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AUTHORS	Athina Ditsiou Evangelos Siskos  Konstantia Darvidou 
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Athina Ditsiou, Ph.D. Candidate,
Department of International and
European Economic Studies, University
of Western Macedonia, Greece.
(Corresponding author)

Evangelos Siskos, D.Sc. in Economics,
Professor, Department of International
and European Economic Studies,
University of Western Macedonia,
Greece.

Konstantia Darvidou, Ph.D.,
Department of International and
European Economic Studies, University
of Western Macedonia, Greece.



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Athina Ditsiou (Greece), Evangelos Siskos (Greece), Konstantia Darvidou (Greece)

EFFICIENCY OF THE INTRA-EU TRADE IN GOODS AND SERVICES: GEOGRAPHICAL AND PRODUCT STRUCTURE ANALYSIS

Abstract

Economic integration facilitated international trade within the EU with overall benefits for its economy. However, the importance of intra-EU trade varies by country and industry. This paper aims to estimate the efficiency of the intra-EU trade for particular Member States and economic sectors. The trade efficiency of the Member States is measured with the net export index and the difference in export and import growth. Correlation and regression analysis is used to assess sector-specific effects. The results show that South European Member States perform better in the efficiency of intra-EU services trade and worse in merchandise trade, but the difference is decreasing. Western European countries tend to have medium efficiency of services trade and stability in the efficiency of merchandise trade. North European countries are likely to have less than average trade efficiency and no major changes in it. Central European countries perform better than average and have an upward trend in merchandise trade efficiency. Ireland, Poland, Czechia, Slovenia, and Bulgaria have the best performance in the total intra-EU trade. The EU has a well-diversified intra-bloc trade with the domination of manufactured goods. The elasticity of value added to exports is the highest for apparel, automotive industries, agriculture, and travel services (0.8-1.2). Other sectors have lower elasticities: 0.3-0.7 (goods) or 0.4-0.6 (services). Export demand has little effect on the food industry, fuel industry, construction, and insurance sectors. The negative correlation in financial services was a prominent exception among industries.

Keywords

exports, imports, international integration, structural effects, competitiveness, industries, European Union

JEL Classification

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INTRODUCTION

In many cases, international trade is an essential driver of economic growth and contributes to a national GDP, creation of jobs, production cost minimization, and improved access to a greater variety of goods and services. The benefits of trade may be exploited under the deep economic integration of competitive economies.

The EU is an enormous economic union that constitutes a substantial part of the global economy and is a model example of the substantial elimination of trade barriers for intra-bloc trade due to the establishment of the internal market. The latter helped to increase competition, contain inflation, enlarge market size, and improve the convergence of the Member States' economies. Unlike in many other integration blocks, most trade involving the EU Member States is inside the EU, which stresses its importance compared to relatively smaller extra-EU trade flows.

Despite the generally positive effects for the Union, individual effects for particular Member States may vary. This causes their stratifica-

tion into full-scale beneficiaries of trade integration and counties that underexploited their economic potential, at least within the intra-bloc trade. Member States may be divided into net exporters and net importers, which demonstrates the difference in the intra-EU trade efficiency for them. Besides efficiency differentiation at a macro-level, there is dispersion in how intra-bloc trade may affect particular industries at a meso-level.

Structural differences in trade efficiency may motivate various stakeholders inside the EU, affecting decision-making in the EU economic policies and sentiments toward European integration. Intra-EU trade deficits in some Member States may become a matter of concern in the long run, which raises the issue of searching for tools to offset them with extra-EU exports, foreign investments to restore competitiveness, or fiscal transfers within the EU.

1. LITERATURE REVIEW

The research on intra-EU trade is mostly devoted to its importance, structure, competitiveness, factors, and effects. The studies describe either general trends at the EU level or trends in particular groups of countries or industries.

The intra-EU trade product structure relied primarily on machinery and transport equipment, chemicals, and other manufactured goods. Germany, the Netherlands, France, Belgium, and Italy were the main contributors to its geographical structure (Alatríste-Contreras, 2015). In sectoral terms, there was also an increase in intra-EU export concentration for wearing apparel, wood products, and partially transport equipment relative to the extra-EU trade. Trade in services in the EU experienced a better trend than the trade in goods (Leitner et al., 2016).

The gravity model approach is a traditional tool to analyze trade factors. In particular, there is more than a proportional effect of country size and less than a proportional effect of income in the trade between the old and new EU Member States. A physical capital endowment was more critical in EU-15 countries, and human capital endowments had a more significant effect in CEEC-10 countries. Negative factors included borders and especially distance (Marques, 2008), which fits theoretical assumptions. Geographical proximity and access to sea minimize transportation costs, which is more important for trade in intermediate goods than in final ones (Martínez-Zarzoso et al., 2011).

When the export competitiveness of Member States in the foreign markets within the EU was considered, its factors included domestic real unit labor

costs and tertiary education. Their effect was significant, at least in 2002–2012. The imports depended positively on lower taxation levels and higher research and development expenditures (Pistikos & Zarotiadis, 2014). Trade between the EU regions is stimulated by improved quality of government institutions, which influences international trade more than domestic interregional trade. The effect is especially visible for ICT and financial and professional services (Barbero et al., 2021). International investment indicators significantly correlated with trade indicators at least before the crisis in 2008, but the direction of a causal link was not specified (Kučerová & Poměnková, 2014).

Original European economic integration and the accession of the new member states were other factors discussed in the literature. Before the accession, the trade between Western European countries was more developed than between the Central European countries preparing for accession and between these two groups of countries (Paas, 2003). Joining the EU provided a 70% increase in trade for the old Member States and a 300% increase for the New ones. There was an additional 40% increase because of the Economic and Monetary Union membership (the effect was estimated for the old Member States) (Glick, 2016). There is no robust evidence that intra-EU trade grew faster than global trade in 2002–2013 (Mika & Zymek, 2018), so no trade diversion occurred due to the euro effect.

Services Directive had a positive effect on intra-EU services trade (30-62% growth) and services sector FDI (18-36%) within several years after the implementation of the Directive (Kox & Lejour, 2006). As for the EU Cohesion Policy Transport

Infrastructure Investment program, an average additional investment in transport infrastructure increases exports of the EU NUTS2 regions by 0.4%, but the effect significantly varies by region. Central and Eastern European Regions benefit the most (Shevtsova et al., 2021).

The trade between the accession countries increased because of the growing variety of export products (extensive margin), as the exports of existing products did not change much. However, despite a relatively more substantial growth of trade between the new Member States and the trade between the old EU Member States, the effect of the accession was insignificant after controlling for standard trade factors (Foster-McGregor, 2012). Egger and Pfaffermayr (2013) suggested that European economic integration more strongly stimulated the core-periphery and intra-periphery trade growth than the trade between the core Member States.

Despite the consensus that the EU integration caused an increase in the intra-EU trade-to-GDP ratio, it is not a linear trend as it can be interrupted due to various challenges. In particular, the crisis of 2008 led to a stop in the export-driven economic growth model. The share of intra-EU trade in global trade decreased to 20% in 2011 from 30% a decade before. But the intra-EU trade was still the most important for the EU (60% of international trade of the Union) (Leitner et al., 2016).

There was also a period when European integration was less efficient in increasing export flows than NAFTA (Managi et al., 2005). The analyzed period (1996–2001) was soon after the establishment of NAFTA, while the EU was between the major integration stages (establishment of the single market and finalization of the monetary union establishment).

Another phenomenon that partially curbed intra-EU trade was geographical trade diversification involving other competitive economies. Exports to China had a substitution effect weakening trade between the EU countries, especially the core Member States (unlike trade between the periphery Member States and imports from China). Similarly, imports from the US weakened trade within the EU. However, imports from India strengthened intra-EU trade (Chen et al., 2021).

It is also necessary to assess national differences in the trade importance and efficiency. The contribution of intra-EU exports to value added in the EU Member States was, on average, 14.8%. The lowest values were 4.4% in Greece, 8.4% in the United Kingdom (not EU member since 2020), and 10.8% in Spain and France. The highest were 33.3% in the Czech Republic, 32.8% in Malta, 32.2% in Luxemburg, 32.0% in Hungary, and 30.7% in Slovakia (Arto et al., 2018). Central European Member States depended more on exports than the old Member States (Kučerová & Poměnková, 2014).

Increasing trade value is not the economic policy's main goal. It is natural for smaller economies to have larger trade-to-GDP ratios. It just offsets their original disadvantage of a smaller domestic market. Moreover, the location of a country at the center or edge of the EU territory may affect which countries (Member or non-Member states) are geographically closer to it, affecting trade flows.

The gravity equation approach to trade efficiency estimation measures the deviation of actual trade from a predicted value with the gravity model, which considers the difference in conditions of countries. For example, Kang and Fratianni (2006) estimated the efficiency for 177 countries. The efficiency of the EU trade was above the average (0.21). Among the EU Member States, the highest values were in the Netherlands (1.17), Germany (0.54), and Sweden (0.50), and the lowest one was in Spain (−0.13) and Luxemburg (−2.19). But their data were for the end of the XX century, and again trade value is not the ultimate efficiency indicator.

Therefore, another group of studies considered the economic growth effects of trade. On the one hand, specialization provided by international trade positively affected economic growth in the EU's old Member States regardless of whether it was specialization in high-tech goods or not (Welfens & Perret, 2010). There is evidence of the two-way relationship between economic growth and exports in the sample of 13 new EU Member States in 1995–2013 (Dritsakis & Stamatiou, 2017). Ribeiro et al. (2016) stated that specialization in high-value-added industries (manufacturing and high-tech products) and exports mainly to near-by high-income economies stimulated economic

growth in the EU. This evidences about higher efficiency of intra-EU trade than efficiency of extra-EU trade.

In't Veld (2019) simulated a counterfactual scenario to estimate the effect of the EU single market on eliminating trade barriers. On average, the positive effect is 9% of GDP. It is larger in small and open economies (16% in the Netherlands, 18% in Belgium, and 20% in Luxemburg), including Central and Eastern European countries, and smaller in larger economies (8% in Germany, 7% in France and Italy) and Greece (6%).

On the other hand, Ingianni (2012) has not found evidence that output convergence in eight new Member States resulted from trade openness. Acaravci and Ozturk (2012) proved mutual causality between economic growth and exports only in the case of Latvia and Slovakia while studying this effect in ten Central European economies. Thus, despite the mainly positive economic growth effects, the research results on efficiency may still depend on a specific sample that was analyzed.

Trade balance may be used as a convenient and practically useful relative efficiency indicator as its deterioration, either from surplus or deficit, reduces economic growth (Blavasciunaite et al., 2020). At first glance, the direct beneficiaries at a national level included the net intra-EU exporters, such as Belgium, Denmark, Germany, Ireland, Hungary, the Netherlands, and Slovakia (Alatrisme-Contreras, 2015). Nevertheless, using other approaches could provide different results. For example, the gross and value-added trade balances may differ considerably. A fifth part of intra-EU trade imbalances was caused by demand in extra-EU countries and therefore was less of a problem than extra-EU trade imbalances (Nagengast & Stehrer, 2014).

When groups of Member States are considered, in 1995–2007, export growth in the EU-15 was below the global average and experienced no positive structural changes. In contrast, CEE-10 countries had the fastest-growing exports among the global regions, mainly because of improving their export structure (Francois & Wörz, 2011). The North of the EU benefited from economic growth in the South via trade channels. But the reverse effect of the North on the South was absent. The intra-bloc

trade of the North increased more in 2000–2007 than the trade of the West and the South. This shifted the intra-EMU trade balance in favor of the North (Ederer & Reschenhofer, 2016). Another efficiency differentiation regularity was that less advanced Member States became more successful in medium-quality segments of intra-EU trade (Leitner et al., 2016). International trade is also an important determinant of regional performance inside a country, at least when the case of Italy was analyzed (Kounetas & Napolitano, 2018).

Business cycles also may affect trade efficiency, especially in the short run. Central European Member States increased their market shares in the EU as a result of the crisis in 2008–2009. By that indicator, France, Italy, and the UK were the worst performers at that time. Belgium, Luxembourg, and Ireland improved their services market shares at the cost of losing merchandise market shares (Vondra, 2014). Pistikos and Zarotiadis (2014) estimated that relatively smaller economies were more resilient to the crisis period in 2009–2012 if their leading trade partner (countries oriented to German or Scandinavian markets) remained strong enough or when they were able to devalue their currency (Hungary and Poland).

As for the meso-level sectoral approach, there was a high hub score within the EU trade for machinery and equipment in Austria, Czech Republic, Finland, Germany, Hungary, Slovenia, and Sweden; for food, beverages, and tobacco – especially in the Netherlands and France; for chemical and chemical products – in Belgium, France, Germany, Ireland, Italy, Lithuania, the Netherlands, Poland, and Romania (Alatrisme-Contreras, 2015), which demonstrates that specific Member States may be efficiency leaders in particular industries.

Export elasticities to value added or output in manufacturing were different in the EU-15 (0.52) and CEE-10 (0.37). In EU-15, the highest elasticity was for paper (1.2), clothing, wood, and chemicals (0.73), which was insignificant for most other industries. In CEE-10, the elasticities for all the manufacturing sectors were significant, with the highest ones for electric, electronic devices, and vehicles (about 0.9), while the lowest one was for basic metals and wood (0.4) (Francois & Wörz, 2011).

However, most researchers at this level analyzed individual sectors, although there is an obvious bias in the sample of considered industries. For example, there was an upward trend in both intra-EU and extra-EU ICT services trade. Ireland became the leading country in ICT trade. In 2018, countries with positive Revealed Symmetric Comparative Advantage Index and Lafay index included Ireland, Finland, Sweden, the Czech Republic, Romania, Cyprus, Bulgaria, Latvia, and Slovakia. Countries specializing in ICT trade performed better in extra-EU trade than within the EU market (Stefaniak & Ambroziak, 2021).

A number of studies focused on agricultural trade. In 2005–2009, agricultural trade balances worsened in the new Member States (except in Poland and Hungary), which contrasted with their surplus in agricultural trade with non-Member States (Kiss, 2011).

Relative measures like export market share (EMS), revealed comparative advantage (RCA), and net export index (NEI), which is the ratio of the trade balance to the sum of exports and imports, are alternative approaches that are especially suitable for sectoral level analysis. For example, they were jointly used to assess competitive performance in the EU agri-food trade. The first cluster with high EMS, RCA, and positive NEI included the Netherlands, France, Belgium, and Spain. The second cluster had high EMS, low RCA, and negative NEI: Germany and Italy. The third cluster with low EMS, high RCA, and positive NEI included Denmark, Ireland, and Greece. The fourth cluster had low values of all three indices: the United Kingdom, Austria, Portugal, Sweden, and Finland (Banterle, 2005).

With a similar methodological approach, Carraresi and Banterle (2013) showed that France, Belgium, and Spain experienced worsening competitiveness in the agriculture and food industry. The Netherlands and Italy improved their competitive position. In 2020, Central European net exporters in agricultural trade with comparative advantage on the internal EU market included Hungary, Bulgaria, Lithuania, and Croatia. Poland, Czechia, Slovakia, Estonia, and Malta had both comparative disadvantages and net imports. In general, there was an improvement in the EU-13 new Member States in 2020 compared to 2004 (Jarosz-Angowska et al., 2022).

Pawlak (2010) analyzed the competitive advantage of the main producers of plant raw materials within the intra-EU trade. Several quantitative measures were used: Export Specialization Index (SI), Import-Export Coverage Ratio (CR), Relative Revealed Comparative Export Advantage Index (XRCA), Relative Import Penetration Index (MRCA), Relative Trade Advantage Index (RTA), Grubel-Lloyd Intra-Industry Trade Index (IIT), the share of a country in intra-EU trade, export value per 1 hectare of agricultural area, and export value per 1 full-time employee in the agricultural sector. The latter two indicators were calculated relative to the EU average. Hungary was the most competitive in oil seeds, France in cereals, and Spain in horticultural products. The sources of the comparative advantage were the scale of production and natural conditions.

The literature review shows a gap in the analysis of the meso-level effect of intra-EU exports on economic growth in particular sectors (especially in manufacturing and most services sectors). Also, modern challenges lead to shifts in countries' export competitiveness, requiring a reassessment of macro-level patterns. Therefore, this paper aims to estimate the efficiency of the intra-EU trade for particular Member States and industries in recent periods. The main tested hypothesis in this paper is that there is a heterogeneity of the intra-EU trade efficiency (it is assumed to vary by the Member States and industries). The hypothesis is checked by using static and dynamic approaches in measuring the economic benefits.

2. METHOD

EU-27 (without the United Kingdom) composition defines the intra-EU trade. Its geographical structure is analyzed with a breakdown by its Member States. Product structure is considered with a breakdown by product groups or subgroups of goods and services. Several measures of exports and imports are used: absolute values, relative values (relatively the total intra-EU exports or imports), and long-term growth rates. The trade balance is also calculated as absolute and relative values.

The current efficiency of the trade for Member States is evaluated with the net export index (NEI)

that shows their relative competitiveness inside the EU. There are better methods than this because a trade deficit in the intra-EU trade may be caused by imports of components and materials used for exports outside the EU. Also, the difference between export growth and import growth, in the long run, is calculated as a measure of trade efficiency dynamics (TED). According to each efficiency indicator, countries are grouped by two dimensions (goods and services trade).

Correlation and regression analysis is used to estimate the effect of intra-EU trade on economic growth in particular industries. The general formula of the tested model is:

$$y = b_0 + b_x x, \tag{1}$$

where x is the intra-EU export growth for a particular group of goods or services (data from World Trade Organization (n.d.) were used for exports in dollars with conversion into euros according to the exchange rate published by the International Monetary Fund (n.d.)), y is the value-added growth in industries producing the same or at least partially the same types of goods and services (data from Eurostat). As both growth rates are measured in percent, b_x is the elasticity of production to intra-EU exports.

3. RESULTS

3.1. Geographical structure of the intra-EU trade

Germany, the Netherlands, France, and Italy are the main exporters and importers, with a share of about one-half of the total intra-EU trade (see Table 1).

Table 1. The intra-EU international trade of the Member States (goods and services), 2020

Source: United Nations Conference on Trade and Development (n.d.).

Indicator	Exports	Imports	Exports	Imports
Units	Billion dollars		% total intra-EU	
Austria	156.2	153.4	3.9	4.1
Belgium	260.9	281.0	6.5	7.5
Bulgaria	26.1	24.3	0.6	0.7
Croatia	17.9	22.3	0.4	0.6
Cyprus	5.3	7.2	0.1	0.2

Indicator	Exports	Imports	Exports	Imports
Units	Billion dollars		% total intra-EU	
Czechia	168.0	114.9	4.2	3.1
Denmark	84.9	96.7	2.1	2.6
Estonia	14.8	16.9	0.4	0.5
Finland	48.2	59.5	1.2	1.6
France	371.0	509.7	9.2	13.6
Germany	849.6	767.8	21.1	20.5
Greece	28.3	36.4	0.7	1.0
Hungary	104.0	92.6	2.6	2.5
Ireland	152.0	72.2	3.8	1.9
Italy	302.6	303.8	7.5	8.1
Latvia	13.3	15.0	0.3	0.4
Lithuania	26.8	27.8	0.7	0.7
Luxembourg	75.4	59.3	1.9	1.6
Malta	–	–	–	–
The Netherlands	518.7	349.6	12.9	9.4
Poland	230.3	167.4	5.7	4.5
Portugal	59.1	67.1	1.5	1.8
Romania	72.1	79.6	1.8	2.1
Slovakia	75.7	56.5	1.9	1.5
Slovenia	31.1	25.2	0.8	0.7
Spain	224.3	192.1	5.6	5.1
Sweden	108.5	137.3	2.7	3.7
European Union	4026.2	3737.4	100.0	100.0

The absolute leaders in the intra-EU trade surplus are the Netherlands, Germany, Ireland, and Poland (see Table 2). Countries with the most significant intra-EU trade deficit are France, Belgium, and Sweden. The Member States with the highest intra-EU trade efficiency (measured by net export index) are Ireland, the Netherlands, Czechia, Poland, Slovakia, Luxembourg, and Slovenia. The least efficient intra-EU trade was in Cyprus, France, Greece, Sweden, Croatia, and Finland.

The EU member states can be classified according to the value and origin of trade balance into several groups (see Table 3). Central European countries, together with Ireland and the Netherlands in the first quadrant, had a double surplus (both in trade and services). Many South European and most Baltic countries (located in the second quadrant) had a problem of merchandise trade deficit that was not compensated by services trade surplus. However, 2020 was the year of the COVID-19 pandemic, which greatly affected tourism services. And sun and beach tourism was an important sector of specialization for many of these countries. The third quadrant was dominated by Nordic countries and France, with a double trade deficit. The fourth quadrant includes only Germany, with a minor merchandise surplus and minor services trade

Table 2. The intra-EU trade balance of the Member States, 2020

Source: United Nations Conference on Trade and Development (n.d.).

Indicator Units	Trade balance, goods		Trade balance, services		Trade balance, total	
	Billion dollars	% exports+ imports	Billion dollars	% exports+ imports	Billion dollars	% exports+ imports
Austria	-2.9	-1.3	5.7	6.5	2.9	0.9
Belgium	-12.7	-3.3	-7.4	-4.8	-20.1	-3.7
Bulgaria	-0.1	-0.2	1.9	25.3	1.8	3.6
Croatia	-9.0	-28.1	4.6	56.6	-4.4	-10.9
Cyprus	-3.5	-67.0	1.5	20.7	-2.0	-15.9
Czechia	51.7	20.4	1.4	5.0	53.2	18.8
Denmark	-8.8	-7.1	-3.0	-5.1	-11.7	-6.5
Estonia	-1.4	-6.1	-0.7	-7.4	-2.1	-6.5
Finland	-4.3	-5.8	-7.1	-21.2	-11.4	-10.5
France	-124.6	-19.4	-14.2	-6.0	-138.7	-15.8
Germany	105.4	8.0	-23.5	-8.0	81.8	5.1
Greece	-10.4	-20.8	2.3	15.2	-8.1	-12.5
Hungary	9.6	5.7	1.8	6.4	11.4	5.8
Ireland	39.5	37.6	40.3	33.9	79.8	35.6
Italy	7.0	1.4	-8.3	-7.7	-1.3	-0.2
Latvia	-3.2	-13.7	1.4	27.8	-1.7	-6.1
Lithuania	-5.3	-12.5	4.3	34.0	-0.9	-1.7
Luxembourg	-6.1	-22.5	22.2	20.7	16.0	11.9
Malta	-0.9	-32.9	-	-	-	-
The Netherlands	150.4	21.5	18.7	11.0	169.1	19.5
Poland	48.2	14.8	14.7	20.7	62.9	15.8
Portugal	-14.4	-14.2	6.4	25.9	-8.0	-6.3
Romania	-15.4	-12.8	7.9	25.0	-7.6	-5.0
Slovakia	19.1	16.2	0.2	1.2	19.2	14.6
Slovenia	4.0	8.5	2.0	19.8	6.0	10.6
Spain	19.5	5.8	12.8	16.2	32.3	7.8
Sweden	-21.5	-11.9	-7.4	-11.3	-28.8	-11.7

deficit. Italy and Austria had the most balanced intra-EU trade. Non-Euro Area Member States are likely to have a net surplus in services trade.

The fastest growth of intra-EU net exports was in Ireland, Latvia, Poland, Cyprus, Bulgaria,

Slovenia, Lithuania, and Czechia (mostly in the new Member States) – see Table 4. However, there was a negative change in net exports in some countries, especially Croatia, France, the Netherlands, Greece, and Slovakia.

Table 3. Grouping of the Member States according to their intra-EU trade balance, 2020

Source: United Nations Conference on Trade and Development (n.d.).

Services trade	Merchandise trade				
	Major deficit (NEI < -15%)	Minor deficit	Balanced trade (NEI < +/- 5%)	Minor surplus	Major surplus (NEI > 15%)
Major surplus (NEI > 15%)	Croatia (-), Cyprus (-), Greece (-), Luxemburg (+)	Latvia, Lithuania, Portugal, Romania	Bulgaria	Poland (+), Slovenia (+), Spain	Ireland (+)
Minor surplus	-	-	-	Hungary	Czechia (+), the Netherlands (+)
Balanced trade (NEI < +/- 5%)	-	-	Belgium	Austria	Slovakia (+)
Minor deficit	France (-)	Denmark, Estonia, Sweden (-)	Italy	Germany	-
Major deficit (NEI < -15%)	-	Finland (-)	-	-	-

Note: (+) countries with NEI for total intra-EU trade > 10%; (-) countries with NEI for total intra-EU trade < -10%.

Table 4. Intra-EU trade growth in the Member States, % in 2013–2020

Source: United Nations Conference on Trade and Development (n.d.).

Indicator	Merchandise trade			Services trade			Total trade		
	Exports growth	Imports growth	Export growth – import growth	Exports growth	Imports growth	Export growth – import growth	Exports growth	Imports growth	Export growth – import growth
Austria	1.9	-5.6	7.5	0.4	10.4	-10.0	1.4	-1.7	3.2
Belgium	-5.9	-9.0	3.1	8.0	14.6	-6.6	-2.4	-3.3	0.9
Bulgaria	25.2	7.6	17.5	15.7	12.5	3.2	23.3	8.2	15.2
Croatia	51.9	28.7	23.2	-28.4	7.4	-35.8	8.5	26.7	-18.3
Cyprus	31.4	7.8	23.6	29.2	24.7	4.5	29.6	13.9	15.6
Czechia	24.1	11.0	13.2	-1.7	5.3	-7.0	21.3	10.2	11.0
Denmark	-4.6	5.8	-10.4	0.3	4.7	-4.3	-3.0	5.5	-8.5
Estonia	-4.9	-6.8	1.9	2.5	43.4	-40.9	-2.9	3.8	-6.7
Finland	-3.2	-1.8	-1.3	10.9	4.9	6.0	0.3	0.4	0.0
France	-13.6	4.5	-18.1	-2.8	6.7	-9.6	-10.6	5.1	-15.7
Germany	-0.5	0.0	-0.5	21.1	-1.8	22.8	2.4	-0.4	2.8
Greece	34.6	11.9	22.6	-42.4	-5.3	-37.1	-4.3	8.5	-12.8
Hungary	15.3	15.3	0.0	1.2	10.2	-8.9	13.1	14.6	-1.5
Ireland	48.3	38.4	9.8	85.5	2.0	83.5	65.7	15.9	49.8
Italy	0.4	-2.2	2.6	-2.1	-1.1	-0.9	0.0	-2.0	2.0
Latvia	12.4	0.5	11.9	62.0	30.6	31.4	21.7	3.5	18.2
Lithuania	11.7	16.9	-5.2	131.9	45.8	86.1	33.6	20.5	13.1
Luxembourg	-25.8	-11.4	-14.4	27.0	43.4	-16.4	15.5	22.1	-6.6
Malta	-4.0	-14.1	10.1	-	-	-	-	-	-
The Netherlands	-0.9	13.8	-14.6	26.6	28.5	-1.9	3.2	16.6	-13.4
Poland	34.9	22.2	12.7	55.1	21.9	33.1	38.3	22.1	16.1
Portugal	8.9	10.8	-1.9	-0.5	22.2	-22.7	6.2	12.2	-6.0
Romania	21.5	25.8	-4.2	46.3	36.3	10.0	27.4	27.2	0.2
Slovakia	2.5	16.1	-13.6	1.3	2.9	-1.5	2.4	14.3	-11.9
Slovenia	20.5	3.8	16.7	10.9	4.3	6.6	18.5	3.9	14.6
Spain	4.5	1.4	3.2	-29.6	7.2	-36.8	-4.9	2.3	-7.2
Sweden	-4.4	0.4	-4.7	-10.9	-5.8	-5.2	-6.2	-1.3	-4.9

Table 5. Grouping of the Member States according to their intra-EU trade efficiency dynamics, 2013–2020

Source: United Nations Conference on Trade and Development (n.d.).

Merchandise trade / Services trade	Major net import growth (TED < -15%)	Minor net import growth	Balanced trade growth (TED <+/- 5%)	Minor net export growth	Major net export growth (TED > 15%)
	Major net export growth (TED >15%)		Lithuania (+)	Germany	Ireland (+), Latvia (+), Poland (+)
Minor net export growth			Finland, Romania		Slovenia (+)
Balanced trade growth (TED <+/- 5%)		Denmark, the Netherlands (-), Slovakia (-)	Italy		Bulgaria (+), Cyprus (+)
Minor net import growth	France (-)		Belgium, Hungary, Sweden	Austria, Czechia (+)	
Major net import growth (TED < -15%)		Luxembourg	Estonia, Portugal, Spain		Croatia (-), Greece (-)

Note: (+) countries with TED for total intra-EU trade > 10%; (-) countries with TED for total intra-EU trade < -10%.

The EU member states can be classified into several groups according to goods and services trade efficiency dynamics (see Table 5). By this indicator, South European countries will likely be in the fourth quadrant with balanced or positive net merchandise export growth and balanced or negative net services export growth. Most Western European countries (except France) and predominantly Northern European countries do not have extreme changes in net exports. Most Central European countries have at least nonnegative net merchandise export growth. Non-Euro Area Member States will likely have net positive growth in merchandise exports.

3.2. The product structure of the intra-EU merchandise trade

Despite services being the main component of advanced economies, their share in international trade is smaller (see Table 6). Therefore, the intra-EU merchandise trade is three times more than the services trade. The intra-EU trade is well diversified with the dominant role of manufactured goods, especially machinery and transport equipment. Business and transport services

were the main export services (with travel services twice as lower as in 2019 due to the COVID-19 pandemic).

Intra-EU exports stimulated economic growth in the relevant industries (see Tables 7 and 8). Correlations between export growth and value-added growth for most industries were high enough, with a few exceptions: food, fuels, construction, insurance, and especially financial services. Intra-EU trade in fuels (34% in 2020) is the least important in contrast with the extra-EU imports (66%) among the analyzed industries. Construction was the least tradable service (the ratio of intra-EU exports to the value-added was only 2% in 2020). This can explain the lower role of the intra-EU industry for these sectors.

In the merchandise production sector, the highest elasticity (b_x) of value added to intra-EU exports is for clothing, automotive and agricultural products. But most of the industries have an elasticity of about 2/3. Pharmaceutical industry has the lowest positive effect among the industries with the proven effect.

Table 6. The product structure of the intra-EU trade

Source: World Trade Organization (n.d.), Eurostat, and International Monetary Fund (n.d.).

Group of goods	Share in 2020 exports, %	Group of services	Share in 2020 exports, %
Total merchandise	77.17	Total services	22.83
Agricultural products	9.98	Manufacturing services on physical inputs owned by others	0.79
Food	8.81	Maintenance and repair services n.i.e.	0.40
Fuels and mining products	5.47	Transport	4.19
Fuels	3.01	Travel	2.84
Manufacturers	60.79	Construction	0.35
Iron and steel	2.20	Insurance and pension services	0.61
Chemicals	13.40	Financial services	2.09
Pharmaceuticals	5.08	Charges for the use of intellectual property n.i.e.	1.32
Machinery and transport equipment	28.11	Telecommunications, computer, and information services	3.56
Office and telecom equipment	5.95	Other business services	6.12
Electronic data processing and office equipment	2.22	Research and development services	0.79
Telecommunications equipment	2.90	Professional and management consulting services	2.18
Integrated circuits and electronic components	0.84	Technical, trade-related, and other business services	3.15
Transport equipment	11.23	Personal, cultural, and recreational services	0.38
Automotive products	8.93	Government goods and services n.i.e.	0.18
Textiles	1.01	–	–
Clothing	2.07	–	–

Table 7. Regression analysis of the effect of intra-EU exports (goods) on economic growth in the EU

Source: World Trade Organization (n.d.), Eurostat, and International Monetary Fund (n.d.).

Export growth (x)	Value added growth (y)	Correlation	R2	b0	bx
Agricultural products	Agriculture, forestry, and fishing	0.67	0.45***	-2.8*	0.93***
Food	Manufacture of food products, beverages, and tobacco products	0.37	0.14	1.6***	0.13
Fuels and mining products	Mining and quarrying	0.91	0.83***	-3.5**	0.61***
Fuels	Manufacture of coke and refined petroleum products	0.11	0.01	1.5	0.10
Manufacturers	Manufacturing	0.96	0.92***	-0.6	0.67***
Iron and steel	Manufacture of basic metals	0.94	0.88***	-1.8*	0.59***
Chemicals	Manufacture of chemicals and chemical products	0.78	0.61***	-1.8	0.57***
Pharmaceuticals	Manufacture of basic pharmaceutical products and pharmaceutical preparations	0.89	0.80***	0.04	0.33***
Electronic data processing and office equipment	Manufacture of computer, electronic and optical products	0.66	0.43**	-0.8	0.66**
Automotive products	Manufacture of motor vehicles, trailers, and semi-trailers	0.85	0.73***	-0.05	0.95***
Textiles	Manufacture of textiles, wearing apparel, leather, and related products	0.93	0.86***	-0.3	0.69***
Clothing	Manufacture of textiles, wearing apparel, leather, and related products	0.93	0.86***	-4.6***	1.10***

Note: Correlations and regression models are for 2001–2019/2020 (most goods) or 2001–2014 (basic metals, chemicals, and pharmaceutical products). t-test and F-test: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The results are less robust in the services sector because of fewer cases. The highest positive elasticity is in travel services. Medium elasticity is in business and transport services. The lowest positive one is in information and communication services, entertainment, and recreation services. Financial services have a negative elasticity.

4. DISCUSSION

Almost all the previous studies considered periods before the pandemic crisis. Therefore, this study provides a reassessment of the intra-EU efficiency by using a different period and methodological approach.

Table 8. Regression analysis of the effect of intra-EU exports (services) on economic growth in the EU

Source: World Trade Organization (n.d.), Eurostat, and International Monetary Fund (n.d.).

Export growth (x)	Value added growth (y)	Correlation	R2	b0	bx
Transport	Transportation and storage	0.92	0.85***	-0.7	0.46***
Travel	Accommodation and food service activities	0.99	0.99***	0.4	0.81***
Travel	Travel agency, tour operator, and other reservation service and related activities	0.73	0.54***	-0.9	1.16***
Construction	Construction	0.27	0.07	0.2	0.06
Insurance and pension services	Insurance, reinsurance, and pension funding, except compulsory social security	0.25	0.06	-0.16	0.17
Financial services	Financial service activities, except insurance and pension funding	-0.60	0.36*	4.0**	-0.53*
Telecommunications, computer, and information services	Information and communication	0.81	0.66***	-0.3	0.39***
Other business services	Professional, scientific, and technical activities; administrative and support service activities	0.88	0.77***	-1.8*	0.60***
Personal, cultural, and recreational services	Arts, entertainment, and recreation; other service activities; activities of household and extra-territorial organizations and bodies	0.62	0.38**	-3.6	0.38**

Note: Correlations and regression models are for 2009–2019/2020. t-test and F-test: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The closest methodological equivalent of this study is Banterle (2005). This study also applied the net export index as the key indicator. However, it was used for the total intra-EU exports instead of agricultural exports. This helped to establish the overall competitiveness of the Member States instead of the sectoral competitiveness. This study also combines static and dynamic efficiency estimation approaches based on merchandise and services trade balances.

Similar to Alatríste-Contreras (2015), machinery and transport equipment, chemicals, and other manufactured goods continue to prevail in the intra-EU trade structure. The list of the leading net intra-EU exporters by Alatríste-Contreras (2015) has changed by 1/3 as Belgium and Denmark switched to a trade deficit, while several Central European economies substantially improved their trade balances.

The result of the fastest growth of intra-EU net exports in the new Member States seems to be in line with the most significant effect of elimination of trade barriers in Central and Eastern European countries found by In't Veld (2019), Francois and Wörz (2011) and Glick (2016), unlike less than average growth in the Benelux countries.

The results in this paper do not support the findings of Ederer and Reschenhofer (2016) about better trade performance of the North. The difference in the analyzed periods can be an explanation. Despite the difference in periods, these findings are mainly similar to the conclusion of Vondra (2014) on countries that increased or decreased their market shares due to the crisis in 2008–2009 and the findings of Pistikos and Zarotiadis (2014) on the most competitive Member States in 2009–2012.

Coinciding with Francois and Wörz (2011), elasticities between exports and value-added prove a relationship between them for manufacturers in general, textile products and chemicals in the entire EU, and no significant relationship for food in the old Member States. These regularities remained stable despite the difference in the period.

A few studies in the literature review section focus on specific industries. This complicates the comparison with the results in this paper. The initial hypothesis of heterogeneity of the intra-EU trade efficiency was supported by the geographical breakdown and segmentation by products and services.

CONCLUSION

This paper aimed to estimate the efficiency of the intra-EU trade at the level of particular Member States and industries. The results show that South European Member States are likely to have better than average but decreasing efficiency in (intra-EU) services trade and relatively worse but increasing efficiency in merchandise trade. Most Western European countries have medium efficiency of services trade and no extreme changes in the efficiency of merchandise trade. North European countries perform worse than average with no noticeable trend. Central European countries have better than average trade efficiency and often improve merchandise trade efficiency with minor changes in services trade efficiency. As for the breakdown by particular countries, Ireland has the best performance in total trade. Other highly performing economies include Poland, Czechia, Slovenia, and Bulgaria. Excellent results in services trade (with minor effect on total trade efficiency) are in Lithuania, Latvia, Romania, and Cyprus. In contrast, France was at the bottom of the ranking.

The intra-EU trade is well diversified with the domination of manufactured goods. It is an important factor in the development of most industries. Time series regression analysis shows that such trade is crucial for apparel, automotive industries, agriculture, and travel services, with the elasticity of value added to exports 0.8-1.2. Most other industries have elasticities of 0.3-0.7 (goods) or 0.4-0.6 (services). No significant export demand effect was found in the food, fuel, construction, and insurance sectors; the only negative correlation was in financial services.

This study may help to determine the directions of further trade facilitation measures and sources of potential macroeconomic imbalances. The patterns of heterogeneity in trade efficiency suggest that the EU cohesion policy and fiscal transfers within the EU budget favoring less developed New Member States, together with the original gap in labor costs, may have improved a development convergence within the EU. De facto, the new Member States catch up with the older ones through the trade channel. The export elasticities prove the sufficient level of real integration in most sectoral markets. Further studies may compare the effects of intra- and extra-EU trade and determine whether the found regularities remain stable.

AUTHOR CONTRIBUTIONS

Conceptualization: Athina Ditsiou, Evangelos Siskos, Konstantia Darvidou.

Data curation: Athina Ditsiou, Evangelos Siskos, Konstantia Darvidou.

Formal analysis: Athina Ditsiou, Evangelos Siskos, Konstantia Darvidou.

Investigation: Athina Ditsiou, Evangelos Siskos, Konstantia Darvidou.

Methodology: Athina Ditsiou, Evangelos Siskos, Konstantia Darvidou.

Project administration: Athina Ditsiou, Konstantia Darvidou.

Resources: Konstantia Darvidou.

Supervision: Evangelos Siskos.

Writing – original draft: Athina Ditsiou, Evangelos Siskos, Konstantia Darvidou.

Writing – review & editing: Athina Ditsiou, Evangelos Siskos, Konstantia Darvidou.

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