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# SMALL IS BEAUTIFUL AND IMPORTANT: ECONOMIES AND FIRMS TRADING IN DIGITAL SERVICES

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**Abstract.** Although many firms operate on global digital platforms, small countries and firms also play an essential role at the national level, especially during crises and the slowdown in globalization. This research investigates trade patterns in digital services at the country and firm level and identifies challenges in this area in providing new information and tools to startup mentors and policymakers, who need more evidence for national authorities to develop mentorship and digital programmes. The study also contributes to transaction cost theory, explaining how it is possible to reduce transaction costs. The methodology involves using quantitative and experimental methods, logistic regression for firms and correspondence analysis for countries. The WTO dataset was used to visualise trade in services data and to interpret clusters of digitalised countries. Interestingly, Estonia stands apart from other post-socialist countries in terms of digital services exports, being among smaller countries and hosting the highest concentration of startups per capita. The firm-level analysis revealed that firms trading in digital services differ from others – being smaller, more focused on exports and more often controlled by non-residents. The study encourages investments in small countries and small firms that trade successfully in digital services.

**Keywords:** trade in services, digital services, data visualisation, correspondence analysis, cross-border, mode of supply, international trade, ICT-sector firms, firm-level data, WTO.

**JEL Classification:** F13, F14, F15, F23.

## Introduction

In the digital age, service firms aim to use the opportunities afforded by digitalisation and technology to export digital services (Rueda-Cantuche et al., 2016; World Trade Organization [WTO], 2009). While Asia dominates the global trade in information and communication (ICT) *goods*, the European Union has become more competitive in the ICT *services* trade (Ciriani & Perin, 2017; Kersan Skabic, 2020). Despite the growing importance of digital trade, little is known about its nature, trends and scale (Lee & Goldman, 2020; Kersan Skabic, 2020). Therefore, this study fills a methodological and data gap in this field.

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Compared to international trade in goods, trade in services is under-investigated and studies have less quality (Benkovskis et al., 2019; Bhattacharya et al., 2012; Borchsenius et al., 2010; Cernat & Kutlina-Dimitrova, 2014; Henig & Guildea, 2021; Wettstein et al., 2019). Foreign trade negotiators and economists are not provided with enough evidence on services trade (Cernat & Kutlina-Dimitrova, 2014; Rueda-Cantuche et al., 2016; Cernat, 2016). Therefore, based on a dataset of 38 countries and 7,414 Estonian service exporting firms, this study focuses on explaining trade in services – firms and countries and the relationships between them from the perspective of transaction cost theory. The study demonstrates the importance of small service firms for small countries and encourages investments in small countries and small firms that trade in digital services.

At country level, correspondence analysis was used to identify countries with similar trade profiles. At firm level, the number of employees, ownership, service type, service exports and turnover volumes were the most relevant indicators for further study (Aaby & Slater, 1989; Verwaal & Donkers, 2002). The literature suggests substantial challenges to measuring cross-border service flows (Cernat & Kutlina-Dimitrova, 2014; Hornok & Koren, 2017; Lee & Goldman, 2020; Rueda-Cantuche et al., 2016).

Firm-level studies began appearing in the 1990s (Bernard & Jensen, 1999; Bernard & Wagner, 1997; Melitz, 2003), with more recent studies published on service trading firms (Ambroziak & Stefaniak, 2022; Ariu, 2016; Hornok & Koren, 2017; Tajoli et al., 2021; Temouri et al., 2013; Wagner, 2021; Yi et al., 2022). However, there has not been *enough* research on *service* trading firms (Benkovskis et al., 2019; Hornok & Koren, 2017). Therefore, this article explores trade patterns in digital services across countries, focusing on the differences between traders in digital services and traders in other services. The aim is to answer *two questions*: How is it possible to visualise patterns of trade in *all* services across countries? How do digital services traders differ from other firms that trade in services?

The analysis proposes a fresh approach to estimating trade in digital services by introducing the share of digitally delivered services as an essential indicator for assessing the level of digital services in a given country. The assumption is that the cross-border supply of services (mode 1) broadly corresponds to trade in digital services. Therefore, this interpretative study proposes novel techniques and indicators for economic studies to interpret service trade patterns. The novelty of the analysis is that we capture all four modes of services supply (World Trade Organization, 2009). Firms in ICT services industries could be classified as traders in digital services (Lee & Goldman, 2020). The results support national traders in digital services vis-à-vis worldwide platforming. Trade-related indicators are also vital for achieving the goals of Agenda 2030 (United Nations, 2015).

The coronavirus pandemic impacted trade in services, particularly travel services (Duan et al., 2021; Li et al., 2020). After the Covid-19 outbreak in 2020, Estonia's services exports declined 20% compared to 2019, while ICT services exports increased 12%. A firm's resilience is its ability to adapt to a changing environment (Wahl & Durst, 2022); therefore, digital services exporters may be more resilient during crises, adapting to uncertainties and increasing their export revenues. Therefore, the intention of this article is to conclude with recommendations for evidence-based policymaking, in particular for trade in digital services.

Developed countries are the main players in trade in services, particularly in digital services (Ambroziak & Stefaniak, 2022). Based on OECD and EU country-level data, trade in services can be interpreted by visualising country profiles graphically. In addition, there needs to be a focus on *where* services transactions take place (Ambroziak & Stefaniak, 2022; Cernat, 2021), thereby focusing on service supply modes.

Estonia, a small Nordic country with an open market economy for the last 30 years, is known internationally as a hub for technology firms and startups. Estonia's business environment is an excellent basis for digital service firms that complement the digital economy. A firm can be established online in just a few hours from almost anywhere in the world, offering the freedom to start and manage it remotely. Furthermore, Estonia does not charge income tax on undistributed profits. Despite the hectic times, Estonian startups have still attracted large investments in 2022 (E-Estonia, 2022). In Estonia, exports in digital services comprised 14% of total services exports in 2018 and already 26% in 2021 (Statistics Estonia, n.d.). The decline in tourism during the Covid-19 pandemic contributed to the increase in the share of digital services exports; however, digital services exports also increased in volume – 12% compared to 2019, from 1.1 billion to 1.3 billion euros.

The study proposes to apply the statistical method, namely correspondence analysis (similar to principal component analysis), to analyse trade in services, defined as 2-digit categories according to the Extended Balance of Payment of Services classification (United Nations, 2012). Other researchers have also used "product mapping" (Ambroziak & Stefaniak, 2022; Widodo, 2009); however, this study uses correspondence analysis to visualise the profile of services across the countries' profiles. As in Tajoli, Airoldi, and Piccardi (Tajoli et al., 2021), the study revealed that mapping the profiles of products and countries identifies the trade patterns much more clearly than the sole volume of traded services.

The article will first discuss some concepts and identify links with transaction cost theory. Second, we look at country profiles and trade patterns regarding services trade. Third, we analyse the countries' services trade data from the perspective of the supply mode and service type to identify clusters of digitalised countries. Finally, the article will conclude with a firm-level analysis of Estonian services traders, a presentation of the study's key results, and potential implications for digital services firms at the national level.

## 1. Conceptual considerations

### 1.1. Nature of services

Services may be divided into several categories according to service type, partner country and the mode of supply (how services are delivered to a customer – cross border, mobility of the service producer or receiver). Some services, for example, design services, may complement the production of goods and thereby play an essential role in production. However, more services are also nowadays traded separately from goods and cross-border due to technological advances.

Furthermore, like goods, the services trade may be fragmented across countries, meaning that service firms contribute to different countries (Antràs & Gortari, 2020; Benkovskis et al., 2019; Bilgiç, 2021). Previous research has estimated service trade flows in the four modes of

supply by merging trade in services with affiliate industry-level statistics (Rueda-Cantuche et al., 2016; Kersan Skabic, 2020; Wettstein et al., 2019).

In addition to the profiles of countries, knowledge gained from firm-level information is also essential (Cernat, 2021; Kitsing, 2021). However, due to a lack of firm-level data there are significant information asymmetries. The present article contributes to the literature on trade in digital services which has been widely analysed over recent years (Ciriani & Perin, 2017; Lee & Goldman, 2020; Yi et al., 2022), as technology has become an important support for trade in services in the digital era. Firm-level data analysis started with Bernard and Jensen's papers (Bernard & Jensen, 1999) on firm characteristics within countries and industries, but they focused mainly on firms that exported manufactured goods. Although service trade patterns seem similar to those in goods trade there is still a lack of research on service firms (Benkovskis et al., 2019; Hornok & Koren, 2017; Kelle & Kleinert, 2010; Wagner, 2021). Moreover, services have sometimes been left out of international trade as intangible money flows moved via bank transactions. Nevertheless, firm-level analysis is valuable input (Ariu, 2016; Bilgiç, 2021; Kelle & Kleinert, 2010; Wagner, 2021) and support for policymakers and trade negotiators when making decisions on export strategies that impact national firms.

Next, we use transaction cost theory to explain the tendency of firms and countries to be involved in cross border services trade.

### 1.2. Transaction cost theory

Transaction cost theory (TCT) has often been combined with international trade theories (Nooteboom, 1993; Sampson & Snape, 1985; Williamson, 1989); TCT also known as *modern firm theory* (Foss & Klein, 2005) assumes that every firm should make the most efficient decision. For firms that trade in services, transaction costs arise immediately whenever the resident firm makes a deal with a non-resident firm. The main condition for the transaction to occur is the transaction moment when economic ownership of the service changes (International Monetary Fund, 2009). Transaction cost is a cost incurred in searching for the best supplier or customer, whether located in the home or host economy (Williamson, 1996). Therefore, it is vital to reduce transaction costs (Riordan & Williamson, 1985; Williamson, 1989, 1996) while also reducing the cost of producing the services (e.g. the time to develop software). Digital technologies can also help firms cut transaction costs and focus on many potential market niches (Jungmittag & Welfens, 2009; Kitsing, 2021; Palacio, 2018). Therefore, trade in digital services addresses a vital phenomenon in the economy (Kersan Skabic, 2020).

Transaction cost theory explains how to minimise the costs of trading in cross-border services. There are neither tariffs nor barriers on services at the border, so the cost of exporting services can be minimised. Country data should be complemented with firm data, as much economic activity occurs in firms (Barnard, 1938; Williamson, 1996). Therefore, in this study, digital phenomena are explored both at the country and firm level, the latter approach is also suggested by the literature (Hornok & Koren, 2017; Rueda-Cantuche et al., 2016; Wagner, 2021).

Cost reduction can be possible for those services that are delivered cross-border. Decreasing costs can mean new opportunities for firms, as smaller countries and firms can

more readily become part of the international trade ecosystem, allowing smaller firms to enter multiple markets at a relatively low cost (Lee & Goldman, 2020). However, new costs for firms may arise (e.g. legal and data protection), as there is the need for firms to comply with new regulations specific to digital trade (privacy protection etc).

Therefore, transaction cost theory explains how to minimise the transaction costs associated with exporting and importing digital services *via the cross-border supply mode*.

### 1.3. Trade in digital services

Trade in digital services means that those services are mainly delivered cross-border (Lee & Goldman, 2020; Lemma, 2021; World Trade Organization, 2009), and cross-border trade may be used to estimate the scale of the digital economy in the country. ICT-sector firms often sell services abroad due to the low transaction costs. Therefore, the share of cross-border supply (World Trade Organization, 1995) can be used as an indicator at country level, with the assumption that cross-border service supply corresponds to the digital delivery of services. Services exports by ICT-sector firms can also be used as a proxy for understanding the diffusion of digital technologies (Kitsing, 2021). Both national and international digital agendas (Estonia, 2018; European Commission, 2020) underscore the importance of knowledge on firms exporting digital services.

### 1.4. Supply of services in four modes

The intellectual origin of this conceptual framework can be traced back to Sampson and Snape (1985), who put forward a taxonomy of trade in services similar to the one currently incorporated in the General Agreement on Trade in Services (GATS). Services can be traded or delivered in four different modes. An exporter, for example, a software firm may supply its services in one of the four modes defined in the international guidelines and frameworks (e.g. GATS; World Trade Organization, 1995). The following classification has been used:

- Mode 1 is the cross-border (by internet) delivery of services;
- Mode 2 is consumption abroad (German tourist travels to Estonia);
- Mode 3 is commercial presence (Estonian firm has an affiliate abroad);
- Mode 4 is the movement of natural persons and professionals (an Estonian software firm's employee travels to Germany).

Services generally include transport, travel, construction, financial, cultural, and legal services; however, some services can only be delivered via cross-border; for example, telecommunication and information services (Rueda-Cantuche et al., 2016). Nowadays, there is a tendency that the share of cross-border trade in services is constantly increasing (Cernat, 2021).

Analysis of service trade patterns by mode is essential, as service firms more often offer new services remotely to their customers. Methodologically, trade in services statistics is determined by the balance of payments (International Monetary Fund, 2009; Statistics Canada, 2018) and the respective methodological framework (United Nations, 2012). However, these data capture only part of trade in services (European Commission, 2018; Kerner, 2022; Rueda-Cantuche et al., 2016; Wettstein et al., 2019). The novelty of the analysis in this paper is that all services trade is captured, thus including the firms' commercial presence (mode 3).

## 2. Methodology and data

### 2.1. Country level analysis

For the country-level analysis, the WTO mode of supply dataset (WTO database, 2022) was used by selecting 38 countries[1] from around the world, including all the European Union Member States in 2017. The countries were chosen according to their relevance in services trade, which is why the selection consisted of mainly developed countries, including most of the member countries of the OECD (The Organisation for Economic Co-operation and Development), an international organization committed to democracy and the market economy. We present the shares of service exports in all modes in Figure 1, showing that cross-border supply (mode 1) and firm commercial presence (mode 3) are the most prominent modes.

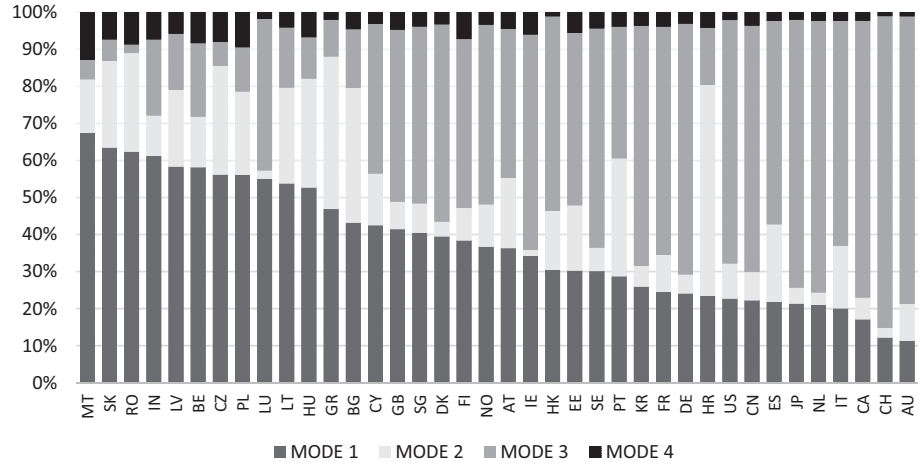


Figure 1. Service exports in four modes, %, 2017
(source: WTO mode of supply dataset, authors' elaborations)

Since the trade in services data consists primarily of category attributes (country, mode of supply, service type etc.), correspondence analysis was chosen to explore the relationships in the data. Correspondence analysis is a valuable data visualisation tool for identifying and displaying the relationship between categories; a geometric approach for visualising the rows and columns of a two-way data table as points in a low-dimensional space. It uses a graph that plots data, showing the outcome of two or more categories of data (TIBCO, 2022). The aim is to have a global view of the data interpretation. By applying correspondence analysis to services trade data, one can visualise associations between countries and service trade characteristics in a simple two-dimensional plot with different points marking countries and supply modes (or types of services). In addition, one can see clusters of countries with similar service trade characteristics.

[1] European Union 28 countries (in 2017); Australia (AU), Canada (CA), Switzerland (CH), China (CN), Hong Kong, China (HK), India (IN), Japan (JP), Korea, Republic of (KR), Norway (NO), Singapore (SG), United States of America (US).

### 2.2. Firm-level analysis

The firm-level analysis used cross-sectional data from the Estonian service traders' dataset (n = 7,414). The dataset was linked with key characteristics obtained from business registers using a firm's common identifier. By linking trade data to the business register data, the impact of the characteristics on trade can be determined (OECD, 2021).

The following variables were used: (1) firm type (ICT or non-ICT[2]), (2) the branch of economic activity (industry) that the firm operates in, (3) services flow (exports, imports, in value), (4) firm size (number of employees), (5) firm ownership (foreign-controlled or domestic), (6) firm turnover (including exports). Student's t-test and logistic regression followed the analysis. Digital services firms were identified using NACE Rev.4[3] as the classification of economic activities (Eurostat, 2008). As a result, the following sectors were included: electronic communication (J 61), computer programming (J 62), information activities (J 63) and repair of computers (S 95) (European Commission, 2019).

Our dataset is secondary, as the data has not been collected primarily for this study. However, the authors adjusted the dataset for the study, using linking, aggregation, and classification methods.

### 2.3. Correspondence analysis

Correspondence analysis (CA) is a technique that helps understand various relationships easily. It is known by many names, including dual scaling, reciprocal averaging, and canonical correlation analysis of contingency tables (M. Greenacre & Hastie, 1987; M. J. Greenacre, 1993; StataCorp LLC, 2021). The modern version of correspondence analysis and its geometric interpretation was developed in France in the 1960s and is associated with the French school of data analysis (*analyze des données*).

CA takes a table of data and turns it into an informative graph that allows comparisons and inferences to be drawn. For instance, export data for a given year is broken down into modes and countries. The graph shows a relationship between the figures and the distance between two points shows the strength of their relationship. The graph gives a quick overview of the relationships between mode and country that are not visible in other graphical presentations. We do not plot the raw data points on the map, but the relationships between variables, ignoring the country size effect, and we get remarkable insights into the relationships *within* a country and *between* countries.

CA can also be seen as a generalised principal component analysis. The goal is to transform a data table into two sets of factor scores, one for rows and one for columns. The factor scores give the best representation of the similar structure of the rows and columns in the table. In the maps, rows and columns are shown as points whose coordinates are the factor scores and the dimensions are called *factors*.

Below, CA is applied several times to visualise relationships between countries, modes, and service types. For example, in the "country by mode of supply table of export volumes"

[2] In this study ICT-sector service exporters are considered as traders in digital services.

[3] NACE classification and the EU regulation (2020/1197).

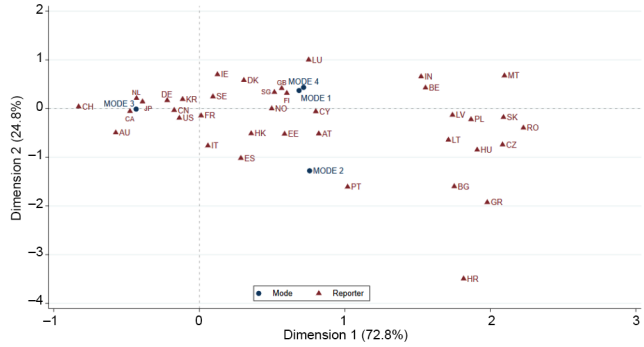


Figure 2. Service exports by mode and by country, 2017
(source: WTO mode of supply dataset, authors' elaborations (Kerner))

(Figure 2), CA results in a two-dimensional plot with 38 points corresponding to the countries and 4 points corresponding to the modes of supply. In the plot, any two countries A and B are close to each other if their profiles are similar. At the same time, country A is close to a particular mode of supply (M) if mode M is typical to country A (mode M has a higher than average percentage in country A). As a result, we can easily see which countries and modes of supply are related to each other, thereby avoiding a complicated analysis of the initial numerical data table.

More technically, CA considers all rows and columns of the data table as vectors representing distributions. For example, when analysing a country-by-mode export dataset with 38 rows and four columns, the vector corresponding to any particular country A is of the form ($p_1$, $p_2$, $p_3$, $p_4$) with four components summing up to 1, and showing the proportions of the four modes of supply for country A. Such a vector is also called the "profile" of country A. Similarly, each supply mode has its profile, a vector with 38 components (countries). With the profiles, it is easy to calculate distances between any two countries and between modes. The results show which countries are more similar or more different. Using the distances, all countries can fit in a 3-dimensional plot but shown two-dimensionally, with the two dimensions chosen to preserve the distances as well as possible. We proceed with the dimension reduction and conclude with the in-depth analysis of service exporting and importing countries.

By applying CA to our datasets, we make small countries (e.g. Estonia) visible among other countries, show their locations (coordinates) on the graph and identify other countries with similar export profiles (close points on the graph). Based on a simple two-dimensional graph, CA helps to visualise complex multi-dimensional data on the countries' trade.

## 3. Empirical results

### 3.1. Service exports by mode and by country

We first apply CA to visualise relationships between *countries and modes of supply*. The data table for CA has four rows (modes 1 to 4) and 38 columns (countries) where each field shows

the respective export volume. Preliminary analysis of our data shows that mode 1 (digitally delivered, or cross-border services) comprises 27% of the total services of 38 countries, indicating that digitally delivered services play an important role. Across all the countries, mode 3 (commercial presence of firms) has the largest share (62%), which corresponds to previous results (Rueda-Cantuche et al., 2016; Wettstein et al., 2019). The full profile of services exports is the vector (0.27; 0.08; 0.62; 0.03), which is the average (weighted) profile of all countries. As presented below in Figure 2, the average profile lies at the origin of the coordinates (although it is not shown as a point). However, individual country profiles vary – some are close to the average profile but others deviate significantly. Our goal is to identify the main factors that explain these deviations.

The CA resulted in a two-dimensional plot (Figure 2) where the countries and the modes are depicted as points. Countries and modes are close to each other if their profiles are similar. The overall quality of the two-dimensional representation is excellent since the total descriptive power of the first two factors is as high as 97.6% (=72.8% + 24.8%). This means that there is only minimal "depth" (or 3rd dimension) in the data which can practically be ignored, which makes the two-dimensional representation almost exact.

There are, however, some moderate deviations of points from the plane. We first see, in Figure 2, that modes 1 and 4 stand very close to each other, meaning that the two modes have somewhat similar profiles. However, when examining "quality" indicators, we notice the difference: modes 1, 2 and 3 have quality close to 1; that is, they lie precisely on the plane, but the quality of mode 4 is 0.681, meaning that 68.1% of the deviation of the profile of mode 4 from the average profile is explained by factors 1 and 2, and the remaining 31.9% of the deviation is explained by the third factor measuring deviation from the plane. In regard to the country points, for most of them the quality of two-dimensional representation is high (close to 1), with only two exceptions – China (0.74) and France (0.54). This means that the export profiles of these two countries differ from the average profile in a way that needs a third factor to be fully explained.

Now let us look at the two dimensions (factors) in Figure 2. The easiest way to do this, is by studying the locations of the four supply modes. The horizontal axis (factor 1) is described by modes 1 and 4 on the right and mode 3 on the left, indicating that *the contrast (difference) between mode 1 and mode 3 components in the country profiles* is the main factor of inter-country difference. Therefore, the countries with a high digital services trade (mode 1) component (and consequently with a low "commercial presence" or mode 3 component) stand on the right, and the countries with a high mode 3 component (and consequently with a low mode 1 component) are on the left.

As to the second (vertical) factor, it is seen to be mainly the travel services (mode 2) component of the profiles. When one recalls that the plot corresponds to the aggregate profile of all 38 countries, it is not surprising that big economies like the United States (US), China (CN) and Germany (DE) stand close to the origin, thanks to their large contribution to the average.

Having clarified the meaning of the two axes in Figure 2, it is easy to interpret the locations of the countries. *Digital services exports (exports in mode 1)* are essential for Luxembourg, Singapore, Cyprus, Austria, Estonia, Norway, Finland, Hong Kong and the United

Kingdom, as those countries are located close to digital services trade (mode 1) on the plot (Figure 2).

On the left side of Figure 2, we see that mode 3 (commercial presence, e.g. foreign affiliates) has the most significant share in the profiles of Switzerland (CH), Canada (CA), Australia (AU), Japan (JP), and the Netherlands (NL). In the big group of countries on the right, modes 1 and 4 have the largest share in their export profiles, while the percentage of mode 3 is very small or even zero. At the same time, the lower part of this group – Croatia (HR), Greece (GR), Bulgaria (BG), Portugal (PT), Spain (ES) and Hungary (HU), which all have a large value for vertical factor 2 – make up a strong tourism cluster (mode 2). Interestingly, Estonia stands apart from other post-socialist countries on the right, in the middle of digital services trade (mode 1) and movement of employees (mode 4) and tourists (mode 2), but still relatively far from foreign services trade by affiliates (mode 3). Indeed, foreign affiliates are not typical for Estonian companies.

### 3.2. Service imports by mode and by country

Instead of service export data, we now apply CA to data on imports with the same structure. The quality of the two-dimensional representation is again very high (97.8%), showing that one can identify similarities and differences between countries and modes of supply largely based on this figure (almost no depth) (Figure 3). Switzerland (CH), Germany (DE), France (FR), and Lithuania (LT) are in the centre (around the origin), thus their profiles are very close to the mean profile. The interpretation of the two axes (factors) is quite similar to the previous case: the first axis is *the competition between digital service imports (mode 1) and the commercial presence of firms (mode 3)*, and the second axis is purely travel services (mode 2). Digital services *imports* is essential for Luxembourg, Ireland, the Netherlands, Singapore, Japan, and Cyprus; even more for the three countries on the right (India, Malta and Belgium) and because of their long distance from commercial presence (mode 3), they have a negligible share of mode 3 in their profiles (Figure 3). As to further details, commercial presence or mode 3 (e.g. foreign affiliates) is typical for countries where the affiliates are located: the United Kingdom, Hong Kong, but also Central and Eastern European countries, such

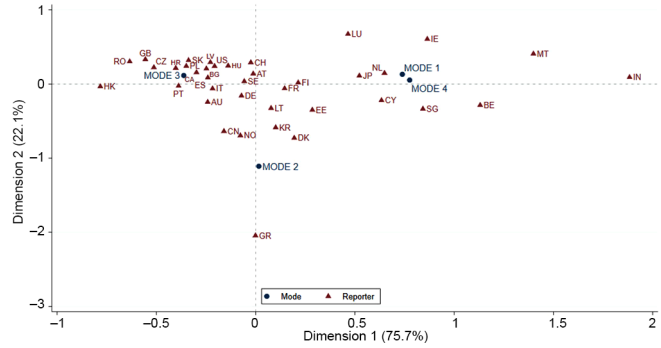


Figure 3. Service imports by mode and by country, 2017
(source: WTO mode of supply dataset, authors' elaborations (Kerner))

as Romania, Czech Republic, Poland, Slovakia and Bulgaria. Greece is characterised by an exceptional role of travel services (mode 2) in its services imports profile. Estonia is located in the middle of the plot, between digital and travel services, again separate from the other Central and Eastern European countries that are concentrated around imports of commercial presence (imports of services by affiliates), as mode 3, on the left.

### 3.3. Service exports by service type and by country

Next, we proceed with the same analysis method and apply it to data structured by country and service type, instead of supply modes. The aim is to provide a simple geometric representation for the massive data array (a 38 by 14 table of export and import volumes) reflecting links between countries and service types. As one could expect, due to the much larger volume of categorical data (14 service types and 38 countries), the overall quality of the two-dimensional representation is lower now – 47.8% for export and 63.8% for import data (Figures 4 and 5).

Figure 4 depicts exports of services by type and by country. The first (horizontal) axis explains 27.4% of the differences between country profiles and the average profile (at origin), and it shows clearly the share of construction and manufacturing services (services that accompany the processing of goods) in the country profile. This share is characteristic of China. At the other end of the axis are services that require highly educated and highly skilled labour; for example, insurance and financial services, typical of Luxembourg, Cyprus, Hong Kong and Germany. We can therefore conclude that the x-axis shows where a country stands on the scale ranging from hard technology to soft technology services. The vertical axis shows telecommunication services (essential for India, Ireland and Japan) and personal services like health services (e.g. Cyprus), tourism (Croatia, Malta, UK, Portugal, Italy and Spain) and recreational services (Bulgaria). This means that factor 2 (y-axis) measures the country's position on the scale ranging from indirect to direct personal services.

Estonia's position on the x-axis, together with the Czech Republic, Poland and Romania, is leaning slightly to the hard technology side of services. Among all service types, "other

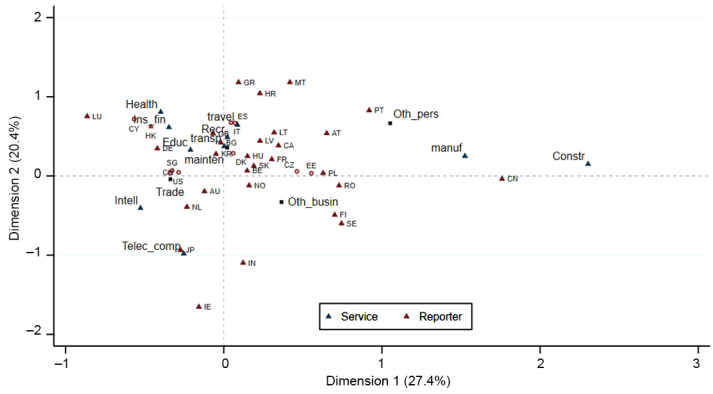


Figure 4. Exports of services by country and service type, 2017
(source: WTO mode of supply dataset, authors' elaborations (Kerner))

business services" (incl. research, engineering, consulting) has a close (important) position (Figure 4). Estonia's neighbouring countries, Finland and Sweden, are closer to telecommunications services than is Estonia.

More detailed information can be seen in Table 1, which shows the average shares of the service groups. For example, telecommunication comprises 14% of exports and 13% of imports across all countries, and other business services 20% of both exports and imports. As a measure of factor fit, the indicator "quality" was used, showing the full fit if it is equal to 1. When examining "quality" indicators in Table 1, we can notice the differences: construction, insurance and telecommunications have quality close to 1 (i.e. they lie precisely on the plane), but the quality of health services is 0.17, meaning that 17% of the deviation of the health services profile from the average profile is explained by factors 1 and 2, and the remaining 83% of the deviation is explained by the other factors measuring the deviation from the plane.

Table 1. Service exports and imports by service type: correspondence analysis results

| Flow/service type | Exports | | Imports | |
|---|---|---|---|---|
| | Share of services (mass*) | Quality (measure of fit**) | Share of services (mass*) | Quality (measure of fit**) |
| Manufacturing | 0.01 | 0.37 | 0.01 | 0.10 |
| Maintenance | 0.01 | 0.08 | 0.01 | 0.11 |
| Transport | 0.11 | 0.65 | 0.12 | 0.45 |
| Tourism | 0.06 | 0.24 | 0.07 | 0.72 |
| Health | 0.00 | 0.17 | 0.00 | 0.17 |
| Education | 0.01 | 0.30 | 0.01 | 0.85 |
| Construction | 0.04 | 0.91 | 0.03 | 0.22 |
| Insurance | 0.20 | 0.86 | 0.17 | 1.00 |
| Intellectual | 0.03 | 0.34 | 0.03 | 0.96 |
| Telecommunication | 0.14 | 0.87 | 0.13 | 0.55 |
| Other business | 0.20 | 0.66 | 0.20 | 0.83 |
| Recreational | 0.00 | 0.14 | 0.00 | 0.06 |
| Other personal | 0.01 | 0.30 | 0.01 | 0.03 |
| Trade-related | 0.19 | 0.66 | 0.21 | 0.87 |
| Total | 1.00 | | 1.00 | |

*Notes*: * *mass* is the share of modes of supply, or share of countries, whereas the sum of *mass* over the categories of a variable equals 1.
** *quality* is the measure of fit: fraction of row/column profile explained by the two selected dimensions; in the case of a full description, *quality* = 1.

### 3.4. Service imports by service type and by country

Figure 5 explains the imports of services by type and by country. The explanatory power of the first two factors (40.7% and 23.1%) is higher than the CA of exports data.

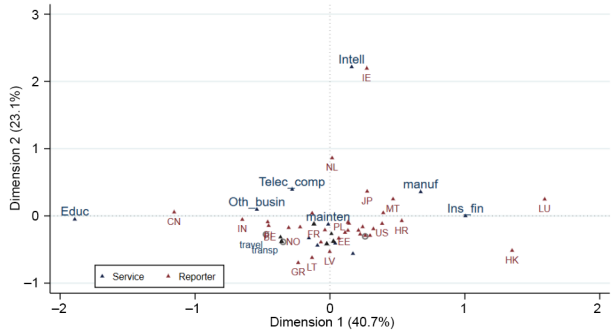


Figure 5. Service imports by service type and by country, 2017
(source: WTO mode of supply dataset, authors' elaborations (Kerner))

One can see three dominant links between countries and service types: insurance imports are typical for Luxembourg and Hong Kong, intellectual property imports for Ireland, and education services imports (students studying abroad) for China. On the other hand, *telecommunication services (mode 1) are* vital in the Netherlands, South Korea, Japan, Hungary and Switzerland. Here, it is not easy to interpret and name the two axes; however, analysing country locations among the service points makes it possible to obtain quick information on the links between countries and service types.

### 3.5. Firm-level analysis

Exports in digital services (firms from ICT sectors) have been pushed to the forefront of the global trading system (Ronen, 2021). This is why Estonian ICT services traders (n = 1,158) among all service traders (N = 7,414) in 2018 were analysed starting with some basic statistics in Table 2 – mean values and standard deviations and p-values calculated separately for ICT and non-ICT groups.

Table 2. Comparison of the means of ICT and non-ICT groups in Estonia, 2018
(source: Statistics Estonia, 2022)

| Firm characteristics | mean | | standard deviation | | p-value |
|---|---|---|---|---|---|
| | ICT n = 1158 | non-ICT n = 6256 | ICT n = 1158 | non-ICT n = 6256 | t-test |
| Firm ownership (0 = domestic; 1 = foreign) | 0.48 | 0.31 | 0.49 | 0.46 | p = 0.000 |
| Firm size (number of employees) | 12.2 | 20.6 | 64.9 | 144.4 | p = 0.026 |
| Export intensity | 64.8 | 55 | 36.7 | 40.03 | p = 0.000 |
| Service mix (number) | 1.10 | 1.21 | 0.44 | 0.69 | p = 0.000 |
| Exports volume (thousand euros) | 752.4 | 532.4 | 3261.7 | 4417.6 | p = 0.047 |
| Turnover volume (thousand euros) | 1509.8 | 2502.6 | 10359.7 | 16514.9 | p = 0.007 |

In the ICT group, export intensity is more prominent than in the non-ICT group – 65% and 55%, respectively. In contrast, the average firm size (number of employees) is 12 for ICT and 21 for non-ICT, meaning that ICT services firms tend to be smaller than non-ICT traders.

When we look at firm ownership on a scale of 0 (domestic) to 1 (foreign), the mean value for ICT firms is 0.48, compared to 0.31 for non-ICT firms. There are also differences in the number of services in the basket, export volumes and turnover. However, import volumes did not show statistically significant mean differences between the ICT and non-ICT group. The mean values in Table 2 are simple means across firms, although a weighted average can be used in some cases. For example, the weighted turnover average of export intensity has a more significant difference in the ICT group than in the non-ICT group (0.50 (752 / 1510) and 0.21 (532 / 2503), respectively).

Figure 6 presents the mean export intensities by firm size and ICT orientation. We may conclude that ICT firms have higher average export intensity than non-ICT firms in all size groups (1 employee, 2–5 employees, 6–20 employees, 21–100 and 100 and more employees). For example, small ICT firms with one employee have an average export intensity of 71%, meaning that they export nearly three-quarters of the total turnover, compared to 67% for non-ICT service traders. Moreover, one can see that the dependence between firm size and export intensity is U-shaped and the squared number of employees should be included in the model. However, econometric analysis was not conducted for this article and can be studied in further research. The numerical details of the dependence are in Table 3.

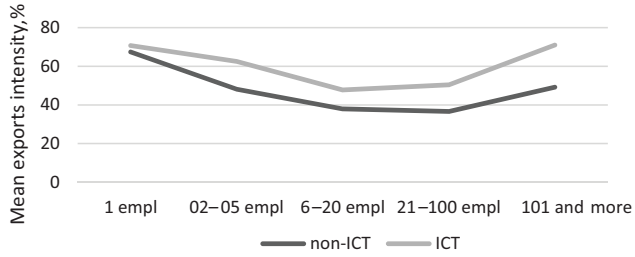


Figure 6. Export intensity by firm size and service type (ICT or non-ICT) for Estonian service traders 2018 (source: Statistics Estonia, 2022)

Table 3. Export intensity by size and export orientation in Estonia, 2018 (source: Statistics Estonia, 2022)

| Firm size (number of employees) | ICT | | | Non-ICT | | |
|---|---|---|---|---|---|---|
| | N | mean | Std.Dev | N | mean | Std.Dev |
| 1 | 708 | 70.7 | 34.2 | 3138 | 67.4 | 36.8 |
| 2–5 | 184 | 62.5 | 35.2 | 1272 | 48.1 | 38.3 |
| 6–20 | 147 | 47.8 | 40.4 | 1046 | 37.9 | 38.0 |
| 21–100 | 96 | 50.4 | 39.6 | 602 | 36.6 | 39.6 |
| 101 and more | 23 | 71.0 | 36.6 | 198 | 49.2 | 44.7 |
| Total | 1158 | 64.8 | 36.7 | 6256 | 55.0 | 40.0 |

### 3.6. Discussion and limitations

The article aimed to interpret a global view of trade in services. The results showed that the indicators of trade in services that consider modes and service types could be valuable inputs for such an interpretation. Based on a dataset of 38 countries and 7,414 Estonian service exporting firms, the study focuses on the digital service trade and firms and countries and the relationships between them from the perspective of transaction cost theory. Decreasing costs for trade in digital services can mean new opportunities for small firms. Smaller countries and firms can more readily become part of the international trade ecosystem. However, new costs for firms may arise (e.g. legal costs), as there is a need to comply with new regulations specific to digital trade (data and privacy protection etc). The major findings are highlighted as follows.

First, the study proposes that the share of digitally delivered services (mode 1 as the share of all four modes) be included as an essential indicator to assess the digital level of countries, as trade-related indicators are also vital for achieving the goals of the 2030 Agenda (United Nations, 2015).

Second, the indicators can support mentorships in startups and digital strategies to mitigate the risks of worldwide platforming processes and globalization slowdown for firms that trade in digital services (50% export intensity for trade in digital services, compared to 21% for non-digital).

Third, the study emphasizes the need to support the small firms that have a higher export intensity of digital services, attracting highly educated and highly skilled labour.

Fourth, the results can help small firms and small countries to attract foreign direct investment.

Fifth, the results showed that digital services exports are essential for a cluster of "digitalised" countries such as Luxembourg, Singapore, Cyprus, Austria, Estonia, Norway, Finland, Hong Kong and the United Kingdom, and digital services imports for a cluster including Luxembourg, Ireland, the Netherlands, Singapore, Japan, and Cyprus.

Finally, the findings indicate that firm size impacts digital service exports and that small size can be an advantage that plays a vital role in adjusting to the slowdown of globalization.

This study has generated startup mentorship, managerial and policy implications. For startup mentors and business managers, it is important to understand the impact of size and other characteristics of firms and service types on export orientation under the uncertain conditions of a slowdown in globalization. Small firms, including startups, and small economies should undertake initiatives to attract foreign direct investment. The results of the study support the management of firms that trade in digital services and add new knowledge to the digital orientation of countries and trading firms. Understanding the impact of firm size on export orientation provides valuable information for investors to choose small firms (including startups) in ICT industries. For policymakers, our study may provide useful information on service trade visualisation and measurement challenges, regarding the characteristics of firms and industries. Equipped with such information, government officials, mentors and investors could be better prepared to formulate digital responses and agendas.

This study also has some limitations which may provide research opportunities in the future. Startups were analysed with all small Estonian service trading firms; however, they

could be analysed separately. Furthermore, the study was based on cross-sectional data, and the time effect could be studied in future research. We concluded that trade in digital services is important for small countries, however the size effect could be studied in future research by performing econometric analysis.

## Conclusions

By empirically investigating and visualising the relationships between the trade in services data of countries, the study enriches transaction cost theory in respect to firm behaviour in the context of a slowdown in globalization. In addition, the study captured all the service trade opportunities, which is rare when trade in services data is interpreted.

Based on a dataset of 7,414 service exporting firms, the relationship between the size and digital orientation of the firms (ICT or non-ICT) was examined. The major findings indicate that firms trading in digital services are different from those trading in other services, being smaller, more focused on exports and more often controlled by non-residents. For countries, by proposing correspondence analysis of how to interpret global services trade data, this study enriched our understanding of the relationship between services patterns and clustering opportunities at country level. The results confirmed that trade in digital services can be measured on the scale from "hard technology" to "soft technology" services. In addition, a country's position can also be identified on the scale from "indirect" to "direct" personal services. The study demonstrates the importance of trade in digital services by small service firms in small countries. It encourages investments in small countries and small firms that also trade successfully in digital services. This research provides new information and tools to managers, startup mentors and policymakers to include more evidence to develop mentorship and national digital programmes.

The two questions posed were answered. Correspondence analysis was used to interpret trade in services and identify clusters of more "digitalised" countries, and a fresh approach was found to visualise multi-dimensional data. The study showed that firm size and export intensity dependence is U-shaped. Detailed econometric analysis should follow in the next stage. In addition, more information on service exporting firms in other countries could contribute to better digital economy policies. The strength of this research was to show that trading in digital services *via* cross-border is a good way to reduce transaction costs. Furthermore, firm-level data analysis adds value to this research, showing that small open digitalized economies can increase services exports by supporting investments in firms that trade in digital services.

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