enjoy free trade under their RTAs, but they also have long land borders. Simultaneously, in the case of Japan and South Korea, which were also included in the study, there is no land border and IIT is less intensive. Thus, economic integration is not the only possible cause of increased IIT. Other factors described in the Introduction also play a role. This is not surprising, as economic integration, especially when far-reaching, is characteristic for *natural partners* which have the characteristics we have stressed as important for IIT development.

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