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ORIGINAL PAPER

COMPARATIVE ADVANTAGES IN INTERNATIONAL TRADE OF SERVICES – A FOCUS ON THE EUROPEAN UNION AND POLAND

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Abstract

This study examines comparative advantages in the context of international trade in services. Using the Revealed Comparative Advantage (RCA) index, countries with comparative advantages in specific service groups across 28 EU countries were identified. The results are illustrated for each service category using gradient maps, allowing for the determination of sectoral specialization in individual countries. Subsequently, a detailed case study of Poland was conducted, additionally utilizing the Corrected Revealed Comparative Advantage (CRCA) index to assess the stability of its comparative advantages between 2010 and 2018. The study identifies labor-intensive sectors, such as production services, transport, construction, and repair and maintenance services, as key areas of Poland's comparative advantage, stemming from lower labor costs compared to Western Europe.

PRZEWAGI KOMPARATYWNE W MIĘDZYNARODOWYM HANDLU USŁUGAMI – ANALIZA PRZYPADKU UNII EUROPEJSKIEJ I POLSKI

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Abstrakt

W pracy opisano przewagi komparatywne w kontekście międzynarodowego handlu usługami. Wykorzystując wskaźnik ujawnionej przewagi komparatywnej (RCA), zidentyfikowano kraje mające przewagi komparatywne w poszczególnych grupach usług w 28 krajach UE. Wyniki zobrazowano dla każdej kategorii usług z wykorzystaniem map gradientowych, co pozwoliło na określenie specjalizacji sektorowej poszczególnych państw. Następnie szczegółowo przeanalizowano przypadek Polski, z zastosowaniem dodatkowo skorygowanego wskaźnika ujawnionej przewagi komparatywnej (CRCA), w celu oceny stabilności jej przewag komparatywnych w latach 2010-2018. W wyniku badania zidentyfikowano pracochłonne sektory, jak usługi produkcyjne, transportowe, budowlane oraz naprawy i utrzymania, jako kluczowe obszary przewagi komparatywnej Polski, wynikające z niższych kosztów pracy w porównaniu z Europą Zachodnią.

Introduction

In today's world, we are witnessing increasingly strong globalization processes and the dynamic integration of the global economy. These processes have significantly accelerated since the 1990s, as confirmed by Krugman *et al.* (1995) and Baldwin (2016). This leads to an increase in trade flows between countries in both goods and services. At the beginning of the current millennium, services accounted for one-quarter of international trade (Hoekman & Matoo, 2000), and at that time, a significant increase in this share was expected due to the intensifying internationalization of services. While most of the literature still focuses on comparative advantages in goods trade, Lejour and de Paiva Verheijden (2004) and Balassa (1965) proposed key theories and methodologies that can be successfully adapted to the analysis of services trade.

Although the Revealed Comparative Advantage (RCA) index was originally designed for assessing competitiveness in the export of industrial goods (Balassa, 1965), subsequent research has demonstrated its applicability to international trade in services. Hindley and Smith (1984), Nusbaumer (1987), and Peterson and Barras (1987) were among the first to discuss how RCA can be employed in service sector analysis, emphasizing the growing role of services in international trade. Deardorff (1985, 2005) further explored the theoretical foundations of RCA in the context of services, highlighting the differences between goods and services in terms of trade patterns and specialization. More recently, Wyszkowska-Kuna (2016) reviewed these contributions, providing evidence of RCA's relevance for measuring service sector competitiveness across various EU economies. These studies confirm that, despite its initial focus on manufacturing trade, the RCA index remains a valuable tool for analyzing comparative advantages in services.

In the context of the European Union, trade in services is shaped not only by globalization but also by deep economic integration among member states. The creation of the EU's Single Market has significantly facilitated cross-border service exchanges by ensuring the free movement of services, one of the four

fundamental freedoms enshrined in the Treaty on the Functioning of the European Union (TFEU). The elimination of internal barriers and the harmonization of regulations have played a crucial role in enhancing service sector competitiveness within the EU. A key milestone in this process was the adoption of the Services Directive (2006/123/EC), which came into force in 2010. This directive aimed to simplify administrative procedures, promote competition, and remove unjustified restrictions on service providers operating in different EU countries. By fostering regulatory convergence, it has contributed to the increased specialization of EU economies in various service sectors, reinforcing comparative advantages at the regional level.

This paper attempts to deepen the understanding of international trade in services by examining the countries of the European Union. We aim to determine which EU countries specialize in which types of services and to find the optimal method for measuring comparative advantages. The case of Poland is analyzed in greater depth in comparison to other EU countries, identifying the sectors in which it holds comparative advantages, with a detailed focus on the stability of these advantages over time.

Measures of Comparative Advantages

The concept of comparative advantage was developed by Ricardo through the creation of the Ricardian model. The Ricardian model, which forms the foundation of the theory of comparative advantage, was first introduced by David Ricardo in his seminal work *On the Principles of Political Economy and Taxation* (Ricardo, 1817). According to this model, trade between two countries can be beneficial if both countries export goods in which they have a comparative advantage. Through specialization, each country participating in trade can achieve greater benefits than in the absence of trade (Francois & Hoekman, 2010). After many years of investigation several types of indices can be used to estimate comparative advantages (Langhammer, 2004; Gaurav & Bharti, 2018).

The most common index of revealed comparative advantage is the H.H. Liesner index from 1958, which was improved by Balassa (1965, 1989), now known as the Balassa Index or the Revealed Comparative Advantage (RCA) Index. This indicator shows a country's position in the export of particular goods or services. The Balassa index is given by the following formula (1):

$$\mathrm{RCA}_i = \left(\frac{X_{ij}}{X_j}\right) : \left(\frac{X_i}{X}\right) \tag{1}$$

where:

X_{ij} – the export value of the i-th product group in the j-th country,

X_j – the total export value of the j-th country,

X_i – the export value of the i-th product group in the reference countries (or globally),
X – the total export value in the reference countries (or globally).

The index ranges from 0 to infinity. A country exhibits a comparative advantage when the share of exports from i-th sector in the country's total exports is higher than the share of that sector in the export structure of the reference countries, meaning when RCA is greater than 1. Values between 1 and 2 indicate a weak comparative advantage, values between 2 and 4 signify a moderate advantage, and values above 4 indicate a strong comparative advantage. Values below 1 suggest that the country lacks a comparative advantage in the given sector (Balassa, 1965; Vollrath, 1991; Laursen, 2015).

Although the Revealed Comparative Advantage (RCA) initially seems like a robust method for estimating revealed comparative advantages, further analysis has shown that it is imperfect in several ways. One of the major limitations of the RCA index is that it is not consistent over time. It does not adequately capture changes in global trade patterns or shifts in comparative advantages. To address this issue, researchers have proposed the Corrected Revealed Comparative Advantage (CRCA) index (Laursen, 2015; Yu *et al*., 2009). Unlike the traditional RCA, the CRCA adjusts for biases that arise from changes in the global export structure, providing a more accurate reflection of a country's comparative advantage over time. It is given by the following formula (2):

$$\mathrm{CRCA}_i = \frac{X_i}{\sum_i X_i} - \frac{M_i}{\sum_i M_i} \tag{2}$$

where:
X_i – the export volume in the given product group,
M_i – the import volume in the given product group,
$\Sigma_i X_i$ – the total export volume,
$\Sigma_i M_i$ – the total import volume.

Positive CRCA values indicate product groups in which a given country has a revealed comparative advantage (Vollrath, 1991; Laursen, 2015).

Another issue affecting the RCA is that its distribution depends on the number and size of the sectors and countries used in the analysis. Additionally, the mean RCA is unstable and cannot be interpreted in economic terms. To address these limitations, Hoen and Oosterhaven (2006) developed the ARCA, which adjusts the RCA by making it additive. This modification allows for a more accurate comparison across sectors and countries, correcting the instability of the average RCA value, which often leads to misleading interpretations. By utilizing ARCA, researchers can obtain more reliable results when analyzing comparative advantages, as this method accounts for the structural variations in the dataset that the traditional RCA does not. Additive RCA (ARCA) is defined by the following formula (3):

$$\mathrm{ARCA}_{ij} = \left(\frac{X_{ij}}{X_j}\right) - \left(\frac{X_i}{X}\right) \tag{3}$$

where:

X_{ij} – the export value of the *i*-th product group in the *j*-th country,
X_j – the total export value of the *j*-th country,
X_i – the export value of the *i*-th product group in the reference countries (or globally),
X – the total export value in the reference countries (or globally).

If country j has a revealed comparative advantage in sector *i*, then this value is greater than zero. Conversely, if country *j* does not have a revealed comparative advantage, this value is less than zero (Hoen & Oosterhaven, 2006). It is also possible to aggregate these values to obtain an aggregated ARCA for the entire country. This is given by the following formula (4):

$$\mathrm{ARCA}_j = \frac{1}{2}\sum_i \left|\left(\frac{X_{ij}}{X_j}\right) - \left(\frac{X_i}{X}\right)\right| \tag{4}$$

Thus, we are dealing with an Additive RCA (ARCA), with bell-shaped distributions between −1 and +1, and a mean value of zero, which by definition is independent of the number and classification of distinguished countries and sectors. Furthermore, for a country as a whole, the overall Aggregated ARCA ranges from 0 to 1, indicating pure intra-sectoral trade and pure inter-sectoral trade, respectively. Hoen and Oosterhaven (2006) also point out that to obtain an objective ARCA, the country or region under analysis should be excluded from the group of reference countries or regions.

There are also alternative ways of measuring comparative advantages. One of them is the Trade Coverage Index (TC), which is a useful alternative, particularly when analyzing the balance between a country's exports and imports in a specific sector (Vollrath, 1991; Laursen, 2015). This index measures the extent to which a country's exports can "cover" its imports, providing insights into the trade balance of particular sectors. The formula for the TC index is typically (5):

$$\mathrm{TC}_i = \frac{X_i}{M_i} \tag{5}$$

where:

X_i, M_i – represent the export and import of products from the *i*-th industry in a given country, respectively.

A TC index level above one indicates a surplus in the trade of products within a specific category for the given country, which in turn points to a competitive advantage in trading products from this sector. On the other hand, values below one indicate a trade deficit, resulting in a weak position in foreign markets. (Tian *et al.*, 2024; Jiang & Lin, 2020).

The final indicator we will mention is the Trade Balance Index (TBI), developed by Lafay (1992). It is measured in the following way (6):

$$\mathrm{TBI}_{ij} = \frac{X_{ij} - M_{ij}}{X_{ij} + M_{ij}} \tag{6}$$

where:

X_{ij}, M_{ij} – represent the export and import, respectively, of the i-th product group by country j.

The index takes values in the range (-1,1). Positive values, which indicate a trade surplus in the exchange of a given good, signal the country's specialization in trading that particular product group. On the other hand, values below 0 suggest a lack of export specialization by the country (Lafay, 1992)

Other approaches include the Normalized RCA (NRCA) index, which adjusts for size effects in trade data and improves comparability across sectors and countries (Yu *et al.*, 2009).

Additionally, the choice of RCA modification depends on the specific research objective, as different indices capture distinct aspects of comparative advantage. As highlighted by Stellian and Danna-Buitrago (2022), there is no universally superior measure, and selecting an appropriate index requires balancing theoretical consistency with empirical applicability.

Data and Methodology

The balance of payments data required for the empirical analysis of the aforementioned indices was obtained from the Eurostat website. The year 2016 was selected for the RCA analysis due to the greatest availability of data. For the CRCA analysis, data from the years 2010-2018 was used. The CRCA analysis was concluded in 2010, as this year marked the end of a uniform methodology for data collection and reporting, allowing the use of a single database. The dataset analyzed extends until 2018, which may make the analysis seem temporally distant. However, this approach enables the identification of the comparative advantages of EU countries without distortions caused by shocks such as the COVID-19 pandemic and the armed conflict in Ukraine. The recent shifts in comparative advantages due to these shocks could be an important subject for future research.

To calculate a country's export or import figures, the 28 European Union countries (EU28) were used as trading partners. The formulas presented above were applied for the calculation of the analyzed indices. Service categories were divided according to the EBOPS2010 classification into the following services: S – Total Services, SA – Manufacturing services on physical inputs owned by others, SB – Maintenance and repair services, SC – Transport

services, SE – Construction services, SF – Insurance and pension services, SG – Financial services, SH – Charges for the use of intellectual property, SI – Telecommunications, computer, and information services, SJ – Other business services, SK – Personal, cultural, and recreational services, SL – Government goods and services not elsewhere classified.

This study excludes travel services (SD) due to the complexity of their interpretation within Revealed Comparative Advantage (RCA) analysis. Unlike other service sectors, which involve structured business transactions, travel services primarily reflect consumer spending by non-residents on domestic services such as accommodation and dining. This makes it difficult to attribute them to a specific sectoral specialization or assess their competitiveness using traditional trade indicators. Additionally, comparative advantage measures focus on stable, supply-driven trade patterns, whereas travel services are highly demand-driven and volatile, influenced by economic cycles, mobility trends, and temporary external factors. Since RCA assumes competitiveness is based on sectoral efficiency, applying it to travel services could lead to misleading conclusions. To maintain methodological consistency, travel services were excluded, as their nature as a consumption-driven sector does not align with the supply-side focus of RCA.

The question that naturally arises during such an analysis is whether the obtained results are stable over time. Unfortunately, the RCA index cannot be used for such comparisons due to the limitations of its formula. To address this question, the Corrected Revealed Comparative Advantage (CRCA) index was applied. Calculations were performed for the period between 2010 and 2018. While this is a relatively short period, analyzing periods before 2010 would require using different data sets, which raises concerns that the results may not be comparable. For the results obtained, a comparative advantage correlation analysis was conducted. For each year, a value of one was assigned if a country exhibited a comparative advantage in a given service sector, and zero otherwise. Correlation coefficients were then calculated for these binary variables across consecutive years.

Results

The results of the RCA analysis are presented in Appendix 1. To maintain clarity and facilitate the interpretation of the results, gradient maps were created to reflect RCA levels across various countries, divided into service categories. Countries that did not have a revealed comparative advantage in a particular service sector, i.e., those for which $RCA_i < 1$ (where i represents the respective sectors), were marked in white.

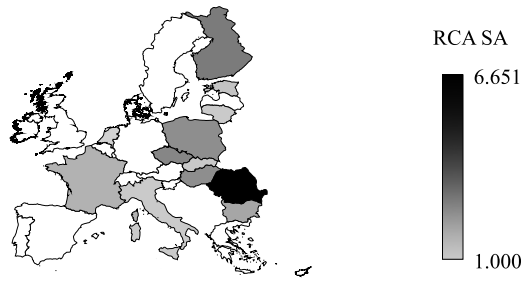

Fig. 1. RCA SA Index; manufacturing services on physical inputs owned by others
Source: own elaboration based on data Eurostat (2024). Balance of payments data.

The chart for RCA SK was omitted, as no country had a comparative advantage in this service category. However, this deviation should be considered as an underestimation of RCA SK due to significant data gaps in this category.

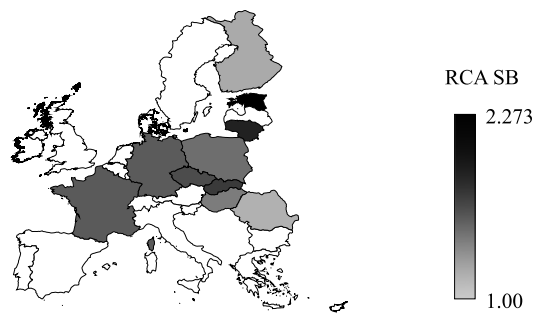

Fig. 2. RCA SB Index; maintenance and repair services
Source: own elaboration based on data: Eurostat (2024). Balance of payments data.

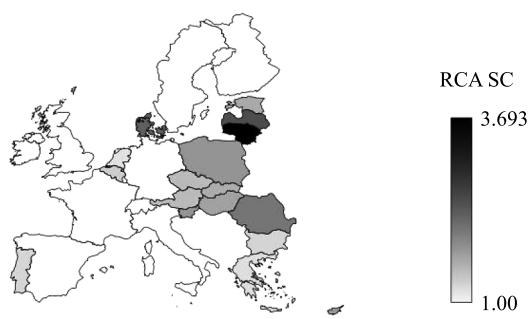

Fig. 3. RCA SC Index; transport services
Source: own elaboration based on data Eurostat (2024). Balance of payments data.

The analysis of the charts leads to conclusions consistent with both expectations and empirical observations, aligning with previous studies on comparative advantages in services trade. For example, Balassa (1986) and Francois and Hoekman (2010) highlight the role of labor costs in shaping trade specialization, particularly in labor-intensive service sectors. Similarly, Bobirca and Miclaus (2007) and Wosiek and Visvizi (2021) provide evidence that Eastern European countries maintain comparative advantages in services requiring high labor inputs, such as manufacturing services based on inputs from other firms, transport services, and construction services, due to their relatively lower labor costs compared to Western Europe.

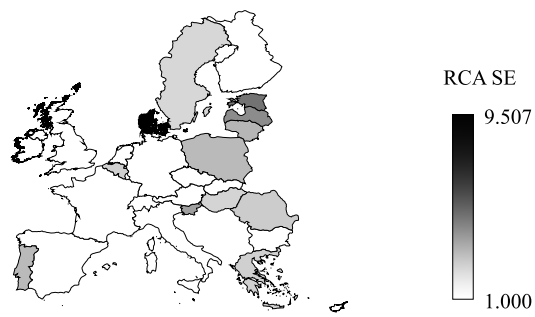

Fig. 4. RCA SE Index; construction services
Source: own elaboration based on data Eurostat (2024). Balance of payments data.

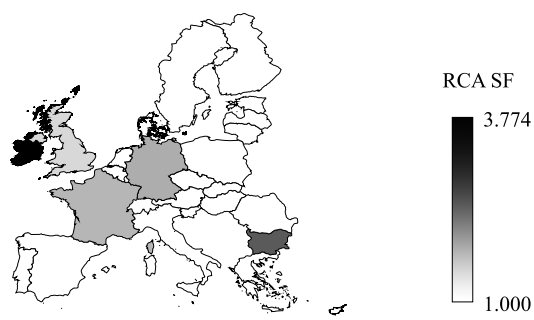

Fig. 5. RCA SF Index; insurance and pension services
Source: own elaboration based on data Eurostat (2024). Balance of payments data.

In the case of maintenance and repair services, France and Germany also show strong comparative advantages. This is consistent with research indicating that such services often require high technological sophistication and significant capital investments, areas where developed countries hold competitive edges (IMF, 2013; Cieślik, 2022).

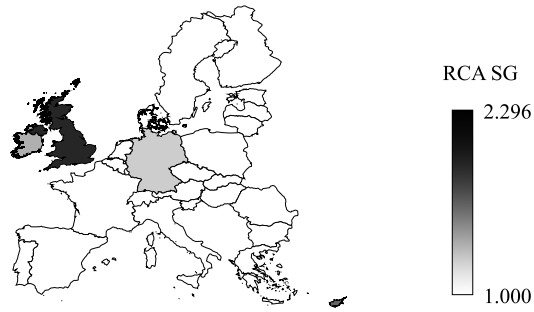

Fig. 6. RCA SG Index; financial services
Source: own elaboration based on data Eurostat (2024). Balance of payments data.

Regarding the financial services sector, the United Kingdom exhibits the most significant comparative advantage, aligning with empirical findings that emphasize London's dominance as Europe's leading financial hub and its global position in banking and investment services (Brei & von Peter, 2018; Schoenmaker, 2022).

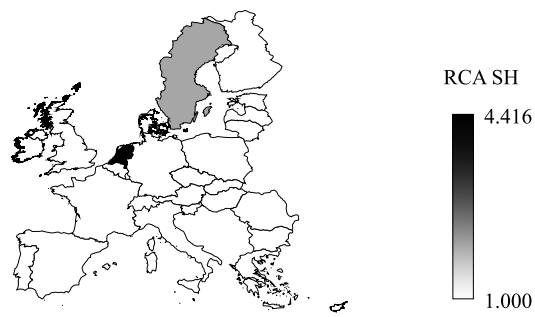

Fig. 7. RCA SH Index; charges for the use of intellectual property
Source: own elaboration based on data source: Eurostat (2024). Balance of payments data.

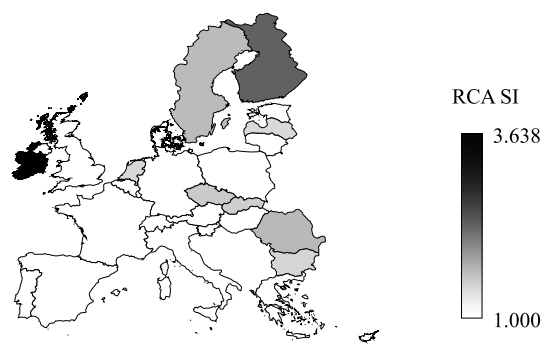

Fig. 8. RCA SI Index; telecommunications, computer and information services
Source: own elaboration based on data source: Eurostat (2024). Balance of payments data.

Additionally, business services and insurance reveal comparative advantages in highly developed Central European countries and Ireland. This observation is supported by more recent studies, which identify Ireland's strong export position in knowledge-intensive services, particularly in IT, financial, and business consulting sectors (Barry & Bergin, 2019; Department of Finance Ireland, 2021). Ireland's success in these industries is linked to favorable tax policies, foreign direct investment (FDI) inflows, and its integration with multinational corporations, reinforcing its role as a global hub for high-value service exports.

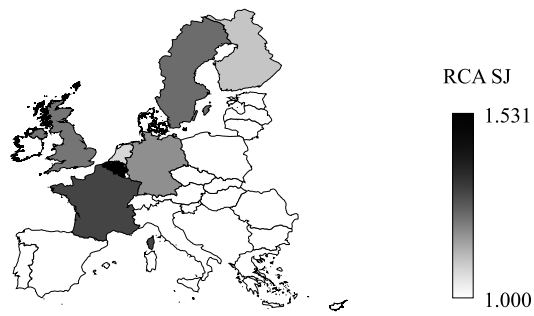

Fig. 9. RCA SJ Index; other business services
Source: own elaboration based on data source: Eurostat (2024). Balance of payments data.

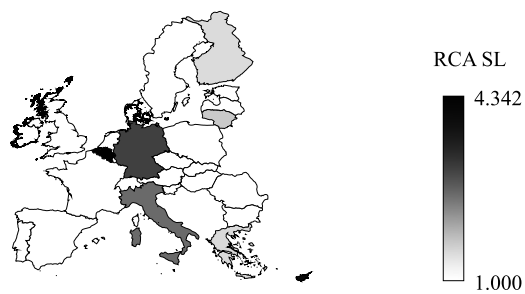

Fig. 10. RCA SL Index; government goods and services not elsewhere classified
Source: own elaboration based on data source: Eurostat (2024). Balance of payments data.

The Other Business Services sector, which includes consulting, legal, accounting, engineering, and R&D services, exhibits comparative advantages primarily in Western and Northern Europe. France shows the highest RCA value, likely due to its strong consulting and legal sectors, while Germany and the UK also perform well, reflecting their roles as major business hubs. The Netherlands and Nordic countries demonstrate strengths in business advisory and management services, benefiting from knowledge-intensive economies. In contrast, Central and Eastern European countries lack significant comparative advantages in this sector, likely due to a less developed market for specialized business services and a lower presence of multinational consulting firms.

The obtained correlation coefficients for the previously described binary variables indicating the presence or absence of comparative advantage over time were as follows: 2018-2017: 0.768, 2017-2016: 0.714, 2016-2015: 0.722, 2015-2014: 0.745, 2014-2013: 0.652, 2013-2012: 0.680, 2012-2011: 0.735, 2011-2010: 0.735. These values are relatively high, especially considering that data gaps between consecutive years increasingly affect the indicator's value. Nonetheless, it can be reasonably assumed that comparative advantages are relatively stable over a eight-year period. To answer definitively whether CRCA is stable over time, a panel data analysis would be required.

It is also important to consider whether the other indices proposed in this paper yield consistent results. To examine the consistency between the different computational methods used to estimate comparative advantages in the services sector, the TBI, TC, and ARCA indices were calculated for 28 European Union countries and each service group for the year 2016 (see Appendix 1, 2, 3, 4). Based on these indices, it was determined whether a country exhibited a comparative advantage in a given sector. A value of one was assigned when a comparative advantage was present, and zero when it was not. Correlation coefficients were then calculated for these binary variables (Tab. 1).

Table 1

Correlation matrix of RCA, TBI, TC, and ARCA indices for 2016

Specification	RCA	TBI	TC	ARCA
RCA	1	–	–	–
TBI	0.416	1	–	–
TC	0.416	1	1	–
ARCA	0.965	0.461	0.461	1

Source: own elaboration based on data Eurostat (2024). Balance of payments data.

The correlation analysis reveals that RCA yields consistent results only with the ARCA index, as indicated by the high correlation coefficient of 0.965. This consistency can be explained by the fact that both indices use the same set of variables in their calculations. However, there is a significant divergence when comparing RCA with the TBI and TC indices. This divergence can be attributed to the inclusion of a new variable – the volume of imports – into the calculations.

While RCA provides valuable insights into a country's export specialization, it does not account for import structures, which can distort the interpretation of comparative advantages if considered in isolation. In this regard, the TBI index serves as a complementary measure, offering a broader view of trade competitiveness by incorporating the balance between exports and imports (Lafay, 1992; Vollrath, 1991). The high correlation (1.0) between TBI and TC suggests that these indices capture similar aspects of trade performance,

further emphasizing the need to analyze RCA and TBI together rather than interchangeably. By combining RCA for export specialization and TBI for trade balance analysis, a more comprehensive understanding of a country's comparative advantage in services can be achieved.

Based on the calculations of the aggregated ARCA index for entire countries, we can conclude that the most inter-sectoral trade (indicative of inter-industry specialization) is observed in Romania, with an aggregated ARCA value of 0.073. In contrast, the most intra-sectoral trade (suggesting intra-industry specialization) occurs in Slovenia, where the aggregated ARCA value is 0.002. The ARCA index, by construction, provides insight into whether a country's trade structure is more sectorally diversified (higher ARCA values, reflecting inter-industry trade) or concentrated within specific industries (lower ARCA values, reflecting intra-industry trade) (Hoen & Oosterhaven, 2006). However, while ARCA allows for a broad classification of trade specialization, a more detailed assessment of intra-industry trade (IIT) requires complementary measures such as the Grubel-Lloyd index, which explicitly captures the extent of simultaneous imports and exports within the same industry (Grubel & Lloyd, 1975; Fontagné & Freudenberg, 1997).

From the analysis of RCA data for 2016 (Fig. 11), it is evident that Poland holds comparative advantages in manufacturing services based on third-party owned materials, maintenance and repair services, transport services, and construction services. Considering the structure of services in Poland, this aligns with expectations (Wosiek & Visvizi, 2021). Undoubtedly, Poland remains a country with relatively low labor costs within the European Union, making it competitive in labor-intensive service sectors. It is also worth noting that Poland has a comparative advantage in the maintenance and repair sector, which, as discussed earlier, indicates a relatively high level of technological sophistication and capital investment in the country.

Fig. 11. RCA Index for Poland in 2016
Source: own elaboration based on data Eurostat (2024). Balance of payments data.

If we look at the CRCA data for Poland over the period from 2010 to 2018, we can draw conclusions similar to those for RCA. Figure 12 shows how this index has changed over time. Its analysis allows us to conclude that Poland's comparative advantages have been relatively stable. This is not surprising, considering the

observation period is eight years, as in this case. However, if a period of over 20 years were considered, we would expect changes in comparative advantages. To thoroughly analyze the stability of this index over time, it would be necessary to gather data from a longer period and conduct a time-series analysis, which exceeds the scope of this paper. Therefore, we limit ourselves to a graphical analysis.

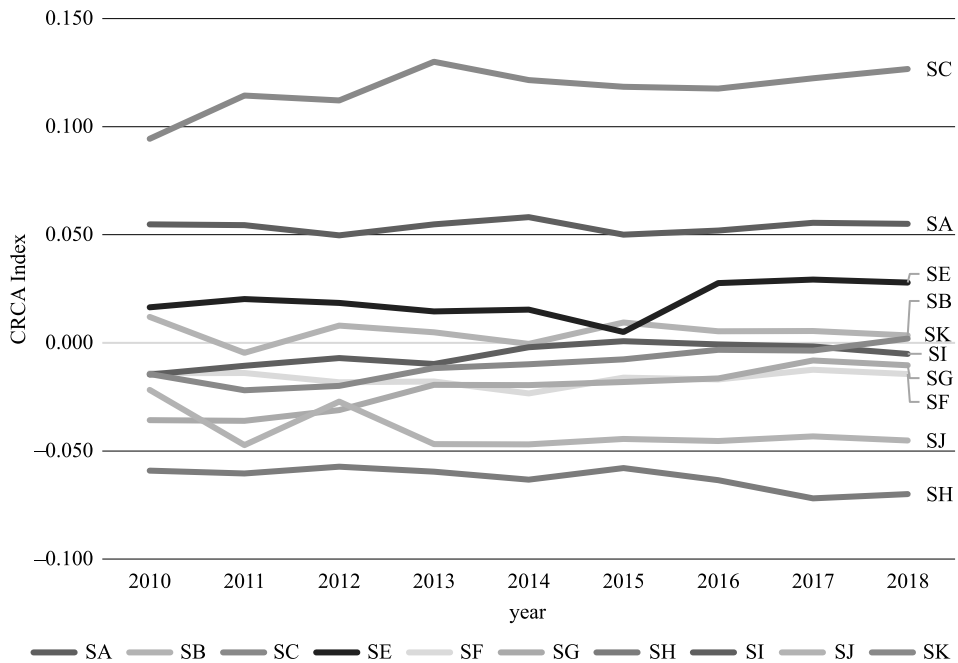

Fig. 12. CRCA Index for Poland from 2010 to 2018
Source: own elaboration based on data Eurostat (2024). Balance of payments data.

Conclusions

This paper has examined the comparative advantages of Poland and other European Union countries in the international trade of services, focusing particularly on the period from 2010 to 2018. Through the analysis of the Revealed Comparative Advantage (RCA) and Corrected Revealed Comparative Advantage (CRCA) indices, as well as other alternative measures like TBI, TC, and ARCA, we identified the sectors in which Poland exhibits significant comparative advantages, including labor-intensive sectors such as manufacturing services, transport services, construction services, and maintenance and repair services. The results confirm that Poland's comparative advantages are relatively stable over time, particularly in sectors where lower labor costs offer

a competitive edge compared to Western Europe. Moreover, the inclusion of other EU countries in the analysis has allowed for a broader understanding of the specialization patterns within the union, showing that countries with more advanced technological infrastructure, such as France and Germany, demonstrate comparative advantages in sectors requiring high technological sophistication and capital investment.

Although the RCA and CRCA indices provide a robust framework for analyzing comparative advantages, we identified certain limitations. For instance, the RCA index alone cannot capture long-term changes in trade patterns due to its dependency on a fixed dataset. To improve the robustness of future studies, panel data analysis over a longer period should be conducted, which would provide deeper insights into the evolution of comparative advantages in services trade.

Finally, the results suggest that while labor-intensive service sectors continue to be areas of strength for Eastern European countries, further research into the impact of technological developments on the comparative advantages of advanced economies would offer a more comprehensive view of how these factors shape international trade in services.

Translated by Piotr Malinowski

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APPENDIX

Appx. 1. RCA index values for 11 service categories in 2016

Country	RCA SA	RCA SB	RCA SC	RCA SE	RCA SF	RCA SG	RCA SH	RCA SI	RCA SJ	RCA SK	RCA SL
Austria	0.645	0.804	1.460	0.863	0.397	0.327	0.303	0.827	0.868	0.033	0.312
Belgium	no data	0.578	1.306	1.867	0.536	0.591	0.548	0.950	1.531	0.064	4.342
Bulgaria	1.949	0.995	1.259	0.212	2.266	0.156	0.080	1.050	0.505	0.002	0.038
Cyprus	0.007	0.000	1.762	0.068	0.255	1.741	no data	no data	0.047	0.001	4.206
Czech Republic	3.371	1.852	1.455	0.996	0.404	0.202	0.157	1.142	0.877	0.007	0.000
Germany	0.683	1.772	0.929	0.597	1.692	1.058	no data	0.895	1.202	no data	2.899
Denmark	0.114	0.394	2.271	9.507	0.277	0.150	0.545	0.706	0.584	0.019	0.451
Estonia	1.406	2.273	1.595	3.988	0.023	0.239	0.039	0.807	0.840	0.003	0.987
Greece	0.028	0.273	1.181	1.293	0.628	0.057	0.051	0.455	0.338	0.007	1.018
Spain	no data	no data	0.685	0.388	0.277	0.245	0.197	0.555	0.579	no data	no data
EU28	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Finland	3.636	1.198	0.942	0.366	0.270	0.223	0.859	2.529	1.037	0.003	1.005
France	1.725	1.579	0.917	0.303	1.585	0.442	0.664	0.738	1.375	0.133	0.854
Hungary	3.167	1.587	1.671	1.191	0.048	0.087	0.663	0.694	0.915	no data	no data
Republic of Ireland	0.150	0.746	0.522	0.062	3.774	1.306	0.478	3.638	0.791	0.002	0.841
Italy	1.304	0.608	0.664	0.145	0.586	0.879	0.435	0.851	0.798	0.004	2.303
Lithuania	1.288	1.933	3.693	1.998	no data	0.084	0.108	0.386	0.425	no data	1.190
Latvia	0.656	0.439	2.473	3.204	0.025	0.463	0.025	1.155	0.553	0.001	0.639
Malta	0.000	0.791	0.184	0.000	0.307	2.296	0.466	0.069	0.891	no data	no data
Netherlands	1.169	no data	1.158	0.900	0.205	0.249	4.416	1.024	1.008	0.039	no data
Poland	2.421	1.666	1.789	2.644	0.426	0.159	0.125	0.891	0.918	0.038	no data
Portugal	0.563	0.860	1.241	1.871	0.187	0.102	0.044	0.415	0.584	0.010	0.643
Romania	6.651	1.172	2.066	1.396	0.143	0.132	0.063	1.282	0.793	0.003	0.473
Sweden	0.625	0.463	0.962	1.106	0.272	0.664	1.956	1.267	1.203	0.019	0.563
Slovenia	0.866	0.729	1.768	3.643	0.411	0.062	0.087	0.671	0.484	0.005	0.182
Slovakia	1.321	1.763	1.578	0.922	0.176	0.184	0.040	1.102	0.699	0.002	0.867
United Kingdom	0.409	0.843	0.713	0.691	1.022	2.081	0.973	0.806	1.184	no data	no data

Source: own elaboration based on data Eurostat. (2024). Balance of payments data.

Appx. 2. TBI index values for 11 service categories in 2016

Country	TBI SA	TBI SB	TBI SC	TBI SE	TBI SF	TBI SG	TBI SH	TBI SI	TBI SJ	TBI SK	TBI SL
Austria	-0.351	-0.061	0.001	0.048	-0.068	0.060	-0.217	0.082	0.035	-0.401	0.339
Belgium	no data	-0.014	-0.025	-0.044	0.030	-0.039	0.077	0.127	-0.033	0.039	0.955
Bulgaria	0.769	0.220	0.123	0.073	0.352	-0.034	-0.660	0.459	0.005	-0.053	no data
Cyprus	no data	no data	0.344	0.500	-0.586	0.368	no data	no data	-0.545	-0.798	no data
Czech Republic	0.722	-0.043	0.296	0.253	-0.530	0.137	-0.718	0.202	-0.038	-0.243	no data
Germany	-0.188	-0.030	-0.135	-0.059	0.286	0.208	no data	-0.119	-0.048	no data	0.529
Denmark	-0.805	-0.158	0.045	0.332	-0.080	-0.019	-0.041	-0.165	-0.155	-0.545	0.438
Estonia	0.635	0.439	0.027	0.677	-0.772	0.162	-0.669	0.110	0.075	0.042	0.259
Greece	0.358	0.088	0.070	0.615	-0.462	-0.425	-0.579	0.223	0.314	-0.117	0.123
Spain	no data	no data	0.328	0.694	-0.227	-0.223	-0.626	0.031	0.029	no data	no data
EU28	0.114	0.060	0.025	0.126	0.081	0.222	-0.051	0.164	-0.023	-0.004	no data
Finland	0.064	0.159	-0.282	-0.744	-0.549	-0.589	-0.075	0.165	-0.299	-0.841	0.145
France	0.095	-0.063	-0.136	-0.206	-0.072	0.231	-0.357	-0.047	-0.007	0.065	0.981
Hungary	0.814	0.156	0.200	0.388	-0.744	-0.499	-0.104	0.052	-0.079	no data	no data
Republic of Ireland	-0.019	0.244	0.703	-0.571	0.207	0.304	-0.854	0.922	-0.146	-0.471	0.900
Italy	0.064	-0.013	-0.382	0.675	-0.349	-0.271	-0.441	-0.168	-0.216	-0.593	0.032
Lithuania	0.923	0.217	0.330	0.421	no data	-0.469	-0.287	0.041	-0.033	no data	-0.175
Latvia	0.818	0.226	0.464	0.795	-0.500	0.300	-0.758	0.303	0.087	0.529	0.294
Malta	no data	0.566	-0.052	no data	-0.302	0.083	-0.175	-0.265	-0.265	no data	no data
Netherlands	-0.003	no data	0.229	-0.012	0.266	-0.268	0.651	0.162	-0.050	-0.003	no data
Poland	0.772	0.249	0.358	0.552	-0.316	-0.214	-0.780	0.125	0.036	0.044	no data
Portugal	0.903	0.002	0.497	0.789	-0.406	-0.338	-0.866	0.071	0.044	-0.183	0.352
Romania	0.904	0.009	0.550	0.633	-0.568	-0.029	-0.817	0.312	0.052	-0.029	-0.082
Sweden	-0.094	-0.144	-0.100	-0.323	-0.027	0.371	0.285	0.093	-0.006	-0.079	0.390
Slovenia	0.883	0.020	0.362	0.570	-0.151	-0.593	-0.744	0.018	-0.143	0.091	-0.681
Slovakia	0.602	0.015	0.023	-0.092	-0.549	0.030	-0.894	0.077	-0.114	-0.292	0.499
United Kingdom	0.492	0.516	-0.120	0.098	0.406	0.652	0.318	0.211	0.221	no data	no data

Source: own elaboration based on data Eurostat. (2024). Balance of payments data.

Appx. 3. TC index values for 11 service categories in 2016

Country	TC SA	TC SB	TC SC	TC SE	TC SF	TC SG	TC SH	TC SI	TC SJ	TC SK	TC SL
Austria	0.481	0.885	1.001	1.101	0.872	1.129	0.643	1.179	1.073	0.428	2.026
Belgium	no data	0.973	0.951	0.915	1.062	0.925	1.166	1.290	0.937	1.081	43.897
Bulgaria	7.669	1.563	1.279	1.158	2.085	0.934	0.205	2.694	1.010	0.900	no data
Cyprus	no data	no data	2.047	3.000	0.261	2.165	no data	no data	0.294	0.112	no data
Czech Republic	6.194	0.918	1.842	1.679	0.307	1.318	0.164	1.507	0.926	0.608	no data
Germany	0.683	0.941	0.762	0.888	1.800	1.526	no data	0.788	0.908	no data	3.243
Denmark	0.108	0.727	1.095	1.995	0.852	0.962	0.920	0.716	0.732	0.295	2.558
Estonia	4.472	2.564	1.055	5.199	0.128	1.387	0.198	1.247	1.163	1.088	1.698
Greece	2.113	1.194	1.151	4.196	0.368	0.403	0.267	1.576	1.914	0.790	1.279
Spain	no data	no data	1.975	5.539	0.630	0.636	0.230	1.065	1.060	no data	no data
EU28	1.257	1.127	1.050	1.288	1.176	1.570	0.903	1.393	0.955	0.991	no data
Finland	1.137	1.377	0.560	0.147	0.291	0.259	0.860	1.394	0.540	0.086	1.340
France	1.209	0.881	0.760	0.658	0.866	1.602	0.474	0.911	0.986	1.138	104.333
Hungary	9.773	1.369	1.499	2.267	0.147	0.335	0.812	1.109	0.853	no data	no data
Republic of Ireland	0.962	1.645	5.737	0.273	1.523	1.874	0.079	24.502	0.745	0.360	19.059
Italy	1.138	0.975	0.447	5.161	0.483	0.574	0.388	0.712	0.645	0.256	1.066
Lithuania	25.053	1.554	1.983	2.451	no data	0.362	0.555	1.086	0.937	no data	0.703
Latvia	10.000	1.583	2.729	8.778	0.333	1.855	0.138	1.871	1.190	3.250	1.833
Malta	no data	3.609	0.901	no data	0.536	1.181	0.701	0.581	0.581	no data	no data
Netherlands	0.994	no data	1.595	0.975	1.726	0.578	4.725	1.386	0.904	0.994	no data
Poland	7.767	1.662	2.117	3.464	0.520	0.647	0.124	1.286	1.074	1.092	no data
Portugal	19.643	1.004	2.979	8.457	0.422	0.495	0.072	1.153	1.092	0.691	2.088
Romania	19.889	1.017	3.449	4.451	0.275	0.944	0.100	1.907	1.110	0.944	0.849
Sweden	0.829	0.749	0.819	0.511	0.948	2.181	1.796	1.205	0.988	0.854	2.278
Slovenia	16.056	1.040	2.137	3.655	0.738	0.255	0.147	1.037	0.750	1.201	0.189
Slovakia	4.021	1.030	1.048	0.832	0.291	1.062	0.056	1.167	0.795	0.549	2.991
United Kingdom	2.941	3.132	0.786	1.217	2.369	4.749	1.932	1.534	1.567	no data	no data

Source: own elaboration based on data Eurostat. (2024). Balance of payments data.

Appx. 4. ARCA index values for 11 service categories in 2016

Country	ARCA SA	ARCA SB	ARCA SC	ARCA SE	ARCA SF	ARCA SG	ARCA SH	ARCA SI	ARCA SJ	ARCA SK	ARCA SL
Austria	-0.009	-0.003	0.078	-0.002	-0.016	-0.069	-0.037	-0.019	-0.032	-0.002	no data
Belgium	no data	-0.006	0.052	0.014	-0.012	-0.042	-0.024	-0.006	0.128	0.000	no data
Bulgaria	0.024	0.000	0.044	-0.013	0.034	-0.087	-0.049	0.005	-0.119	-0.007	no data
Cyprus	-0.026	-0.015	0.129	-0.016	-0.020	0.076	no data	no data	-0.230	-0.011	no data
Czech Republic	0.061	0.012	0.077	0.000	-0.016	-0.082	-0.045	0.016	-0.030	-0.006	no data
Germany	-0.008	0.011	-0.012	-0.007	0.019	0.006	no data	-0.012	0.049	no data	no data
Denmark	-0.023	-0.009	0.215	0.142	-0.019	-0.088	-0.024	-0.033	-0.100	-0.004	no data
Estonia	0.010	0.019	0.101	0.050	-0.026	-0.078	-0.051	-0.021	-0.039	-0.003	no data
Greece	-0.025	-0.011	0.031	0.005	-0.010	-0.097	-0.051	-0.060	-0.160	-0.006	no data
Spain	no data	no data	-0.053	-0.010	-0.019	-0.078	-0.043	-0.049	-0.101	no data	no data
EU28	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	no data
Finland	0.068	0.003	-0.010	-0.011	-0.020	-0.080	-0.008	0.169	0.009	-0.010	no data
France	0.019	0.008	-0.014	-0.012	0.016	-0.058	-0.018	-0.029	0.090	0.002	no data
Hungary	0.056	0.009	0.114	0.003	-0.025	-0.094	-0.018	-0.034	-0.020	no data	no data
Republic of Ireland	-0.022	-0.004	-0.081	-0.016	0.074	0.032	-0.028	0.292	-0.050	-0.012	no data
Italy	0.008	-0.006	-0.057	-0.014	-0.011	-0.012	-0.030	-0.016	-0.049	-0.012	no data
Lithuania	0.007	0.014	0.456	0.017	no data	-0.094	-0.048	-0.068	-0.138	no data	no data
Latvia	-0.009	-0.008	0.249	0.037	-0.026	-0.055	-0.052	0.017	-0.108	-0.009	no data
Malta	-0.026	-0.003	-0.138	-0.017	-0.019	0.134	-0.029	-0.103	-0.026	no data	no data
Netherlands	0.004	no data	0.027	-0.002	-0.021	-0.077	0.183	0.003	0.002	-0.008	no data
Poland	0.037	0.010	0.134	0.027	-0.015	-0.087	-0.047	-0.012	-0.020	0.004	no data
Portugal	-0.011	-0.002	0.041	0.015	-0.022	-0.093	-0.051	-0.065	-0.100	-0.006	no data
Romania	0.146	0.003	0.181	0.007	-0.023	-0.089	-0.050	0.031	-0.050	-0.010	no data
Sweden	-0.010	-0.008	-0.006	0.002	-0.019	-0.035	0.051	0.030	0.049	-0.005	no data
Slovenia	-0.003	-0.004	0.130	0.044	-0.016	-0.097	-0.049	-0.036	-0.124	0.001	no data
Slovakia	0.008	0.011	0.098	-0.001	-0.022	-0.084	-0.051	0.011	-0.072	-0.010	no data
United Kingdom	-0.015	-0.002	-0.049	-0.005	0.001	0.111	-0.001	-0.021	0.044	no data	no data

Source: own elaboration based on data Eurostat. (2024). Balance of payments data.