

# SERVICES TRADE CONTRIBUTION ON GLOBAL INCOME GENERATION (2000 - 2014)

Michel Lioussis

Mònica Serrano

---

*UB Economics Working Paper No. 423*

**Title:** Services trade contribution on global income generation (2000 - 2014)

**Abstract:** This paper investigates the contribution of services trade to the variation of global income generation for the period of 2000 to 2014, applying a structural decomposition analysis in a global multi-regional input-output framework. We disentangle impacts of determinants of this variation for 56 sectors (of which, 29 are services) on a global level and on seven world regions, considering primary inputs, technology, components of final demand (private consumption, government expenditures and investment), trade and trade structure of both intermediate inputs and final products as drivers. Empirical findings suggest that overall, intermediate trade of services contributed to 5,38% of global income generation while final trade of services to 4,56% for the 15 years-period analyzed. This significant contribution seems to be explained mainly through the increase of demand of services as the negative effect of the structure of trade suggests that per unit of services traded, the value-added generated decreased over this period. At the sectoral level, wholesale trade, the financial sector, administrative and support services, legal and accounting services along with land transport appear to be the most important contributors of the services sectors through trade. Despite having northern European countries along with the BRIIC countries and the northern American ones as the most important contributors through services trade, when looking at the share of contribution of services trade of different groups relative to only their own total contribution, the eastern European countries is the group that makes it to the top.

**JEL Codes:** F14, C67, D57, F63, L80

**Keywords:** Services trade, structural decomposition analysis, global multiregional input-output analysis, global value chains

**Authors:**

Michel Lioussis

Universitat de Barcelona

**Email:** michel.lioussis@gmail.com

Mònica Serrano

Universitat de Barcelona and BEAT

**Email:** monica.serrano@ub.edu

**Date:** June 2022

# 1 Introduction

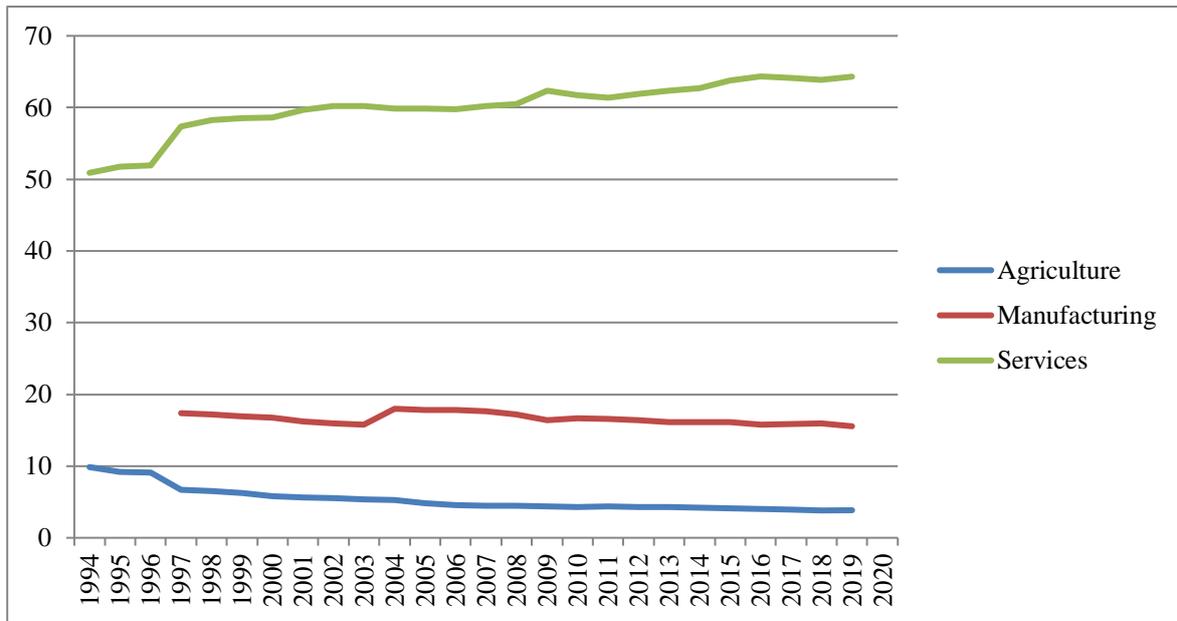
Structural change is considered one of the main factors to foster economic growth. From industrial revolution, economic transformation was driven mainly by the manufacturing sector. However, reduction of transport costs and technological changes led by information technology (IT) have opened a new path of economic structure characterized by globalization. In a nutshell, the so-called agri-food system has been strongly transformed by sharing many characteristics of manufacturing industries, manufacturing production processes have experienced a great global fragmentation, and a large number of new services activities have emerged. In this context, services seem to particularly benefit from this IT led technological change by allowing them to be tradable, having high value added per worker, absorbing moderately skilled workers, showing a relative important productivity growth, and taking advantage of scale and agglomeration economies.

Even though industrial economy has offered very important outcomes in terms of export-led development trajectories so far, the modern globalized economy offers much wider and extensive possibilities. According to Braga (2019) important factors link services sectors with income generation and Gross Domestic Product (GDP) growth. Mostly, services are high value-added and high productivity sectors (such as Information-Communication-Technology (ICT) or business services), and they are the dominant receiver for Foreign Direct Investment (FDI) flows representing more than half of the total FDI stock. Hoekman and Mattoo (2008) show that services represent a very important source for economic growth through the liberalization of the sector that improves services performance and FDI, allowing services to enhance Total Factor Productivity (TFP) at the firm level.

The significant shifting from agriculture to manufacturing that the economy experienced in the past is now boosting by the services rise in the majority of the countries, causing a significant growth of world GDP. Even though the shift took centuries for certain economies, the upsurge of the services has taken place much faster in some countries as India or Sri Lanka, shifting directly to the tertiary sector without developing in depth the secondary one. The services sector seems to contribute to high productivity and economic growth as it provides essential inputs to other manufacturing products and services. This relationship among services and economic growth seems to have increased in last decades as the contribution of services to income generation rises. According to Buckley and Majumdar (2018) value added of services accounted for 74 % of GDP in 2015 relative to 69 % in 1997 in developed economies. Figure 1 is a good illustration of this latter phenomenon, showing

the contribution of agriculture, manufacturing and services on income generation in the world from 1994 to 2019. It reveals that services represent the main provider of the income generation globally each year, with some variations through the years and especially during the 2008 economic crisis but with an average of 60 % of the global GDP.

**Figure 1:** Contribution of the economic sectors on global income generation, 1994-2019 (in %)



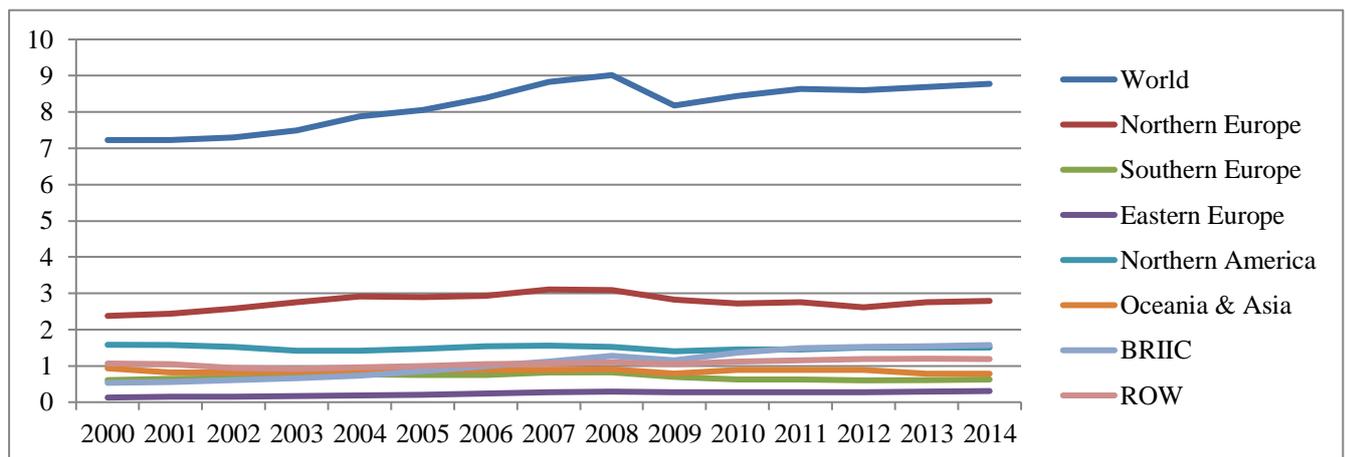
Source: Own elaboration

Services have attained this significant level of importance through trade. In fact, in the last two decades (especially since 2000), cross-border flows of services have grown rapidly and have become too big and too important to be ignored. On global scale, trade in services has increased 60% faster than trade in goods in the last decade (2007-2017). Liberalization of the services sector appears to be the most important and analyzed determinant of services trade and services-related generated growth. As a matter of fact, the majority of the literature seems to agree that openness of the services sector not only implies faster economic growth (Mattoo, Rathindran and Subramanian, 2006 and El Khoury and Savvides, 2006, among others) and bigger TFP growth rates of industrial firms (Arnold, Javorcik, Matoo and Lipscomb, 2012; Beverelli, Fiorini and Hoekman, 2015), but it is also linked with welfare gains, distributional effects (Francois and Hoekman, 2010), and onward FDI (Escheban and Hoekman, 2006; Arnold, Javorcik and Matoo, 2006).

Figure 2 shows the contribution of the services trade to income generation for the world and world regions from 2000 to 2014. Despite the small de-escalations during the 2008

economic crisis, during these 15 years the share of value added of the services trade relative to total value added in the world passed from 7,2 % to 8,8 %, meaning an increase of 22.22 %. The most important increases occurred in the BRIIC (Brazil, Russia, India, Indonesia and China) countries and Eastern European countries with a rise of 198.11 % and 130.77 %, respectively. Other European countries experienced smaller increases (Northern Europe 14.75 %) or almost no changes (Southern Europe 0.81 %). On the other hand, services trade reduced its contribution to income generation in Northern America (- 4.4 %) and Oceania and the rest of Asian countries (-15.05 %). This figure illustrates the growing share of services trade relative to global GDP and thus its increasing importance on income generation. The different evolutions of world regions might determine the future role in the world economy played by countries.

**Figure 2:** Contribution of services trade on income generation for different groups of countries and for the world (in %)



Source: Own elaboration

Despite the aforementioned services' determinants, other important factors related to services have also been discussed in the literature in recent years such as the role of institutions (Crozet, Milet and Mirza, 2016), internet (Freund and Weinhold, 2002), or firm-level heterogeneity (Breinlich and Criscuolo, 2011). The importance of services trade has also been analyzed in the general and global context of World Trade Organization, with mainly a common agreement that it promotes economic growth (Hoekman and Mattoo, 2008), and also analyzed mainly for the particular case of trade in financial services in the BRICS (Brazil, Russia, India, China and South Africa) economies (Khatun, 2016).

Studies so far concern mainly direct trade without distinguishing if services are used as inputs (i.e. intermediate services trade) or to satisfy final demand (i.e. final services trade). Moreover, those studies are based on standard measures for services trade that rely on direct trade in services over global trade flows. Up to now, few studies considered the contribution of services in the value added generation of other economic activities such as agriculture or manufacturing, or the weight of services content in agriculture or manufacturing exports. Evaluating services trade flows on the basis of global value chains (GVCs) would completely change the actual vision of economy and the current equilibrium as services would occupy a much more important part in international trade than the traditional trade data would suggest. Mirodout and Cadestin (2017) provide new evidence on the role of services in GVCs revealing that services inputs, whether domestic or foreign, account for about 53 % of the value of manufacturing exports and that the total contribution of services to exports is growing to almost two-thirds. They also show that on a global level 75 % of the services trade repose on intermediate inputs for manufactured and services products.

In conclusion, although there is a growing interest in the literature about the role of services and their trade into the economy, the majority of these studies do not account for a complete picture of the role of services: whether they act as inputs (intermediate services) or as final outputs (final services). Moreover, the most part of services studies performed a partial analysis by focusing the research on some particular services sectors and/or some countries. The globalization process has shown, however, that all sectors and all countries of the world are interrelated. In the current economic structure, the fragmentation of the manufacturing process and the increasing outsourcing and offshoring of services, demand for a global analysis of the topic.

The aim of this paper is to analyze the contribution of trade in services in the income generation and its evolution in the last decades with a global perspective. Income generation is one of the ways of defining GDP by taking into account the income approach, which states that expenditures of the economy should correspond to the total income generated by the production of all economic goods and services. In this study we include both services as intermediate inputs and final outputs in order to be able to have a complete view of the sector and allowing us to understand their indirect contribution through the intermediary of the manufacturing and agricultural sector through all GVCs in the world. In particular, this paper will answer the following questions: To what extend trade in services contributed to the variation of global income generation? What are the contributions of the trade structure of

intermediate and final services? Is there any difference at the regional level? Are all services sectors performing the same? In order to achieve this purpose, a Structural Decomposition Analysis (SDA) is conducted on a Global Multiregional Input-Output (GMRIO) framework applied to input-output tables collected from the World Input-Output Database (WIOD) for the period of 2000 to 2014. This database covers 56 sectors, of which 29 are services, and 44 countries (43 countries and the rest of the world aggregate) (see Table A.2 and Table A.1 in Appendix for further details). This paper might contribute to the literature by being the first analysis to look at the impact of services final and intermediate trade to global economic development highlighting the regions of the world but also the sectors that contribute the most and accounting for the effect of the structure of trade.

The remainder of the paper is organized as follows. The next section defines services trade and provides a brief historical context of the evolution of how services trade was considered through economic history. Section 3 surveys the theoretical and empirical literature focused on services and services trade. Section 4 presents the methodology and the model employed for this study, whereas section 5 describes the dataset. Section 6 presents and comments the results of the analysis, and finally the last section brings together the main findings and provides brief policy implications drawn from the results.

## **2 Services Trade: Definition and Historical Context**

This section explains what is nowadays considered as services trade in the different institutions and in the literature but also how the trade in services concept has evolved and how it has been perceived and measured through the years. Knowing the nature of this economic activity would help to better understand its relevance and its role nowadays.

### **2.1 Definition**

Trade in services seem to result in foreign money coming into the domestic country (for the export) or in money sent from the domestic country abroad (for the import). The OECD Statistics defines trade in services as a “record of the value of services exchanged between residents and non-residents of an economy, including services provided through foreign affiliates established abroad”<sup>1</sup>. While the World Trade Organization’s General Agreement of Trade in Services (GATS) defines services as a transaction between a resident and a non-

---

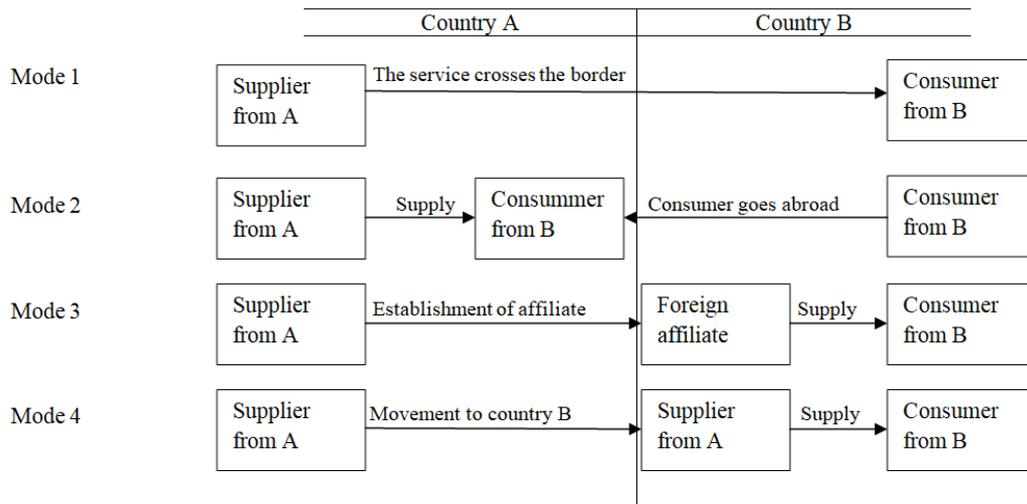
<sup>1</sup>Definition from OCDE website <https://data.oecd.org/trade/trade-in-services.htm>

resident (General Agreement on Trade in Services, Annex 1B, 1995, p. 285-286) categorizing the type of services trade by the way they are delivered. This latter definition is the most commonly used for the way of measuring trade. More precisely, the definition provided by the GATS is four-pronged, depending on territorial presence of suppliers' consumer at the time of transaction. Figure 3 summarizes GATS definition and modes.

- Mode 1 or cross-border supply: applies when service suppliers resident in one country provide services in another country without either supplier or buyer/consumer moving to the physical location of the other.
- Mode 2 or consumption abroad: refers to a consumer resident in one country moving to the location of the supplier(s) to consume a service.
- Mode 3 or commercial presence: refers to legal persons (firms) moving to the location of consumers to sell services locally through the establishment of a foreign affiliate or branch.
- Mode 4 or movement of natural persons: refers to a process through which individuals (temporarily) move to the country of the consumer to provide the service.

To sum up, on the contrary to the general term of trade, trade in services concerns only international trade, so traded from one country to the other, among a resident and a non-resident, and as a result any reference of services trade or export will imply on an international level while the terms of domestic demand could be used in this paper to refer to a monetary-based exchange of services from a supplier of one country to a consumer of the same country.

**Figure 3:** Simplified description of GATS four mode of supply



Source: Own elaboration

Traditionally, due to the fact that services were usually non storable and in order to be traded there was a need for proximity between the provider and the consumer meaning that one of these actors will need to move to the location of the other. As a result, in order to be able to have services trade there will be a need of mixture between cross-border transaction and local presence of suppliers. This could have important consequences regarding the market structure of the service industries as the proximity condition could result into an absence of scale economies but also could imply an upsurge to a broad product differentiation as services are usually adapted to individual consumers. It's also important to note that regulatory cost could be significant for some services sectors, resulting into high fixed costs. However, recent evolution of digital technology and access to big data is changing the present extremely quickly and opening a new phase of globalization process. Until almost few years, most services and professional jobs needed for a face-to-face contact facing relative high cost of travelling. But digital technology is revolving this picture, having people working in services sectors from long distances. They are the so-called "telemigrants" who are moving from the face-to-face service to a virtual one (Baldwin, 2019).

There is also a distinction among intermediate and final trade in services. Intermediate trade in services is services traded as intermediate inputs to produce a final output, that being either a good or a service. In fact, in order to be able to take into consideration all the exchanges of the services and to be able to perceive their complete role and impact in the economy, covering the global value chains, there is a necessity to also examine the

intermediate trade and look at the role of the services used as intermediate factors to produce other tradable goods or services. Acknowledging intermediate services trade allows into seeing the true imprint of services in the economy and enables to see the whole picture as intermediate services trade could represent more than half of the total trade in some cases and could cover a very important share of generated growth. Transportation as well as logistics or ICT services are some powerful illustrations of such cases.

## **2.2 Brief Historical Context**

Even though the definition of services trade and how it can be measured appears to be clear and mainly uniform, it has long evolved before reaching this form and being considered as an important economic sector. Having a historical overview of the services progress and recognition could help us understand better the current definition and classification of services. In their paper “Services in Economic Thought: Three Centuries of Debate”, Delaunay and Gadrey (1992) retrace a historical evolution about how economists and other social scientists have viewed services. Starting with the classical period where particular attention is paid to the views of Adam Smith who was not concerned with services per se, but rather made the distinction between productive and unproductive labor. The connection with services is that his "unproductive labor" included workers such as the servants of wealthy individuals or of the state but also the military, the clergy, lawyers, medical personnel, writers and musicians, all professionals that would be nowadays included in the service sector. Smith's distinction between productive and unproductive labor was shared by later writers such as Ricardo, Malthus, James Mill, and others. Heinrich Storch is perceived as one of the classical authors who appreciated the fact that service activities did produce value, whereas John Stuart Mill was classified as taking an intermediate position. Although Karl Marx did not significantly expand the debate on services, his views on services' role into the economy had very important impacts as they influenced national accounting systems of Soviet Union and other communist countries, where service industries were often neglected.

The debate regarding services diminished until about the First World War where any activity was seen to provide a service and hence a distinction between goods and services wasn't considered important, except for the Marxists who persisted with the distinction between productive and unproductive activities.

The next era in which services had an important progress was the period 1930-70 with the development of national income statistics which three subgroups were distinguished: primary

activities, secondary or industrial activities, and tertiary or service activities. This is the first period in which there was concern about the productivity of the services sector, and when the growing importance of the services activities in the economy was noticed before obtaining the major part it has now.

### **3 Literature Review**

The economic growth literature has so far focused especially on the crucial part of the manufacturing sector for economic expansion, with the role of the primary sector being also discussed. A limited but yet considerable number of studies analyzed the effect of the overall services sector to economic development with the methodology however and the dataset varying significantly from one research to the other. In the last decades the studies on the contribution of services to economic growth has seen a drastically escalation whether this concerns the impact of the general sector to growth or the role of its trade which has been so far underestimate and mainly evaluated for some specific countries and sectors. In the next paragraphs we present the most important studies focusing on the trade of the tertiary sector, before examining the much richer literature on general trade, on the effect of the liberalization of the services sector to economic expansion and on the limited analysis centering their attention on the importance of services to GDP growth.

#### **3.1 Services Trade Effect to Economic Growth**

There is a low by growing number of papers attempting to assess the economic impact of trade in services in the last years. This focus has been done so far for some particular cases of countries and for some particular services sectors that would appear as the most relevant choices to analyze.

In accordance with the general trade narrative, Li, Greenaway and Hine (2005) demonstrate that services' imports have a significant positive impact on growth for the developed countries while a negative one for the developing. These results seem to be confirmed to a certain extent and explained by Gabriele (2006) who finds a weaker yet existent positive impact of services export to GDP growth in developing countries relative to the developed ones. He states that the growth-enhancing effect of exports in developing countries declines in the 1990's but this decline is explained mainly by the merchandise component of exports rather than the services one. While Makki and Somwaru (2004) and Dash and Parida (2013) confirm the positive influence of FDI and services exports to

economic output, Thomas (2019) concludes that foreign value-added content in India's services exports is found to be highest in the case of business services, transport services and telecommunications. Alege and Ogundipe (2013) confirms this causal relationship for the sub-Saharan African countries and Khatun's (2016) empirical findings suggested a causal relationship existing between trade in financial services and economic growth having both short-run and long-run uni-directional causalities. Muhtaseb's (2015) analysis on the effect of imports to economic growth for Jordan suggest that despite a positive and significant effect of total imports, the influence of only services imports appears to be negative to GDP variation mainly explained by the important and significant negative effect of business services. On his side, Sermcheep (2019) separates services into traditional and modern exports, concluding that both contribute positively to economic expansion in the Association of Southeast Asian Nations (ASEAN) with the modern ones however having less solid effect. On a close but distinct type of services trade analysis, Ariu, Mayneris and Parenti (2020) demonstrate that provision of services would boost firms' manufacturing export values as well as the quantities and prices. Using a 192 countries services trade dataset from 1970 to 2014, Loungani et al. (2017) show that trade is shifting rapidly from the manufacturing sector towards services. They suggest that the tertiary sector could "be a game-changer, offering the opportunity to revive and sustain globalization" and provide an opportunity to countries having already depleted their manufacturing resources to find a new growth strategy. Similarly, Chen and Whalley (2014) show that despite the significantly lower positive effect of services trade relative to goods one in China, with a policy environment adapted to the low term plans of China, a much more important influence of services trade both to the country and to the global economy is very likely to take place.

A different way of achieving growth through services trade is through the economic complexity, Stojkoski, Utkovski and Kocarev (2016) show that a diversification of services exports and its sophistication could provide growth for both developing and developed countries. Finally, Hoekman and Mattoo (2008) provide a brief review of recent literature review of the topic discussing the role of services in economic growth, confirming that services are very important for growth as trade liberalization is a key channel for improving services performance and FDI imply higher quality and lower cost services.

### **3.2 International Trade Effect to Economic Growth**

Even though the effect of services trade to economic growth seem to have been analyzed in only some particular aspects as some specific sectors (as the financial sector) or some specific countries (as BRICS) and only for final trade, with many others being still unexplored, it seems that the overall effect of international trade to GDP variation has been a very popular subject in the last decades.

Even though the majority of the studies looking at the effect of overall trade do not make the distinction between goods and services trade, Karam and Zaki (2015) decompose the GDP growth of the Middle East and North Africa (MENA) countries to disentangle the contributions of both sector's trade. This study argues that despite the larger effect of goods services, services trade has also a positive effect to growth and bigger than the one of the tertiary enrollments.

There are few studies that focus on only one economy. Jayachandran and Seilan (2010) and Kumar (2018) chose the classic case of India, showing an important correlation between trade and the GDP using for both of them a cointegration analysis. Sandri, Alshyab and Ghazo (2016) find a positive effect of trade in goods to growth and a positive one for trade in services for the case of Jordan, while Bakari and Mabrouki (2016) use a Granger causality test to find a bidirectional relationship between import and growth and export and growth for Turkey. Using similar types of econometric techniques, Hsiao and Hsiao (2006) show that there is bidirectional effect of export to GDP growth for South East Asian countries, Awokuse (2008) argues that the import-led growth is stronger than the export one for some Latin American countries, whereas Yuksel and Zengin (2016) conclude that the relationship between import, export and the growth rates vary along the developing countries. Zahonogo (2017) and Ikpesu, Vincent and Dakare (2019) focus on Sub-Saharan African countries stating that the link between trade openness and growth appears to not be linear with trade domestic investment and import affecting positively growth and the export negatively.

The studies that analyzed the relationship between international trade and growth for a multitude of countries deduce that overall, there is clear positive influence of trade volumes to GDP variation (Frankel and Romer, 1999; Busse and Koniger, 2012) even though this positive effect is much less clear for the least developed countries (Fosu, 1996; Dollar and Kraay, 2004; Were, 2015). Silberberger and Koeniger (2016) also precise that trade has a stronger effect when the appropriate policies are put in place and this especially for countries with worse regulatory quality and middle- income countries.

Despite a general and important focus on final trade there are few analyses that account for intermediate trade (Simas, Wood and Hertwich, 2015) or even center their attention on it (Veeramani, 1996). Their findings confirm the positive relation of trade with growth and with an ambiguous effect for the least developed countries (Raei, Ignatenko and Mircheva, 2019).

### **3.3 Liberalization of Services and Impact to Economic Growth**

Despite the fact that a part of the literature focused on the services trade relationship with growth, the majority of the trade literature seems to have focused on the liberalization of the services sector and on the importance of openness of the sector for economic development.

Hoekman (2006) and Francois and Hoekman (2010), survey the literature and show there is important evidence that liberalization of the services sector can provide very significant welfare gains and result to a key source of trade volumes and economic expansion. Using OCDE input-output tables and the TiVA database, Chuc and Duong (2019) identify the backward and forward linkages between the Vietnam's services and manufacturing sectors focusing on e-commerce and making key policy recommendations to improve the linkages and GVC activities. Mattoo, Rathindran and Subramanian (2006) show that the liberalization of the financial and telecommunications sectors generated an average growth of 1.5 % relative to the rest of the countries. Similarly, Eschenbach and Hoekman's (2006) findings suggest that changing policies towards financial and infrastructure services are highly linked with onward FDI, pointing out that measures of services policy reform are statistically significant explanatory variables for the economic performance of transition economies in the sample.

Focusing also on the financial sector, Khatun and Bist (2019) add that for the liberalization of this sector to generate growth, the stock market, bond market and insurance sector should be included in the system. Arnold, Javorcik and Mattoo (2006) find a positive relationship among FDI in services and the productivity of the domestic manufacturing firms, concluding that the presence of foreign services suppliers as a measure of services policy is the most solid services variable affecting performance, while Arnold, Javorcik, Mattoo and Lipscomb (2012) find a positive causal relationship between Indian policy reforms in banking, telecommunications and transport and the performance of industrial firms. On similar questions relating services liberalization and manufacturing productivity, Beverelli, Fiorini and Hoekman (2015) provide evidence of a positive effect of services liberalization on the manufacturing productivity, whereas Crozet, Milet and Mirza (2016) demonstrate that the

effects of domestic regulations on both the decision to export and the values exported by each firm do not differ with firm's performance and remains statistically significant for the European Union (EU).

In addition of the positive effect of services trade liberalization, Briggs and Sheehan (2019) precise that the positive effect is stronger for countries with high export values but also for low-income countries. From their part, El Khoury and Savvides (2006) find a positive and significant link between openness in telecommunication services and growth for countries with income per capita below an endogenously determined threshold level and openness in financial services and growth for countries with income per capita above the threshold. On their side, Vijil, Le Mouel and Huchet (2011) have evidence that openness to trade may impact growth negatively for countries which would be specialized in low quality products and that countries increasing their exports will grow faster after reaching a certain level of the extensive margin of exports. Finally, Antràs and Staiger (2012) assert that the rise of offshoring will represent an important obstacle for governments in order to answer to their trade-related problems, suggesting an evolution of effective trade agreements and the institutions that support them focusing on deep integration rather than on market access.

### **3.4 Services Impact to Economic Growth**

An only restricted number of studies analyzed the effect of the overall services sector to economic development by applying different methodologies and datasets. The main outcome of these analyses is that services is playing an important role in economic development but some of them quantified that this effect is less important than the one of the manufacturing. The majority of these studies considers final services or at the most defines some sectors as intermediate and so others as finals. We also found that theoretical studies are superior to empirical studies.

In particular, Kolleen Rask and Kevin Rask (1994) showed that strategic services are an integral part of the progressive division of labor and as a result of the development, while Krishna Dutt and Lee (1993) argued that the expansion of the services sector could have a detrimental effect to economic growth. According to Dasgupta and Singh (2005) services are closely related to GDP growth through the manufacturing sector; while Lundquist, Olander and Henning (2008) precise that this is also the case for producer services state, however, for the case of Sweden this relationship is accompanied with a divergence in growth among services sectors. Triplett and Bosworth (2004) append that productivity growth of services

was much more important than the manufacturing one in the US since 1995. Giovanni and Arend (2017) analyzed the contribution of services to economic growth in order to answer Kaldor's fifth law and determine whether intermediate services contribute to industrial goods. Even though this analysis seems to present a very similar topic with ours, the methodology and the dataset are very different from our study since they used a panel VAR model and in their data two out of the five services sectors were considered intermediate. Their findings suggest that a growth of the services sector induce an increase in the industrial productivity but also in the industrial density and the economic complexity.

Relative to this latter notion of complexity, which reflects the degree of knowledge embedded in the productive structure of the economy, Stojkoski, Utkovski and Kocarev (2016) argue that complexity indices for services are higher than those in goods and that a diversification and enhancement of the services exports can provide a supplementary route for economic growth. The United Nations Conference on Trade and Development (Arda, 2017) is in accordance with the latter conclusions, indicating the major force of the tertiary sector in economic transformation and highlighting the role of services trade in transformation opportunities, employment creation and value addition suggesting that adequate regulations, good policies and strong institutions should be in place to allow the sector transmitting its beneficial effects to the different economies. Jain, Nair and Jain (2015) study the effect of several macro-variables on the GDP component for India in the 2000's decade, deducing that export of the manufacturing sector has no significant effect on GDP while service export has a significant one. On a similar analysis, Attiah (2019) compares the manufacturing and services sectors in periods of growth acceleration for developing countries concluding that secondary sector seems to represent a more primordial role in accelerated growth than tertiary. These last findings are in line with Hauge and Chang (2019) who deduce that the two sectors are working as complementary forces and that without a solid industrial sector the services would not be able to thrive and benefit the economy.

## **4 Methodological Approach**

In this section we introduce the methodological approach that we are employing providing a brief literary background of its creation and usage so far before presenting our model.

## 4.1 Structural Decomposition Analysis

In order to determine the main drivers of variation through time, decomposition analysis is one of the methodologies most frequently applied. The main idea of such analysis is to disentangle the variation of a certain variable into changes in its determinants in order to disclose the contribution of each of them. Within decomposition analysis, structural decomposition analysis (SDA) represents an essential technique employed by macroeconomists and especially by economist using input-output tables. In this paper, the objective of the SDA is to evaluate the contribution of different determinants to the evolution of income generation (or GDP).

The study of determinants' contribution in the variation of the structure of production was introduced and developed in an input-output framework already in the 1950's by Leontief (Leontief, 1951, 1953), and matured in the following decades by Chenery and Carter (Chenery, 1960; Carter, 1970). The primary usage of SDA was to identify the sources of variation of various macroeconomic variables as GDP, output, employment, energy etc. Feldman (1987) focused on the output variation of the fifteen most important sectors of the US economy for the period of 1963 to 1978 concluding that for the majority of industries, final demand changes was the main responsible for output variation. Skolka (1989), Fujimagari (1989), Pamukçu and Boer (2001), and Akita and Hermawan (2000) applied the SDA technique to study economic growth of Austria, Canada, Turkey and Indonesia respectively. Kabeta and Sidhu (2016), on their side, showed the contribution on the economic and employment growth of Ethiopia arguing that employment rate change of the agricultural sector was the main contributor of GDP growth, with services having a negative effect on employment changes. Oosterhaven and Hoen (1998) used a SDA to look at the contribution of preferences, technology and trade on real income changes for some EU countries between 1975 and 1985, including primary, secondary as well tertiary sectors.

Also applying SDA, some researchers focused on analyzing growth determinants of the services sector. Barker (1990) studied the case service sectors of United Kingdom (UK) for the period of 1978 to 1984, while Savona and Lorentz (2006) focused on the same sector for Germany, USA, UK and the Netherlands. Similarly, de Souza et al. (2016) focused on Brazil and USA accounting for both intermediate and final demand changes. Their findings suggest that among different factors that contribute to services growth, private household consumption seems to play a major role. According to Karar and Mukhopadhyay (2018), there are several studies that have also focused on the main contributors of the services sector

for the case of India. Among them some applied regressions in amacroeconomic framework (such as Gordon and Gupta, 2003; Banga, 2005; Papola, 2005; Rath and Rajesh, 2006; Sirari and Bohra, 2011; Agarwwal, 2012), while others applied input-output analysis. For the last case, one of the most significant works was the contribution by Bhardwaj and Chadda(1991) who used the methodology of demand-side decomposition of output growth. Later, Hansda (2002), Sastry et al. (2003), Kumari (2005), Dholakia et al. (2009), and Eichengreen and Gupta (2010), among others, used similar techniques to analyze changing patterns of sources of growth for India with an important focus on the tertiary sector.

In this paper, the objective of the SDA is to evaluate the contribution of different determinants to the evolution of income generation (as a definition of GDP). The basic model to perform this analysis is based on standard input-output model (Leontief, 1951). Let's consider an economy of  $n$  industries and  $n$  products. In this case the output will be defined by<sup>2</sup>:

$$\mathbf{x} = \mathbf{L}\mathbf{f} \quad (1)$$

Where  $\mathbf{x}_{nx1}$  is the gross output vector,  $\mathbf{f}_{nx1}$  is final demand and  $\mathbf{L}_{n \times n}$  is the Leontief inverse matrix defined as  $\mathbf{L} = (\mathbf{I} - \mathbf{A})^{-1}$  with  $\mathbf{I}_{n \times n}$  the identity matrix and  $\mathbf{A}_{n \times n}$  the matrix of technical coefficient of the economy.

When (1) is given for two years ( $t = 0,1$ ), the increase in total output ( $\Delta\mathbf{x} = \mathbf{x}_1 - \mathbf{x}_0 = \mathbf{L}_1\mathbf{f}_1 - \mathbf{L}_0\mathbf{f}_0$ ) can be decompose in different ways:

$$\Delta\mathbf{x} = \Delta\mathbf{L}\mathbf{f}_1 + \mathbf{L}_0\Delta\mathbf{f} \quad (2)$$

$$\Delta\mathbf{x} = \Delta\mathbf{L}\mathbf{f}_0 + \mathbf{L}_1\Delta\mathbf{f} \quad (3)$$

The first term on the right side of equations (2) and (3) represents the contribution of changes of technology ( $\mathbf{L}$ ) as a driver of change in total output ( $\mathbf{x}$ ); while the second term, the corresponding contribution of changes of final demand ( $\mathbf{f}$ ). Since both expressions are mathematically correct and theoretically equivalent, but they produce different outcomes. One solution is to take the arithmetic average of (2) and (3):

---

<sup>2</sup>Matrices are indicated by bold, upright capital letters; vectors by bold, upright lower-case letters; and scalars by italicized lower case letters. Vectors are columns by definition, so that row vectors are obtained by transposition, indicated by a prime. A diagonal matrix with the elements of any vector on its main diagonal and all other entries equal to zero is indicated by a circumflex.

$$\Delta \mathbf{x} = \frac{1}{2} \Delta \mathbf{L}(\mathbf{f}_0 + \mathbf{f}_1) + \frac{1}{2}(\mathbf{L}_0 + \mathbf{L}_1) \Delta \mathbf{f} \quad (4)$$

Alternative, and taking into account the so-called interaction term  $\Delta \mathbf{L} \Delta \mathbf{f}$  we have two additional expressions mathematically correct and theoretically equivalent, but again that produce different outcomes:

$$\Delta \mathbf{x} = \Delta \mathbf{L} \mathbf{f}_0 + \mathbf{L}_0 \Delta \mathbf{f} + \Delta \mathbf{L} \Delta \mathbf{f} \quad (5)$$

$$\Delta \mathbf{x} = \Delta \mathbf{L} \mathbf{f}_1 + \mathbf{L}_1 \Delta \mathbf{f} - \Delta \mathbf{L} \Delta \mathbf{f} \quad (6)$$

Equation (5) represents a Laspeyres decomposition and equation (6) a Paasche one. In this case we have two different solutions. The first would be to take the arithmetic average of equations (5) and (6), which equals to (4)—the arithmetic average of (2) and (3). The second, to split the interaction term into the determinants in order to have a complete decomposition<sup>3</sup>. In this case, the contribution of technological changes on change in output will be  $\Delta \mathbf{L} \mathbf{f}_0 + 1/2(\Delta \mathbf{L} \Delta \mathbf{f})$  following (5) and  $\Delta \mathbf{L} \mathbf{f}_1 - 1/2(\Delta \mathbf{L} \Delta \mathbf{f})$  following (6). Similar fashion will hold for the contribution of final demand changes on change in output:  $\mathbf{L}_0 \Delta \mathbf{f} + 1/2(\Delta \mathbf{L} \Delta \mathbf{f})$  according to (5) and  $\mathbf{L}_1 \Delta \mathbf{f} - 1/2(\Delta \mathbf{L} \Delta \mathbf{f})$  according to (6).

In all cases, these equations inform us about how much the change of  $\mathbf{L}$  (or  $\mathbf{f}$ ) leads to the change of  $\mathbf{x}$ , with all the other variables  $\mathbf{f}$  (or  $\mathbf{L}$ ) remaining unchanged. Separating the variation of one variable (i.e.  $\mathbf{x}$ ) into different contributions of the several determinants allows to have a clear vision of the most important drivers of change and to understand to which of the determinants the variable of interest is the most sensible to. However, in this paper the aim is to evaluate the contribution of the most important drivers of income growth and not total output, in a Global Multiregional Input-Output (GMRIO) framework. In the next section, we describe how the aforementioned SDA expression needs to be modified.

## 4.2 Structural Decomposition Analysis in a Global Multiregional Input-Output Framework

Even though the SDA is a technique that seems to have been widely employed over the last decades, much less studies have applied this methodology in a GMRIO framework and using GMRIO tables.

---

<sup>3</sup>Further details on this can be found in Sun (1998), Dietzenbacher and Los (1998) and Oostenhaven and Hoen (1998) among others.

The first reference to GMRIO tables is Isard (1951) who started working and thinking on a “prototype” of such framework. These tables were, however, not fully developed and implemented until the first decade of XXI century. Over last decades, GMRIO tables have become a very useful tool for regional science, international trade, GVCs, and environmental analysis among other applications. GMRIO tables describe the current structure of global economy mainly characterized by production fragmentation. Production processes have been divided into smaller parts that have been outsourced or offshored to more specialized partners usually located abroad. This economic phenomenon led to the rise of intermediate trade, which is differentiated from final trade as intermediate inputs are produced into different locations relative to the final outputs and this has created the global supply chains (Koopman et al., 2010; Daudin et al., 2011; Mirodout and Cadestin, 2017a, 2017b).

In this GMRIO framework, instead of the basic decomposition of (2 – 5) that considers two determinants for changes of total output, the aim of this paper is to decompose changes of income generation. In particular we are interested in analyzing the impact of changes in technology, final demand, and in trade structure for both intermediate and final demand as drivers of changes in income. The methodology we employ for this study follows Oosterhaven and Hoen (1998) and Dietzenbacher, Kulionis and Capurro (2020). The last paper investigated growth in global renewable energy use and was based on previous works of Arto and Dietzenbacher (2014) and Xu and Dietzenbacher (2014).

Let's suppose a world economy with  $M$  countries, and  $n$  industries and  $q$  components of final demand each country. Being  $\mathbf{Z}$  the  $(M_n \times M_n)$  matrix of intermediate deliveries,  $\mathbf{F}$  the  $(M_n \times M_q)$  matrix of final demand, and  $\mathbf{x}$  the  $M_n$ -element output vector. For the sake of simplicity, the  $q$  different components of final demand in each country can be aggregated into one vector. Following the matrix notation these elements can be expressed as:

$$\mathbf{Z} = \begin{bmatrix} Z^{11} & \dots & Z^{1N} \\ \vdots & Z^{RS} & \vdots \\ Z^{N1} & \dots & Z^{NN} \end{bmatrix} \quad (7)$$

$$\mathbf{F} = \begin{bmatrix} f^{11} & \dots & f^{1N} \\ \vdots & f^{RS} & \vdots \\ f^{N1} & \dots & f^{NN} \end{bmatrix} \quad (8)$$

$$\mathbf{x} = \begin{pmatrix} x^1 \\ \vdots \\ x^N \end{pmatrix} \quad (9)$$

Where,  $z_{ij}^{RS}$  represents the element of the  $(n \times n)$  matrix  $\mathbf{Z}^{RS}$ , giving as intermediate deliveries in current price (millions of US dollars) from sector  $i$  of country R to sector  $j$  of

country S. Similarly,  $f_i^{RS}$  is the element of the n-element vector  $\mathbf{f}^{RS}$  and gives us the deliveries from the sector  $i$  of country R in final demand of country S. Finally, element  $x_i^R$  from the n-element vector  $\mathbf{x}^R$  gives us the output of sector  $i$  in country R. Defining  $\mathbf{e}_{N_n}$  as a  $N_n$ -element summation vector consisting of ones, total output of this world economy can be expressed in the following form:

$$\mathbf{x} = \mathbf{Z}\mathbf{e}_{N_n} + \mathbf{F}\mathbf{e}_N \quad (10)$$

In this GMRIO framework, technology of the world will be also represented by  $\mathbf{A}$  the  $(M_n \times M_n)$  matrix of input coefficients defined as  $\mathbf{A} = \mathbf{Z}\hat{\mathbf{x}}^{-1}$ . Arranging the above expression, we get  $\mathbf{A}\mathbf{x} = \mathbf{Z}\mathbf{e}_n$  and substituting it in (10) we obtain a similar equation of (1) but in a GMRIO framework  $\mathbf{x} = \mathbf{A}\mathbf{x} + \mathbf{F}\mathbf{e}_n$  that yields to:

$$\mathbf{x} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{F}\mathbf{e}_N = \mathbf{L}\mathbf{F}\mathbf{e}_n (= \mathbf{L}\mathbf{f}) \quad (11)$$

With  $\mathbf{L}$  being the  $(M_n \times M_n)$  Leontief inverse matrix  $\mathbf{L} \equiv (\mathbf{I} - \mathbf{A})^{-1}$  in this GMRIO framework:

$$\mathbf{L} = \begin{bmatrix} L^{11} & \dots & L^{1N} \\ \vdots & L^{RS} & \vdots \\ L^{N1} & \dots & L^{NN} \end{bmatrix} \quad (12)$$

### *Distinguishing trade patterns in intermediate and final demand*

However, in order to evaluate the contribution of both of intermediate and final trade structure in income growth we need to make a double distinction. First, regarding intermediate inputs we need to separate the input coefficients matrix  $\mathbf{A}$  into two elements: the “pure” technology coefficients matrix  $\mathbf{B}$  and the trade coefficients of intermediate demand matrix  $\mathbf{H}$ . In a nutshell: the technology coefficient matrix  $\mathbf{B}$  represents the technology of the world by describing the amount of each product that each sector of any country needs to produce one unit, regardless the origin of those inputs, whereas, the trade coefficient matrix  $\mathbf{H}$  informs us about the origin of such inputs, i.e. the structure of intermediate trade, informing us about the structure of the commercial relations of a country or sector for intermediate inputs.

Formally this relation is expressed by next expression (13), where  $\otimes$  denotes the Hadamard product of element-wise multiplication of two matrices:

$$\mathbf{A} = \mathbf{B} \otimes \mathbf{H} \quad (13)$$

With  $\mathbf{B}$ :

$$\mathbf{B} = \begin{bmatrix} B^1 & \dots & B^N \\ \vdots & B^S & \vdots \\ B^1 & \dots & B^N \end{bmatrix} \quad (14)$$

Where  $b_{ij}^{1S} = b_{ij}^{2S} = \dots = b_{ij}^{RS} = \sum_R a_{ij}^{RS}$  is the element of  $\mathbf{B}^S = \sum_R \mathbf{A}^{RS}$  and gives us the total amount of input from a good from sector  $i$  (from any country) per unit of output of goods from sector  $j$  in country  $S$ . Matrix  $\mathbf{H}$  shows the shares of this amount that has been imported from country  $R$  is given by  $h_{ij}^{RS}$ , which is the element of  $\mathbf{H}^{RS}$  and represents the import shares if  $R \neq S$ . It can be expressed as  $h_{ij}^{RS} = a_{ij}^{RS} / b_{ij}^{RS} = a_{ij}^{RS} / \sum_D a_{ij}^{RS}$ .

The second distinction we need to do is regarding final demand represented by matrix  $\mathbf{F}$ , which provides information about expenditure in terms of monetary values on each sector output for a final use. This expenditure can be done by any component of the final demand, let say households (private consumption, C), government (government expenditure, G) or investment (gross fix capital formation and changes in inventory, In). Final demand needs can be satisfied by domestic or foreign production. The latter implies a trade relation since they are products produced in a different country.

In this paper we decompose final demand in two different ways in order to obtain different information relative to the contribution of services trade. One way to decompose matrix  $\mathbf{F}$  is following the same logic than for matrix of input coefficient  $\mathbf{A}$  into the technology coefficients matrix  $\mathbf{B}$  and the trade coefficients of intermediate demand matrix  $\mathbf{H}$ . By doing so, it allows us not only to have a consistent decomposition of the intermediate and final demand but also to inform us about the structure of final trade. For this type of decomposition,  $\mathbf{F}$  takes the following form:

$$\mathbf{F} = \mathbf{V} \otimes \mathbf{S} \quad (15)$$

Where  $\mathbf{V}$  represents the “volumes” of the final demand which informs us about the total amount of final demand for each sector and  $\mathbf{S}$  represents the trade structure of final demand so the structure of the commercial relations of a country or sector of final outputs. Similarly, to the case of the intermediate demand we have:

$$\mathbf{V} = \begin{bmatrix} V^1 & \dots & V^N \\ \vdots & V^S & \vdots \\ V^1 & \dots & V^N \end{bmatrix} \quad (16)$$

Where  $v_{ij}^{1S} = v_{ij}^{2S} = \dots = v_{ij}^{RS} = \sum_R f_{ij}^{RS}$  is the element of  $\mathbf{V}^S = \sum_R \mathbf{F}^{RS}$  and gives us the total amount of output from a good from sector  $i$  (from any country) per unit of output of good from sector  $j$  in country  $S$ . Also, the share of this volume imported from country  $R$  is given by  $s_{ij}^{RS}$  which is the element of  $\mathbf{S}^{RS}$  and represents the import shares if  $R \neq S$ . It can be expressed as  $s_{ij}^{RS} = f_{ij}^{RS} / v_{ij}^{RS} = f_{ij}^{RS} / \sum_D f_{ij}^{RS}$ .

The second way of decomposing the final demand  $\mathbf{F}$  is into final demand satisfied by domestic production (C, G, and In), and the final demand satisfied by foreign production resulted from trade (Tr). This second way allow us to see beyond the contribution of trade structure of final demand (covered by matrix  $\mathbf{S}$ ), the contribution of final trade (of all sectors but of services in particular). It is worthy to mention that matrix  $\mathbf{F}$  can take the form of a summation of matrices (or vectors) so that we can have separately the contribution of domestic demand and foreign demand in the following form:

$$\mathbf{F} = \mathbf{Cn} + \mathbf{Ge} + \mathbf{In} + \mathbf{Tr} \quad (17)$$

Where  $\mathbf{Cn}$ ,  $\mathbf{Ge}$ ,  $\mathbf{In}$  and  $\mathbf{Tr}$  are respectively matrices of private consumption, government expenditure, investment and foreign demand (trade) (either a domestic product consumed abroad either a foreign product consumed domestically depending on whether it is an export or import). Or if expressed as vectors as  $\mathbf{F}e_N = \mathbf{f} = \mathbf{cn} + \mathbf{ge} + \mathbf{in} + \mathbf{tr}$ .

In conclusion, following the above decompositions equation (10)  $\mathbf{x} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{F}$  can be expressed as:

$$\Leftrightarrow \mathbf{x} = (\mathbf{I} - (\mathbf{B} \otimes \mathbf{H}))^{-1}\mathbf{F} \quad (18)$$

$$\Leftrightarrow \mathbf{x} = (\mathbf{I} - (\mathbf{B} \otimes \mathbf{H}))^{-1}(\mathbf{V} \otimes \mathbf{S}) \quad (19)$$

$$\Leftrightarrow \mathbf{x} = (\mathbf{I} - (\mathbf{B} \otimes \mathbf{H}))^{-1}(\mathbf{Cn} + \mathbf{Ge} + \mathbf{In} + \mathbf{Tr}) \quad (20)$$

Finally, after applying the corresponding SDA specification with the two forms of decomposition of  $\mathbf{F}$  expressed by (15) and (17), we also use a final and very simple form of SDA to obtain the contribution of the total trade in services (trade of both intermediate and final services) and then of intermediate trade in services.

### Accounting for income generation

This analysis focuses on income generation and decomposes its variation into the variation of its main contributors. Having in mind equation (11), the income generation vector  $\Omega$  can be defined as:

$$\Omega = \hat{\mathbf{c}}(\mathbf{I} - \mathbf{A})^{-1}\mathbf{F} = \hat{\mathbf{c}}\mathbf{L}\mathbf{F} \quad (21)$$

Where  $\mathbf{c}$  is the  $M_n$ -element value added coefficient vector (and  $\hat{\mathbf{c}}$  its diagonalized form), then applying the above decomposition expressions (18, 19, and 20) we get:

$$\Leftrightarrow \Omega = \hat{\mathbf{c}}(\mathbf{I} - (\mathbf{B} \otimes \mathbf{H}))^{-1}(\mathbf{F}) \quad (22)$$

$$\Leftrightarrow \Omega = \hat{\mathbf{c}}(\mathbf{I} - (\mathbf{B} \otimes \mathbf{H}))^{-1}(\mathbf{V} \otimes \mathbf{S}) \quad (23)$$

$$\Leftrightarrow \Omega = \hat{\mathbf{c}}(\mathbf{I} - (\mathbf{B} \otimes \mathbf{H}))^{-1}(\mathbf{Cn} + \mathbf{Ge} + \mathbf{In} + \mathbf{Tr}) \quad (24)$$

According to above expressions, the variation of  $\Omega$ , i.e.  $\Delta\Omega$ , might be due to a variation of value added coefficients  $\mathbf{c}$ , to the Leontief inverse  $(\mathbf{I} - (\mathbf{B} \otimes \mathbf{H}))^{-1}$ , and to the final demand  $\mathbf{F}$ . Changes in Leontief inverse can be split into changes in technology ( $\Delta\mathbf{B}$ ), and changes in trade structure of intermediate demand ( $\Delta\mathbf{H}$ ). In the same fashion, changes in final demand can be split into changes in volume (or total amount of expenditure) ( $\Delta\mathbf{V}$ ) and trade structure of final demand ( $\Delta\mathbf{S}$ ). Alternative, changes in final demand can be also divided into its domestic component changes: consumption ( $\Delta\mathbf{Cn}$ ), government expenditures ( $\Delta\mathbf{Ge}$ ), and investment ( $\Delta\mathbf{In}$ ).

### SDA of determinants of income generation

In order to analyze the contribution of variation of the main determinants to changes in income generation, we need to apply an SDA to equations (22), (23) and (24). Dietzenbacher and Los (1998) demonstrate that with  $k$  components there are  $k!$  equivalent decomposition forms. Following the logic of equation (4), it would mean to take the arithmetic averages of all 24, 120, and 5040 equivalent decomposition forms. To account for this, we choose Sun (1998) decomposition approach whose idea is to split the interaction term of Laspeyres decomposition equally amongst the main determinants (see equation (5)). The solution equals the average of the  $k!$  equivalent decomposition.

Let's start from the simplest form of equation (21) and consider  $\Omega$  at two points in time ( $t = 0, 1$ ). The variation on income generation  $\Delta\Omega = \Omega_1 - \Omega_0$  following the Laspeyres decomposition form is:

$$\Delta\Omega = \Delta\hat{\mathbf{c}}\mathbf{L}_0\mathbf{F}_0 + \hat{\mathbf{c}}_0\Delta\mathbf{L}\mathbf{F}_0 + \hat{\mathbf{c}}_0\mathbf{L}_0\Delta\mathbf{F} + \hat{\mathbf{c}}_0\Delta\mathbf{L}\Delta\mathbf{F} + \Delta\hat{\mathbf{c}}\mathbf{L}_0\Delta\mathbf{F} + \Delta\hat{\mathbf{c}}\Delta\mathbf{L}\mathbf{F}_0 + \Delta\hat{\mathbf{c}}\Delta\mathbf{L}\Delta\mathbf{F} \quad (25)$$

The interaction terms in (25) are  $\hat{\mathbf{c}}_0\Delta\mathbf{L}\Delta\mathbf{F}$ ,  $\Delta\hat{\mathbf{c}}\mathbf{L}_0\Delta\mathbf{F}$ ,  $\Delta\hat{\mathbf{c}}\Delta\mathbf{L}\mathbf{F}_0$  and  $\Delta\hat{\mathbf{c}}\Delta\mathbf{L}\Delta\mathbf{F}$ , thus following Sun (1998):

$$\Delta\Omega = c^{effect} + L^{effect} + F^{effect} \quad (26)$$

Where:

$$c^{effect} = (\Delta\hat{\mathbf{c}}\mathbf{L}_0\mathbf{F}_0) + \frac{1}{2}(\Delta\hat{\mathbf{c}}\mathbf{L}_0\Delta\mathbf{F}) + \frac{1}{2}(\Delta\hat{\mathbf{c}}\Delta\mathbf{L}\mathbf{F}_0) + \frac{1}{3}(\Delta\hat{\mathbf{c}}\Delta\mathbf{L}\Delta\mathbf{F}) \quad (26a)$$

$$L^{effect} = \hat{\mathbf{c}}_0\Delta\mathbf{L}\mathbf{F}_0 + \frac{1}{2}(\hat{\mathbf{c}}_0\Delta\mathbf{L}\Delta\mathbf{F}) + \frac{1}{2}(\Delta\hat{\mathbf{c}}\Delta\mathbf{L}\mathbf{F}_0) + \frac{1}{3}(\Delta\hat{\mathbf{c}}\Delta\mathbf{L}\Delta\mathbf{F}) \quad (26b)$$

$$F^{effect} = \hat{\mathbf{c}}_0\mathbf{L}_0\Delta\mathbf{F} + \frac{1}{2}(\hat{\mathbf{c}}_0\Delta\mathbf{L}\Delta\mathbf{F}) + \frac{1}{2}(\Delta\hat{\mathbf{c}}\mathbf{L}_0\Delta\mathbf{F}) + \frac{1}{3}(\Delta\hat{\mathbf{c}}\Delta\mathbf{L}\Delta\mathbf{F}) \quad (26c)$$

However, in order to analyze the contribution of services trade we need to disentangle the trade component corresponding to intermediate inputs (matrix  $\mathbf{H}$ ) from  $\mathbf{L}$ , but also to final demand (matrix  $\mathbf{S}$ ) from  $\mathbf{F}$ .

Following Dietzenbacher, Kulionis and Capurro (2020),  $\Delta\mathbf{L}$  represents the change in the Leontief inverse matrix, which corresponds to variation of the input coefficients matrix  $\Delta\mathbf{A}$  given that  $\mathbf{L} = (\mathbf{I} - \mathbf{A})^{-1}$ . According to Oosterhaven and van der Linden(1997) and Oosterhaven and Hoen (1998), this latter variation can be split into technological change ( $\Delta\mathbf{B}$ ) and/or trade structure change ( $\Delta\mathbf{H}$ ). This means that a change in the input coefficients  $\Delta\mathbf{A}$  could reflect a change related with the technology (e.g. less inputs needed per unit of output) or with trade structure (e.g. more important share of inputs imported per unit of output). Displaying  $\Delta\mathbf{L}$  in terms of  $\Delta\mathbf{A}$  we get:

$$\Delta\mathbf{L} = \mathbf{L}_1\Delta\mathbf{A}\mathbf{L}_0 = \mathbf{L}_0\Delta\mathbf{A}\mathbf{L}_1 \quad (27)$$

Having in mind equation (13), i.e.  $\mathbf{A} = \mathbf{B} \otimes \mathbf{H}$ , the variation of the input coefficients can be split such that (Dietzenbacher, Kulionis and Capurro, 2020):

$$\Delta\mathbf{A} = \frac{1}{2}(\Delta\mathbf{H}) \otimes (\mathbf{B}_1 + \mathbf{B}_0) + \frac{1}{2}(\mathbf{H}_1 + \mathbf{H}_0) \otimes (\Delta\mathbf{B}) \quad (28)$$

Substituting (28) in (27) we have:

$$\Delta\mathbf{L} = \mathbf{L}_1 \left[ \frac{1}{2}(\Delta\mathbf{H}) \otimes (\mathbf{B}_1 + \mathbf{B}_0) + \frac{1}{2}(\mathbf{H}_1 + \mathbf{H}_0) \otimes (\Delta\mathbf{B}) \right] \mathbf{L}_0$$

$$= \mathbf{L}_0 \left[ \frac{1}{2} (\Delta \mathbf{H}) \otimes (\mathbf{B}_1 + \mathbf{B}_0) + \frac{1}{2} (\mathbf{H}_1 + \mathbf{H}_0) \otimes (\Delta \mathbf{B}) \right] \mathbf{L}_1 \quad (29)$$

Combining (29) in (26b), the decomposition form of the  $L^{effect}$  taking the trade structure of intermediate inputs will be<sup>4</sup>:

$$\begin{aligned} L^{effect} &= \hat{\mathbf{c}}_0 \left[ \mathbf{L}_1 \left[ \frac{1}{2} (\Delta \mathbf{H}) \otimes (\mathbf{B}_1 + \mathbf{B}_0) + \frac{1}{2} (\mathbf{H}_1 + \mathbf{H}_0) \otimes (\Delta \mathbf{B}) \right] \mathbf{L}_0 \right] \mathbf{F}_0 + \\ &\frac{1}{2} (\hat{\mathbf{c}}_0 \left[ \mathbf{L}_1 \left[ \frac{1}{2} (\Delta \mathbf{H}) \otimes (\mathbf{B}_1 + \mathbf{B}_0) + \frac{1}{2} (\mathbf{H}_1 + \mathbf{H}_0) \otimes (\Delta \mathbf{B}) \right] \mathbf{L}_0 \right] \Delta \mathbf{F}) + \\ &\frac{1}{2} (\Delta \hat{\mathbf{c}} \left[ \mathbf{L}_1 \left[ \frac{1}{2} (\Delta \mathbf{H}) \otimes (\mathbf{B}_1 + \mathbf{B}_0) + \frac{1}{2} (\mathbf{H}_1 + \mathbf{H}_0) \otimes (\Delta \mathbf{B}) \right] \mathbf{L}_0 \right] \mathbf{F}_0) + \\ &\frac{1}{3} (\Delta \hat{\mathbf{c}} \left[ \mathbf{L}_1 \left[ \frac{1}{2} (\Delta \mathbf{H}) \otimes (\mathbf{B}_1 + \mathbf{B}_0) + \frac{1}{2} (\mathbf{H}_1 + \mathbf{H}_0) \otimes (\Delta \mathbf{B}) \right] \mathbf{L}_0 \right] \Delta \mathbf{F}) \end{aligned} \quad (30)$$

Simplifying (30) we get:

$$\begin{aligned} L^{effect} &= \frac{1}{2} [\hat{\mathbf{c}}_0 \mathbf{L}_1 (\Delta \mathbf{H}) \otimes (\mathbf{B}_1 + \mathbf{B}_0) \mathbf{L}_0 \mathbf{F}_0] + \frac{1}{2} [\hat{\mathbf{c}}_0 \mathbf{L}_1 (\mathbf{H}_1 + \mathbf{H}_0) \otimes (\Delta \mathbf{B}) \mathbf{L}_0 \mathbf{F}_0] + \\ &\frac{1}{4} [\hat{\mathbf{c}}_0 \mathbf{L}_1 (\Delta \mathbf{H}) \otimes (\mathbf{B}_1 + \mathbf{B}_0) \mathbf{L}_0 \Delta \mathbf{F}] + \frac{1}{4} [\hat{\mathbf{c}}_0 \mathbf{L}_1 (\mathbf{H}_1 + \mathbf{H}_0) \otimes (\Delta \mathbf{B}) \mathbf{L}_0 \Delta \mathbf{F}] + \\ &\frac{1}{4} [\Delta \hat{\mathbf{c}} \mathbf{L}_1 (\Delta \mathbf{H}) \otimes (\mathbf{B}_1 + \mathbf{B}_0) \mathbf{L}_0 \mathbf{F}_0] + \frac{1}{4} [\Delta \hat{\mathbf{c}} \mathbf{L}_1 (\mathbf{H}_1 + \mathbf{H}_0) \otimes (\Delta \mathbf{B}) \mathbf{L}_0 \mathbf{F}_0] + \\ &\frac{1}{6} [\Delta \hat{\mathbf{c}} \mathbf{L}_1 (\Delta \mathbf{H}) \otimes (\mathbf{B}_1 + \mathbf{B}_0) \mathbf{L}_0 \Delta \mathbf{F}] + \frac{1}{6} [\Delta \hat{\mathbf{c}} \mathbf{L}_1 (\mathbf{H}_1 + \mathbf{H}_0) \otimes (\Delta \mathbf{B}) \mathbf{L}_0 \Delta \mathbf{F}] \end{aligned} \quad (30bis)$$

From (30bis) we can differentiate changes in Leontief inverse due to changes in technology ( $B^{effect}$ ) or due to changes in trade structure of inputs ( $H^{effect}$ ), in order words,  $L^{effect} = B^{effect} + H^{effect}$ . Formally:

$$\begin{aligned} B^{effect} &= \frac{1}{2} [\hat{\mathbf{c}}_0 \mathbf{L}_1 (\mathbf{H}_1 + \mathbf{H}_0) \otimes (\Delta \mathbf{B}) \mathbf{L}_0 \mathbf{F}_0] + \frac{1}{4} [\hat{\mathbf{c}}_0 \mathbf{L}_1 (\mathbf{H}_1 + \mathbf{H}_0) \otimes (\Delta \mathbf{B}) \mathbf{L}_0 \Delta \mathbf{F}] + \\ &\frac{1}{4} [\Delta \hat{\mathbf{c}} \mathbf{L}_1 (\mathbf{H}_1 + \mathbf{H}_0) \otimes (\Delta \mathbf{B}) \mathbf{L}_0 \mathbf{F}_0] + \frac{1}{6} [\Delta \hat{\mathbf{c}} \mathbf{L}_1 (\mathbf{H}_1 + \mathbf{H}_0) \otimes (\Delta \mathbf{B}) \mathbf{L}_0 \Delta \mathbf{F}] \end{aligned} \quad (30bis a)$$

$$\begin{aligned} H^{effect} &= \frac{1}{2} [\hat{\mathbf{c}}_0 \mathbf{L}_1 (\Delta \mathbf{H}) \otimes (\mathbf{B}_1 + \mathbf{B}_0) \mathbf{L}_0 \mathbf{F}_0] + \frac{1}{4} [\hat{\mathbf{c}}_0 \mathbf{L}_1 (\Delta \mathbf{H}) \otimes (\mathbf{B}_1 + \mathbf{B}_0) \mathbf{L}_0 \Delta \mathbf{F}] + \\ &\frac{1}{4} [\Delta \hat{\mathbf{c}} \mathbf{L}_1 (\Delta \mathbf{H}) \otimes (\mathbf{B}_1 + \mathbf{B}_0) \mathbf{L}_0 \mathbf{F}_0] + \frac{1}{6} [\Delta \hat{\mathbf{c}} \mathbf{L}_1 (\Delta \mathbf{H}) \otimes (\mathbf{B}_1 + \mathbf{B}_0) \mathbf{L}_0 \Delta \mathbf{F}] \end{aligned} \quad (30bis b)$$

The same procedure we apply for final demand  $\mathbf{F}$ . Having in mind equation (15), i.e.  $\mathbf{F} = \mathbf{V} \otimes \mathbf{S}$ , the variation of final demand matrix can be expressed changes in changes in the

---

<sup>4</sup>It is worthy to mention that is not necessary to combine equation (29) with equations (26a) and (26c) corresponding to value added coefficient effect ( $c^{effect}$ ) and final demand effect ( $F^{effect}$ ), because the disaggregation does not provide useful information.

amount of final demand (volume,  $\Delta\mathbf{V}$ ) and changes in trade structure of final demand ( $\Delta\mathbf{S}$ ), so that:

$$\Delta\mathbf{F} = \frac{1}{2}(\Delta\mathbf{S}) \otimes (\mathbf{V}_1 + \mathbf{V}_0) + \frac{1}{2}(\mathbf{S}_1 + \mathbf{S}_0) \otimes (\Delta\mathbf{V}) \quad (31)$$

Now combining (31) in (26c), the decomposition form of the  $F^{effect}$  taking the trade structure of final demand will be<sup>5</sup>:

$$\begin{aligned} F^{effect} &= \hat{\mathbf{c}}_0\mathbf{L}_0 \left[ \frac{1}{2}(\Delta\mathbf{S}) \otimes (\mathbf{V}_1 + \mathbf{V}_0) + \frac{1}{2}(\mathbf{S}_1 + \mathbf{S}_0) \otimes (\Delta\mathbf{V}) \right] + \\ &\quad \frac{1}{2}(\hat{\mathbf{c}}_0\Delta\mathbf{L} \left[ \frac{1}{2}(\Delta\mathbf{S}) \otimes (\mathbf{V}_1 + \mathbf{V}_0) + \frac{1}{2}(\mathbf{S}_1 + \mathbf{S}_0) \otimes (\Delta\mathbf{V}) \right]) + \\ &\quad \frac{1}{2}(\Delta\hat{\mathbf{c}}\mathbf{L}_0 \left[ \frac{1}{2}(\Delta\mathbf{S}) \otimes (\mathbf{V}_1 + \mathbf{V}_0) + \frac{1}{2}(\mathbf{S}_1 + \mathbf{S}_0) \otimes (\Delta\mathbf{V}) \right]) + \\ &\quad \frac{1}{3}(\Delta\hat{\mathbf{c}}\Delta\mathbf{L} \left[ \frac{1}{2}(\Delta\mathbf{S}) \otimes (\mathbf{V}_1 + \mathbf{V}_0) + \frac{1}{2}(\mathbf{S}_1 + \mathbf{S}_0) \otimes (\Delta\mathbf{V}) \right]) \end{aligned} \quad (32)$$

Simplifying (32) we get:

$$\begin{aligned} F^{effect} &= \frac{1}{2}[\hat{\mathbf{c}}_0\mathbf{L}_0(\Delta\mathbf{S}) \otimes (\mathbf{V}_1 + \mathbf{V}_0)] + \frac{1}{2}[\hat{\mathbf{c}}_0\mathbf{L}_0(\mathbf{S}_1 + \mathbf{S}_0) \otimes (\Delta\mathbf{V})] + \\ &\quad \frac{1}{4}[\hat{\mathbf{c}}_0\Delta\mathbf{L}(\Delta\mathbf{S}) \otimes (\mathbf{V}_1 + \mathbf{V}_0)] + \frac{1}{4}[\hat{\mathbf{c}}_0\Delta\mathbf{L}(\mathbf{S}_1 + \mathbf{S}_0) \otimes (\Delta\mathbf{V})] + \\ &\quad \frac{1}{4}[\Delta\hat{\mathbf{c}}\mathbf{L}_0(\Delta\mathbf{S}) \otimes (\mathbf{V}_1 + \mathbf{V}_0)] + \frac{1}{4}[\Delta\hat{\mathbf{c}}\mathbf{L}_0(\mathbf{S}_1 + \mathbf{S}_0) \otimes (\Delta\mathbf{V})] + \\ &\quad \frac{1}{6}[\Delta\hat{\mathbf{c}}\Delta\mathbf{L}(\Delta\mathbf{S}) \otimes (\mathbf{V}_1 + \mathbf{V}_0)] + \left[ \frac{1}{6}\Delta\hat{\mathbf{c}}\Delta\mathbf{L}(\mathbf{S}_1 + \mathbf{S}_0) \otimes (\Delta\mathbf{V}) \right] \end{aligned} \quad (32 \text{ bis})$$

From (32 bis) we can distinguish changes in final demand due to changes in the amount of final demand ( $V^{effect}$ ) or due to changes in trade structure of final demand ( $S^{effect}$ ). Formally,  $F^{effect} = V^{effect} + S^{effect}$  will be:

$$\begin{aligned} V^{effect} &= \frac{1}{2}[\hat{\mathbf{c}}_0\mathbf{L}_0(\mathbf{S}_1 + \mathbf{S}_0) \otimes (\Delta\mathbf{V})] + \frac{1}{4}[\hat{\mathbf{c}}_0\Delta\mathbf{L}(\mathbf{S}_1 + \mathbf{S}_0) \otimes (\Delta\mathbf{V})] + \\ &\quad \frac{1}{4}[\Delta\hat{\mathbf{c}}\mathbf{L}_0(\mathbf{S}_1 + \mathbf{S}_0) \otimes (\Delta\mathbf{V})] + \left[ \frac{1}{6}\Delta\hat{\mathbf{c}}\Delta\mathbf{L}(\mathbf{S}_1 + \mathbf{S}_0) \otimes (\Delta\mathbf{V}) \right] \end{aligned} \quad (32 \text{ bis a})$$

$$\begin{aligned} S^{effect} &= \frac{1}{2}[\hat{\mathbf{c}}_0\mathbf{L}_0(\Delta\mathbf{S}) \otimes (\mathbf{V}_1 + \mathbf{V}_0)] + \frac{1}{4}[\hat{\mathbf{c}}_0\Delta\mathbf{L}(\Delta\mathbf{S}) \otimes (\mathbf{V}_1 + \mathbf{V}_0)] + \\ &\quad \frac{1}{4}[\Delta\hat{\mathbf{c}}\mathbf{L}_0(\Delta\mathbf{S}) \otimes (\mathbf{V}_1 + \mathbf{V}_0)] + \frac{1}{6}[\Delta\hat{\mathbf{c}}\Delta\mathbf{L}(\Delta\mathbf{S}) \otimes (\mathbf{V}_1 + \mathbf{V}_0)] \end{aligned} \quad (32 \text{ bis b})$$

---

<sup>5</sup>Similarly, it is not necessary to combine equation (31) with equations (26a) and (26b) corresponding to value added coefficient effect ( $c^{effect}$ ) and Leontief inverse effect ( $L^{effect}$ ), because the disaggregation does not provide useful information.

Summarizing, the procedure from equation (27) to equation (32) allows us to express the variation in income generation  $\Delta\Omega$  into 5 different drivers:

$$\Delta\Omega = c^{effect} + B^{effect} + H^{effect} + V^{effect} + S^{effect} \quad (33)$$

- $c^{effect}$ : a variation of the value added coefficient  $\Delta\hat{c}$  (26a)
- $B^{effect}$ : a variation of the technology  $\Delta\mathbf{B}$  (30 bis a)
- $V^{effect}$ : a variation of the volumes of final demand  $\Delta\mathbf{V}$  (32 bis a)
- $H^{effect}$  and  $S^{effect}$ : respectively a variation of the structure of intermediate trade  $\Delta\mathbf{H}$  (30 bis b) and a variation of the structure of final trade share  $\Delta\mathbf{S}$  (32 bis b), both together make the variation of trade structure

Here the effects of (30 bis b) and (32 bis b) are the ones that concerns us the most as it is the ones that relate to trade.

We also apply an SDA to equation (24), i.e.  $\Omega = \hat{c}(\mathbf{I} - (\mathbf{B} \otimes \mathbf{H}))^{-1}(\mathbf{Cn} + \mathbf{Ge} + \mathbf{In} + \mathbf{Tr})$ . From this decomposition form, the final demand effect can be divided into private consumption effect, government expenditure effect, investment effect and trade effect, so that:  $F^{effect} = Cn^{effect} + Ge^{effect} + In^{effect} + Tr^{effect}$ .

Formally, substituting equation (17), i.e.  $\mathbf{F} = \mathbf{Cn} + \mathbf{Ge} + \mathbf{In} + \mathbf{Tr}$ , in (26c):

$$F^{effect} = \hat{c}_0 \mathbf{L}_0 (\Delta\mathbf{Cn} + \Delta\mathbf{Ge} + \Delta\mathbf{In} + \Delta\mathbf{Tr}) + \frac{1}{2} [\hat{c}_0 \Delta\mathbf{L} (\Delta\mathbf{Cn} + \Delta\mathbf{Ge} + \Delta\mathbf{In} + \Delta\mathbf{Tr})] + \frac{1}{2} [\Delta\hat{c} \mathbf{L}_0 (\Delta\mathbf{Cn} + \Delta\mathbf{Ge} + \Delta\mathbf{In} + \Delta\mathbf{Tr})] + \frac{1}{3} \Delta [\hat{c} \Delta\mathbf{L} (\Delta\mathbf{Cn} + \Delta\mathbf{Ge} + \Delta\mathbf{In} + \Delta\mathbf{Tr})] \quad (34)$$

Simplifying (34) we obtain the four equivalent effects of the components of the final demand:

$$Cn^{effect} = \hat{c}_0 \mathbf{L}_0 \Delta\mathbf{Cn} + \frac{1}{2} (\hat{c}_0 \Delta\mathbf{L} \Delta\mathbf{Cn}) + \frac{1}{2} (\Delta\hat{c} \mathbf{L}_0 \Delta\mathbf{Cn}) + \frac{1}{3} (\Delta\hat{c} \Delta\mathbf{L} \Delta\mathbf{Cn}) \quad (34a)$$

$$Ge^{effect} = \hat{c}_0 \mathbf{L}_0 \Delta\mathbf{Ge} + \frac{1}{2} (\hat{c}_0 \Delta\mathbf{L} \Delta\mathbf{Ge}) + \frac{1}{2} (\Delta\hat{c} \mathbf{L}_0 \Delta\mathbf{Ge}) + \frac{1}{3} (\Delta\hat{c} \Delta\mathbf{L} \Delta\mathbf{Ge}) \quad (34b)$$

$$In^{effect} = \hat{c}_0 \mathbf{L}_0 \Delta\mathbf{In} + \frac{1}{2} (\hat{c}_0 \Delta\mathbf{L} \Delta\mathbf{In}) + \frac{1}{2} (\Delta\hat{c} \mathbf{L}_0 \Delta\mathbf{In}) + \frac{1}{3} (\Delta\hat{c} \Delta\mathbf{L} \Delta\mathbf{In}) \quad (34c)$$

$$Tr^{effect} = \hat{c}_0 \mathbf{L}_0 \Delta\mathbf{Tr} + \frac{1}{2} (\hat{c}_0 \Delta\mathbf{L} \Delta\mathbf{Tr}) + \frac{1}{2} (\Delta\hat{c} \mathbf{L}_0 \Delta\mathbf{Tr}) + \frac{1}{3} (\Delta\hat{c} \Delta\mathbf{L} \Delta\mathbf{Tr}) \quad (34d)$$

In combination with previous procedures, these expressions allow us to express the variation in income generation  $\Delta\Omega$  into 7 different drivers:

$$\Delta\Omega = c^{effect} + B^{effect} + H^{effect} + Cn^{effect} + Ge^{effect} + In^{effect} + Tr^{effect} \quad (35)$$

- $c^{effect}$ : a variation of the value added coefficient  $\Delta\hat{\mathbf{c}}$  (26a)
- $B^{effect}$ : a variation of the technology  $\Delta\mathbf{B}$  (30 bis a)
- $H^{effect}$ : a variation of the structure of intermediate trade  $\Delta\mathbf{H}$  (30 bis b)
- a variation of the domestic final demand components, which include a variation of private consumption  $Cn^{effect} \equiv \Delta\mathbf{Cn}$ (34a), a variation of government expenditures  $Ge^{effect} \equiv \Delta\mathbf{Ge}$ (34b), and a variation of investment  $In^{effect} \equiv \Delta\mathbf{In}$ (34c)
- a variation of foreign final demand (trade final demand)  $Tr^{effect} \equiv \Delta\mathbf{Tr}$  (34d)

Here the effects of (30 bis b) and (34d) are the most relevant ones as they are related to intermediate structure of trade and final trade.

Finally, regarding the final and very simple form of decomposition of  $\Omega$ , it takes the following form:

$$\mathbf{\Omega} = \mathbf{TD} + \mathbf{TTr} \quad (36)$$

Where  $\mathbf{TD}$  represents the total domestic demand including both the intermediate and final demand and  $\mathbf{TTr}$  represents the demand from total trade, including both intermediate and final trade. Using the latter  $\mathbf{TTr}$  variable we can obtain the  $\mathbf{ITr}$  variable which is the intermediate trade variable and represents the demand resulted from intermediate trade where:

$$\mathbf{ITr} = \mathbf{TTr} - \mathbf{Tr} \quad (37)$$

So using (36) we get:

$$\Delta\mathbf{\Omega} = \Delta\mathbf{TD} + \quad (38a)$$

$$\Delta\mathbf{TTr} \quad (38b)$$

With (38b) being the contribution of the total trade.

Also  $\Delta\mathbf{ITr} = \Delta\mathbf{TTr} - \Delta\mathbf{Tr}$ (39) is the contribution of the intermediate trade.

## 5 Dataset

In order to be able to assess the impact of trade in services to global income generation variation accounting for the current structure of the economic world, we use the World Input-Output Tables (WIOT) delivered by the World Input-Output Database (WIOD) 2016 release (Timmer et al., 2015) since it provides essential information that we need for our analysis (i.e., economic transactions of services both as intermediate and final services, differentiating those domestic and trade transactions).The main purpose of the WIOT is to capture the

interconnections of significant and essential economic activities as the production, consumption, accumulation but also trade with an aim to discern the structural workings of the economy. The tables represent the reliance among the different agricultural, manufacturing and service sectors of a national economy or among different economies. The tables depict the dependency of each sector on every sector either this is as a customer or as a supplier. The columns of the input-output matrix represent the monetary values of the imports of each sector while the rows the monetary values of the exports. The initiation of such tables leads to the development of the system of national accounts (SNA) which are nowadays themselves used in order to create the input-output tables for recent periods.

We use the WIOD release 2016 that offers WIOT from 2000 to 2014 in current prices denoted in millions of dollars and covers a total of 44 economies: 28 EU countries (United Kingdom is included as it was a member of the EU at this period), 15 other major countries, and the Rest of the World (ROW). During the analysis we group some countries together based on “geo-economic” similarities. In the European countries we have the West-Northern European countries that we call “Northern European countries”; the “Southern Europe countries” and finally the “Eastern Europe countries”. The rest of the countries are grouped as “Northern American countries”; as “Oceania and Asia” countries; the “BRIC” countries and as “ROW” (see Table A.1 in Appendix for a detailed description of all countries and the economic regions considered).

The WIOD release of 2016 also covers in total 56 sectors where 4 of them concern the agriculture sector, 23 the manufacturing one and 29 the services (see Table A.2 in Appendix). The WIOD dataset follows the European System of National and Regional Accounts (ESA) 2010 classification which sets down a harmonized methodology which must be used for the production of national accounts data in the EU. The ESA is the European version of the world-wide System of National Accounts (SNA), with main difference between the two systems being the presentation, which is in the case of ESA more in line with EU needs. The ESA classification represents an EU Regulation which comprises a methodology and a compulsory transmission program of data by Member States. We present the 29 services sector all separately (rather than in groups) in order to provide a precise overlook of the contribution of each of them. In Table A.2 in the Appendix are listed the different services sectors regrouped on the basis of similar functions and on ESA 2010 aggregate classifications.

The WIOD provides 15 input-output tables from 2000 to 2014 with each of them containing 6,637,320 observations that constitute all the interconnections of each of the 56 sectors with each of 44 countries as intermediate inputs and final output in current prices but also some additional information as total output, total intermediate consumption, “taxes less subsidies on products”, “cost, insurance and freight/ free on board” ratio adjustments on exports, direct purchases abroad by residents, purchases on the domestic territory by non-residents, value added at basic prices, international transport margins and output at basic prices (equal to the total output). In this analysis we are using the 2000, 2007, 2010 and 2014 input-output tables and are comparing them to see the evolution through the years. More precisely, in order to look at the variation of the income generation from 2000 to 2014 we are looking at the services trade contribution to the variation of income generation from 2000 to 2007, from 2007 to 2010 and from 2010 to 2014. This allows us to catch the evolution of the contributions through the different periods accounting for the economic crisis of 2008 that modified the ongoing trend. In fact, during the global economic crisis of 2008 the evolution of the contribution of the different economic sectors could be disrupted, modifying the ongoing situation of the previous years. Having different SDAs on the periods before, between and after the crisis has permitted us considering a potential alteration of the results by the economic crash as we compared the different findings from the three decompositions but also their sum with the one applied to the whole period of 2000 to 2014 and made sure that there wasn't any major changes of tendency in the results. If these latter appeared to have been altered importantly, we would have at least presented the final empirical findings on the three periods of time in order to highlight the effect of the crisis on these contributions.

The choice of the usage of WIOT from WIOD instead of other datasets is justified by the fact that WIOD provides all necessary information needed for this type of analysis, it covers an important period for such type of dataset, it covers a very significant number of countries, permitting us to study an important variety of different economies and the tables follow the ESA 2010 classification in line with the EU which is one of the most common classification for input-output tables.

## **6 Results**

In this section are presented the main results obtained by the SDAs applied to equations (23) and (36). The results of the equation (24) are not analyzed given the fact that the part of

the results related to trade is already used and presented in the equation (36) (which are the results regarding the final trade). As a result, the section is divided in two main categories relative to the results of the equation (36) on the overall intermediate and final services trade and of the equation (23) on the structure of services trade which are themselves separated into a part dedicated to the overall results for the 44 countries regrouped, one on the results of the different services sectors and one on the different group of countries for all the sectors combined and for each sector. Also, in this section we present the most important tables and figures and the rest is presented in the Appendix sections B and C.

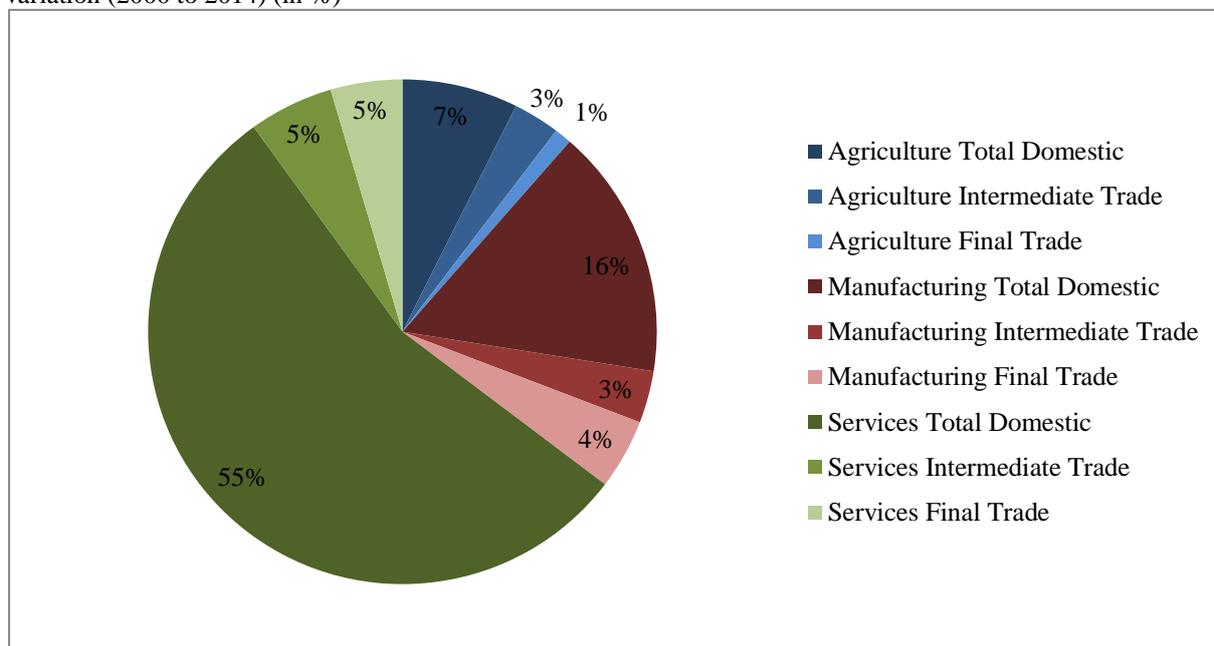
## **6.1 Services Trade**

### **6.1.1 Services Trade Overall results**

Figure 4 presents the general results of the contributions of trade and domestic demand to income generation variation for the three main economic sectors (see also Table B.1 in the Appendix). When applying the SDA to the world aggregate (the 43 countries and the rest of the world), services contribute by 64,7 % to the increase of income generation from 2000 to 2014. This means that globally services have led to 64,7 % of the economic increase observed for these 15 years which leaves only 23,9 % of the increase explained through the manufacturing sector and 11,4 % through agriculture. The total domestic demand represents the domestic intermediate demand and the domestic final demand and shows how the domestic transactions among the different economic sectors contribution to the increase of the income generation, with the services accounting for 54,7 % of the global increase through this variable. As it concerns trade, we have the effect of the final trade to economic development and the one of intermediate trade. Even though the trade of the manufacturing products as final output has almost the same impact as the one of services (4,49 % and 4,56 % respectively) when looking at the contribution of intermediate trade services has a much more important effect accounting for 5,38 % of the global GDP increase relative to 3,33% of the manufacturing sector. As it concerns the “total” effect of trade (both intermediate and final), it appears straightforward that services contribute the most, accounting for 9,94 % of the global economic increase relative to 7,8 % for manufacturing and 4,05 % for the agriculture. Also, it is important to notice here that the effect of services and agricultural trade as intermediate inputs is more important than the one as final outputs with contributions of 5,38 % relative to 4,56 % and 2,96 % relative to 1,09 % respectively. All these results

illustrate the theory of underestimation of the services trade in the economy as the majority of the studies look only at the effect of final trade.

**Figure 4:** Global contribution via domestic demand and different types of trade to income generation variation (2000 to 2014) (in %)



Source: Own elaboration

### 6.1.2 Services Trade Sectoral Results

As it regards the contribution of the different types of services sectors through trade, table 1 depicts the shares of the most important ones (with Figure C.1 and C.2 and Table B.2 in Appendix showing the shares of all of them). Even though the percentages of contribution vary across the sectors, intermediate trade appears to have a stronger effect to income generation variation for the majority of the cases even though the levels remain close. The most contributing sector with important difference compared to the rest is once again the wholesale trade with an overall effect of trade representing 2,04 % of the total increase, divided fairly between intermediate and final trade. The financial sector, the administrative and support services, the legal and accounting along with the land transport one are following among the sectors with the most important services total trade contributions. The nature of some of the sectors here justify their rank and importance as main contributors via trade as the wholesale trade or the financial services sectors which is directly related to trade for the former and well known for selling several products and “packages” aboard for the latter, but the others the importance seems much less straightforward but is justified but an important share of foreign customers who use the services for different reasons relative to the nature of

each sector (many customers using a land transport service from a neighbor country to supply their products or customers interfering with a firm or consulting company from another country due to the higher quality of their services, etc).

**Table 1:** Global contribution of the most important services sectors via intermediate, final and total trade (2000-2014) (in %)

in %	Intermediate Trade	Final Trade	Total Trade
Wholesale trade, except motor vehicles & motorcycles	1,066	0,970	2,036
Land transport & transport via pipelines	0,390	0,326	0,716
Financial services activities, except insurance & pension funding	0,569	0,378	0,947
Legal & accounting activities, activities of head offices; management consultancy activities	0,531	0,298	0,829
Administrative & support service activities	0,495	0,338	0,834

Source: Own elaboration

### 6.1.3 Services Trade Regional Results

When assessing the effect of the services sectors to the variation of income generation for different “regions”, the dominance of the tertiary sector compared to the other sectors appears straightforward. Table 2 shows that the geographical regions are divided into two main groups : the most traditionally developed ones as the Northern and Southern Europeans, the Northern Americans and the Oceania and Asia group have services with more than double percentages of contributions relative to the Agriculture and Manufacturing sectors and the other groups that include mostly developing and least developed countries have much smaller differences among the economic sectors with services being however still a more important contributor (see also Figure C.3 in Appendix).The results of the contribution of the total domestic demand and the different types of trade to the seven groups of countries suggest that services are once again much more important in terms of effect to the GDP increase for the domestic demand, with the manufacturing sector having only a very limited impact of less than 1% with the exceptions of northern America, the BRIIC countries and the ROW aggregate for which the contribution ranges between 2% and 11%.The intermediate trade of services appears also to be more important than the one of manufacturing products for all the regions in exception of the Oceania and Asia group where the contribution is slightly smaller and of the rest of the world aggregate for which the trade of both sectors decreases the income generation increase and with services having a stronger negative effect.In this latter case only the intermediate trade of agricultural products generates a positive impact to

economic expansion and could be explained by a delay of the least developed countries in the progression and expansion of certain types of services employed mainly as intermediate and a specialization of the developing ones (portrayed here especially by the BRIIC group) in the export of the tertiary sector to the developed countries.

**Table 2:** Global contribution of the economic sectors via domestic demand and different types of trade to the income generation variation for 2000-2014 for different group of countries

	Northern Europe					Southern Europe					Eastern Europe				
in %	TD	ITr	FTr	TTr	Total	TD	ITr	FTr	TTr	Total	TD	ITr	FTr	TTr	Total
Agriculture	0,38	0,05	0,19	0,24	0,62	0,21	0,02	0,06	0,08	0,29	0,10	0,01	0,04	0,06	0,16
Manufacturing	0,95	0,93	0,87	1,80	2,75	0,24	0,33	0,24	0,57	0,81	0,18	0,21	0,21	0,42	0,60
Services	8,13	2,09	1,02	3,12	11,25	3,39	0,42	0,20	0,62	4,01	0,81	0,27	0,17	0,44	1,26

	Northern America					Oceania and Asia				
in %	TD	ITr	FTr	TTr	Total	TD	ITr	FTr	TTr	Total
Agriculture	1,16	0,38	0,17	0,55	1,71	0,41	0,07	0,11	0,18	0,59
Manufacturing	2,49	0,11	0,62	0,74	3,23	-0,29	0,48	0,33	0,81	0,53
Services	14,44	0,97	0,48	1,45	15,89	2,47	0,43	0,24	0,68	3,15

	BRIIC					ROW				
in %	TD	ITr	FTr	TTr	Total	TD	ITr	FTr	TTr	Total
Agriculture	3,64	1,00	0,21	1,21	4,85	1,47	1,08	0,31	1,74	3,21
Manufacturing	8,00	1,57	0,89	2,46	10,46	4,51	-0,15	1,34	1,03	5,55
Services	14,80	1,69	0,67	2,36	17,15	10,68	-0,34	1,77	1,27	11,96

Source: Own elaboration

Regarding the different effects of the regions, the contributions are all higher for intermediate trade relative to final trade (in exception of ROW), with northern Europe countries and the BRIIC group having effects stronger of more than 1% in intermediate trade relative to final trade (with respectively 2,09% and 1,69%) and with the rest having effects stronger than 0,25%. The rest of the world aggregate appears to have a negative effect (-0,34%) through intermediate services trade (as for manufacturing trade) but with the strongest effect through final trade (1,77%) implying that these mainly developing and least developed countries switched their trading activities and started trading more their products as final outputs rather than as intermediate inputs.

The result of the total trade follows more the pattern of the intermediate trade rather than the final one, with in the majority of the groups, services having a stronger effect to the  $\Omega$  increase and having a positive impact also for the case of the ROW group (the positive effect of the final trade being stronger than the negative of the intermediate trade)

**Table 3:** Contribution of the economic sectors via domestic demand and different types of trade to the income generation variation for 2000-2014 for different group of countries relative each group's contribution

Northern Europe						Southern Europe					Eastern Europe				
in %	TD	ITr	FTr	TTr	Total	TD	ITr	FTr	TTr	Total	TD	ITr	FTr	TTr	Total
Agriculture	2,58	0,35	1,29	1,64	4,21	4,06	0,40	1,23	1,63	5,69	5,01	0,72	2,04	2,76	7,77
Manufacturing	6,48	6,39	5,9	12,3	18,8	4,70	6,5	4,7	11,1	15,84	9,15	10,5	10,2	20,7	29,8
Services	55,7	14,3	7,00	21,3	76,99	66,3	8,29	3,90	12,2	78,47	40,5	13,3	8,58	21,9	62,4

NorthernAmerica						Oceania and Asia				
in %	TD	ITr	Tr	TTr	Total	TD	ITr	Tr	TTr	Total
Agriculture	5,58	1,82	0,80	2,62	8,20	9,61	1,66	2,59	4,25	13,86
Manufacturing	11,95	0,55	3,00	3,54	15,49	-6,70	11,30	7,74	19,05	12,34
Services	69,33	4,66	2,32	6,98	76,31	57,89	10,18	5,72	15,90	73,79

BRIIC						ROW				
in %	TD	ITr	Tr	TTr	Total	TD	ITr	Tr	TTr	Total
Agriculture	11,22	3,08	0,64	3,72	14,93	7,09	5,23	1,52	8,42	15,51
Manufacturing	24,64	4,83	2,75	7,58	32,22	21,79	-0,73	6,46	4,99	26,77
Services	45,59	5,19	2,06	7,26	52,85	51,57	-1,65	8,53	6,15	57,72

Source: Own elaboration

Table 3 shows the contribution of services trade relative to the total contribution of each group of countries (see Figure C.4 in Appendix). This means that instead of looking at the effect of the different types of trade relative to the global variation of income generation, we look at the effect of the different types of trade of the regions relative to their own variation of income generation. This allows us to take into account the economic weight of each geographic group. The results suggest that with this new way of looking at the effects of trade the dynamics seem to change. Northern and eastern Europe appear to be the two groups with the strongest share of contribution of services trade with respectively 21,32 % and 21,93 % relative to their total variation of income generation, showing that trade of services in their countries play a more determinant role in economic development compared to the rest given their current economic situation. The Oceania and Asia group and southern Europe countries follow with contributions of 15,90 % and 12,19 % respectively.

When examining the sectoral contributions of the different types of services trade to economic development for the different chosen regions (see Figure C.5 and Table B.3 in Appendix), the most important sectors appear to be the same for all types of trade and for the majority of the groups of countries. The wholesale trade has the strongest contribution to the  $\Omega$  variation with effects of through intermediate trades between 0,1% and 0,5% for all the groups except southern and eastern Europe for which the effect is smaller but positive and the

ROW aggregate where the effect is strong but negative of -0,20 %. This latter effect could potentially be partly explained by a non progression of this sector from the least developed countries in comparison to the developing ones but especially from the fact these services rather than being purchased as intermediate services are directly purchased as final ones in these countries as the contribution of this sectors through final trade is the strongest and of 0,42 %. The effect through final trade and total of wholesale trade are also very strong especially for northern Europe and America, the BRIIC countries and the rest of the world. Other sectors significant to economic development for the majority of the regions and the three types of trade are the financial sector and land transport but also the legal; accounting and consultancy services, the administrative support services and the retail trade being important in some of them. The real estate activities appears to be particularly relevant relative to its important sectors for southern Europe countries which could be interpreted as a result of globalization and an increased facility of mobility of people, moving more and more to the south of Europe temporarily or permanently and either this is for studies, leisure, retirement or work.

## 6.2 Structure of Services Trade

### 6.2.1 Overall Results of Structure of Trade

Table 4 presents the results of equation (23) with a main focus on the structure of intermediate and final trade but also important deductions relative to the technological progress and the volumes of final demand (see also Figure C.6 in Appendix).

**Table 4:** Global contribution via structure of intermediate and final trade to income generation variation (2000 to 2014) (in %)

in %	Technological Progress	Structure Intermediate Trade	Volumes of Final Demand	Structure Final Trade	Total Contribution
Agriculture	1,31	0,27	9,64	0,20	11,42
Manufacturing	-2,26	-0,12	26,34	-0,05	23,91
Services	1,11	-0,22	63,91	-0,13	64,67

Source: Own elaboration

The value added coefficient was combined with the technology coefficient matrix in order to provide us a more complete and overall technology variable in order to be able to identify the share of technological progress due to an increase in efficiency in the use of the primary inputs of productions (capital and labor) which are represented by the value added coefficient (a negative value of this latter coefficient translates an increase in efficiency). It seems that

the technological progress lead to a decrease of the value added generation for the manufacturing sector (-2,26 %) while for the agriculture and services an increase of more than 1 % relative to the total variation. This means that from 2000 to 2014 there was a significant technological progress in these two sectors that managed to play a moderate but powerful role in the global economic expansion increasing the generation of value added. This important and much higher effect of technological progress of services relative to the manufacturing sector could be partly explained by the “boom” of the tertiary sector in these fifteen years and the establishment of the tertiary services as the dominant one in the majority of the countries of the world. The structure of intermediate and final trade variables represent the effect of a change in the structure of trade so a change in the commercial partnership of the different countries for one unit of input or output traded. They indicate the value added generated if the structure of a product traded changed and the product is traded to another partner or with a different agreement. The manufacturing and services sectors appear to have a small but negative effect through these two variables with the latter sector having the strongest impact. This could be explained by a change in the partners selling services and a transition of the developed countries starting buying their services cheaper per unit of service traded, probably from more developing and least developed countries generating thus a smaller value added than with the previous partners. Globalization and digital technology has in fact open a much broader and larger market for all the countries, increasing competition and allowing to firms or states to buy services from a much wider pallet of countries that are themselves now able to produce more products cheaper and to offer much more advantageous deals than the previous partners. As a result, even though the effect of the structure of trade is very small in terms of percentage of the total variation of value added generated, these two variables are very informative of the new structure of trade and of the economy, explaining the upcoming dynamics and interconnections of the different economies. These structure variables indicate us also that the fact that services trade has an positive and powerful effect of the economic development, it is due to an increase in the consumption of services as the generated value from a change in services trade for one unit traded decreases the total value added generated. Services have been bought cheaper during these 15 years but in much larger quantities leading to an important increase in the total generation of value added and making them the most important and determinant sector in international trade. As regards the intermediate trade, services, it had a small negative effect of -0,22 % which signify that a change in the structure of trade for intermediate inputs would lead to a decrease of GDP (the

income generation being one way of defining the GDP we may also refer to  $\Omega$  as GDP) by 0,22 % if all the rest remained unchanged. Even though this percentage seems small it represents a very important amount of decrease in terms of millions of US dollars (USD) which resulted only by a change of partners and of the system put in place to trade only for the intermediate inputs. Using the I-O tables that we are using our calculations lead to GDP variation from 2000 to 2014 of 42,16 trillions of USD (with a GDP for 2000 evaluated at 31,65 trillions and for 2014 of 73,81 trillions) so a decrease of -0,22 % represents a loss of 92 752 millions of USD globally which represents a significant cost. For the final trade structure there is also a decrease but of a percentage almost half smaller compared to the intermediate of -0,13 %. The volumes of final demand variable illustrate the final demand accounting the structure of final trade. It is very close to the final demand variable but takes into account the value added generated in the final demand from a variation in a commercial partnership. Given the fact that the value of this variable is very close to the one of the final demand and that the final demand is explaining the most important part of the total contribution, this variable is less informative and relevant than the others and appear to have similar levels of contributions relative to the total effect to the GDP growth with services accounting for 63,9 %.

### **6.2.2 Sectoral Results of Structure of Trade**

Table 5 presents the three sectors contributing the most positively and negatively to the increase of GDP through the structure of intermediate and final trade. The detailed results for all the sectors are presented in Table B.4 and Figure C.7 of the Appendix. We can observe that some sectors as the financial services, the land transport or the administrative and support service activities appear in both types of trade for the respective positive or negative contributions implying that an important change in the commercial relation can impact the sector for both types of trade. Overall, it appears straightforward that the most important services contributing negatively have a higher share of contribution than the ones contributing positively and this especially for structure of intermediate trade. This explains why the aggregate effects of structure of trade is negative and shows that in some case countries changed their commercial partnerships and started importing for a higher price (probably due to a necessity for a higher quality service required), generating a higher value added per unit of sector traded but for the majority of the cases they managed to find cheaper sectors to import decreasing the value added generated per unit traded. Also, among the

majority of these most contributing sectors through structure of trade are the ones also contributing the most –only positively in this case- through total services trade, showing that this change in the commercial relation generated and increase in the consumption of the sector.

**Table 5:** Global contribution of the most important and the worst services sectors via intermediate and final trade structure (2000-2014) (in %)

Structure of Intermediate Trade		
in %	Positive Contribution	Negative Contribution
Financial services activities	0,042	Administrative & support service activities -0,083
Land transport & transport via pipelines	0,028	Legal & accounting activities -0,063
Wholesale trade	0,020	Computer programming, consultancy and information activities -0,045
Structure of Final Trade		
in %	Positive Contribution	Negative Contribution
Water transport	0,028	Administrative & support service activities -0,060
Land transport & transport via pipelines	0,023	Public administration and defense; compulsory social security -0,018
Financial services activities	0,023	Other professional & scientific activities -0,016

Source: Own elaboration

### 6.2.3 Regional Results of Structure of Trade

As it concerns the regional effects, both the structures of intermediate and final trade of services have for the majority of the regions, a negative global contribution except from the case of Eastern Europe countries that have a positive effect through final trade (see also Table B.5 and Figure C.8 in Appendix). For the intermediate trade structure, even though all effects in terms of global share remain low the rest of the world aggregate along with the Northern Europe countries have the highest negative shares of respective -0,044 % and -0,035 %. This could mean that the northern Europe countries were the ones that change the most their commercial deals for intermediate inputs turning to cheaper services and countries from the

rest of the world (mainly developing or least developed countries), the ones decreasing their prices and proposing intermediate services at a lower rate. This most important negative effect of the ROW in addition with a possible smaller consumption of services from these countries leads to the overall negative effect of intermediate services trade for this aggregate regional group. For the structure of trade as final outputs the Eastern Europe have a very small but positive contribution to the total economic increase of 0,003 %. Among the regions with the strongest negative contributions we find once again the Northern Europe ones with the Northern American with respective shares of -0,029 % and -0,034 %.

**Table 6:** Global contribution via structure of intermediate and final services trade for different group of countries (in %)

in %	Structure of Intermediate Trade	Structure of Final Trade
Northern Europe	-0,035	-0,029
Southern Europe	-0,018	-0,011
Eastern Europe	-0,001	0,003
Northern America	-0,011	-0,034
Oceania and Asia	-0,028	-0,005
BRIIC	-0,030	-0,004
ROW	-0,044	-0,022

Source: Own elaboration

When looking at the results of the SDA for the services sector contributions of intermediate and final trade structure to the variation of income generation for the different geographical regions studied, we see that for the majority of the regions, the same sectors that contribute the most overall to the economic development are the ones that have the strongest positive contributions (see Figure C.9 and Table B.6 in Appendix). These sectors are the wholesale trade, the retail trade, the financial services and the land and water transportation and seem to be coherent given their nature as the two former ones are directly related to trade, the third one is a sector highly associated with trade whereas the two latter are also indirectly linked with trade and easy to be traded given the definition of services trade (as the land and water transport will be very easily bought by clients from another country) so a variation in the structure of trade would be made in a much easier way than for other services sectors. For the northern European countries, the wholesale trade represents the highest share relative to growth of GDP while for the southern Europe countries the effect on GDP growth is much smaller (smaller than 0,005% relative to the total growth) but the most important positive

ones are the wholesale trade and water transportation for the intermediate trade and the financial activities for the final one.

For eastern European countries the levels of shares remain also very low with the financial activities standing out among the dominant sectors. In the northern American countries, we find the wholesale trade having a negative contribution to the economic development while for the Asia and Oceania countries it was the financial sector for the case of intermediate trade structure. As it concerns the BRIIC countries and the ROW aggregate among the mentioned sectors the land transport and financial sector stand out for both types of trade while the wholesale trade is important for the intermediate trade of both groups of countries and the water transport especially for the final trade of the latter group. It is important to notice here that for the case of the structure of final trade of the BRIIC countries almost all sectors have a an effect very close to 0 (positive or negative) explaining why this group as a very small overall effect in the structure of final trade relative to the structure of intermediate one.

## **7 Robustness check**

In this section we compare the results obtain from the SDA with current prices with results obtained from an SDA using Input-Output tables with previous years prices (indicated as PYP). Given the fact that for each year there are tables with current prices and others with previous year prices, we performed a second SDA with these latter tables in order to account for possible price effects and make sure our results are reliable. For this the SDA was applied for each of the fifteen years from 2000 to 2014 and then summed to provide the total results for the whole period. In any case the results are expected to be different given the fact that the variables are in values and thus sensitive to price variations and coefficients depending on USD values. The idea of this robustness check would be to make sure that the results of the two SDA remain close in order to make sure that price effects have not influenced the results making them unreliable.

**Table 7:** Global contribution via domestic demand and different types of trade to income generation variation (2000 to 2014) in millions of US dollars and in previous year prices

in millions of US dollars	TD	ITr	FTr	TTr	Total
Agriculture	3097143	1331701	458521	1790223	4887366
Manufacturing	6928668	1447236	1950583	3397819	10326488
Services	22898668	2275616	1906984	4182601	27081269

Source: Own elaboration

**Table 8:** Global contribution via domestic demand and different types of trade to income generation variation (2000 to 2014) in millions of US dollars and in current prices

in millions of US dollars	TD	ITr	FTr	TTr	Total
Agriculture	3105550	1249669	460391	1710060	4815611
Manufacturing	6781463	1406082	1894852	3300935	10082398
Services	23072943	2268670	1922754	4191425	27264368

Source: Own elaboration

Tables 7 and 8 present the contributions of the different types of trade and of the domestic activity to the variation of the global value added in overall values of millions of US dollars in previous year prices and current prices. As expected, the contributions of services appear slightly higher in terms of values in current prices for all the variables except for the intermediate trade. This is also not the case for the agriculture and manufacturing sectors, where for the majority of the variables the values and thus overall contributions of trade and domestic activity are stronger when applying the SDA with previous year prices even though the levels remain very close with the one with current prices. This means that for services the volumes along with the prices of the traded products increased from 2000 to 2014 except from the intermediate inputs and that they decreased for the majority of the products traded (internationally or domestically) in the primary and secondary sectors. Overall, the closeness between the levels of results with the different prices reveals that there shouldn't be any price effect affecting our findings

**Table 9:** Global contribution via domestic demand and different types of trade to income generation variation (2000 to 2014) in percentage and in previous year prices

in millions of US dollars	TD	ITr	FTr	TTr	Total
Agriculture	7	3	1	4	12
Manufacturing	16	3	5	8	24
Services	54	5	5	10	64

Source: Own elaboration

**Table 10:** Global contribution via domestic demand and different types of trade to income generation variation (2000 to 2014) in percentage and in current prices

in millions of US dollars	TD	ITr	FTr	TTr	Total
Agriculture	7	3	1	4	11
Manufacturing	16	3	4	8	24
Services	55	5	5	10	65

Source: Own elaboration

When looking at the differential of contributions of trade and domestic activity with current and previous year prices in terms of percentages (tables 9 and 10), the results confirm the non existence of any price effect as the two appear to be even closer when looking at the shares relatively to the total effect. In fact, for the three economic sectors the shares of contributions relative to the total one are the same with only a few exceptions having differences that represent less than 1 %. More precisely, for the total effect of the services sector the shares in current prices have 0,64 percentage points more than in previous year prices while for the manufacturing 0,50 percentage point less and for the agricultural sector 0,13 less. For the services sector it appears that this is concerns mainly the total domestic effect and of the total effect. This outcome assures us that our main results are reliable and significant and that they haven't been influenced by any price effect.

**Table 11:** Contribution via domestic demand and different types of trade to income generation variation (2000 to 2014) in percentage and in previous year prices for different group of countries

in %	Northern Europe					Southern Europe					Eastern Europe				
	TD	ITr	FTr	TTr	Total	TD	ITr	FTr	TTr	Tot	TD	ITr	FTr	TTr	Total
Agriculture	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Manufacturing	1	1	1	2	3	0	0	0	1	1	0	0	0	0	1
Services	8	2	1	3	11	3	0	0	1	4	1	0	0	0	1

in %	Northern America					Oceania and Asia				
	TD	ITr	FTr	TTr	Total	TD	ITr	FTr	TTr	Total
Agriculture	1	0	0	1	2	0	0	0	0	1
Manufacturing	2	0	1	1	3	0	1	0	1	1
Services	14	1	0	1	15	3	1	0	1	4

in %	BRIIC					ROW				
	TD	ITr	FTr	TTr	Total	TD	ITr	FTr	TTr	Total
Agriculture	3	1	0	1	5	2	1	0	2	3
Manufacturing	8	2	1	3	11	5	0	1	1	6
Services	15	2	1	2	17	11	-1	2	1	12

Source: Own elaboration

**Table 12:** Contribution via domestic demand and different types of trade to income generation variation (2000 to 2014) in percentage and in current prices for different group of countries

in %	Northern Europe					Southern Europe					Eastern Europe				
	TD	ITr	FTr	TTr	Total	TD	ITr	FTr	TTr	Tot	TD	ITr	FTr	TTr	Total
Agriculture	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Manufacturing	1	1	1	2	3	0	0	0	1	1	0	0	0	0	1
Services	8	2	1	3	11	3	0	0	1	4	1	0	0	0	1

in %	Northern America					Oceania and Asia				
	TD	ITr	FTr	TTr	Total	TD	ITr	FTr	TTr	Total
Agriculture	1	0	0	1	2	0	0	0	0	1
Manufacturing	2	0	1	1	3	0	0	0	1	1
Services	14	1	0	1	16	2	0	0	1	3

in %	BRIIC					ROW				
	TD	ITr	FTr	TTr	Total	TD	ITr	FTr	TTr	Total
Agriculture	4	1	0	1	5	1	1	0	2	3
Manufacturing	8	2	1	2	10	5	0	1	1	6
Services	15	2	1	2	17	11	0	2	1	12

Source: Own elaboration

Tables 11 and 12 present the contributions of the different types of trade and of the domestic activity to the variation of the value added in percentages in previous year prices and current prices for the different group of countries studied in this analysis. As it concerns the main divergences between these two regional results, it seems that the shares are once again very close even though in overall values there could be some distinctions in certain areas. It appears that only for the southern Europe countries along with the Oceania and Asia one the total effect of services in previous years prices the shares are higher than for current prices and with the overall effect of the agricultural and manufacturing sectors being lower while for all the other groups we see the opposite effect. However, the differences of these effects remain very low, with the highest variation in percentage for the total effect of services is of 0,57 percentage point for the Oceania and Asia group and the smallest difference of 0,04 percentage points for the Southern Europe one. In the section D of the annex we present other tables with comparative results using previous year prices with other variables of our analysis as the structure of trade and the technology.

## **8 Conclusion**

In this study, we have examined the different contributors explaining the increase in global income generation for the period of 2000 to 2014. The income generation is used as a measure of economic development and the focus of this study is services trade. We have employed a structural decomposition analysis in a global multi-regional input-output framework that allowed us to disentangle all the factors that contribute to generation of income. For this, the final demand was decomposed in two possible ways in order to enable us to look not only to the final trade but also to the structure of final trade in a similar fashion as for intermediate trade. The final results of the variation of the global income generation are also employed to obtain information about the contribution of total trade permitting us to look then at the contribution of intermediate trade. The results obtained for direct trade in services and for the structure of trade in services are compared to the ones of the two other main economic sectors and are presented either as global results either as results for different regions of the world. In order to make sure that the 2008 financial crisis did not affect our results, we applied three different structural decompositions in the periods of 2000 to 2007, 2007 to 2010 and 2010 to 2014 and compared the tendencies between the three results but also their sum with the SDA going directly from 2000 to 2014.

Our findings suggest that overall services are the sector that directly or indirectly contributes the most to the economic growth. The contribution of trade in services appears as more important than the one of trade in manufacturing products and of agricultural products explaining 5,38 % of global income generation increase for intermediate trade and 4,56 % for final trade. The variation in the commercial partners for the tertiary sectors, illustrated by the structure of trade had however the worst effect to GDP increase generating a loss of 92,752 millions of USD globally due to change in the structure of intermediate trade and of 54,808 millions of USD globally for the case of final trade while the two other economic sectors have a much smaller negative impact (for the case of the manufacturing sector) or a positive one (for the case of agriculture). This means that the overall strong contribution of services trade towards income generation is mainly explained from an important increase in the demand of services and thus a growth in the quantity of services traded leading to a higher generation of value-added. The results of the small negative contribution of the structure trade (-0,22 % and -0,13 % for intermediate and final trade respectively) imply that for one unit of service, a variation in the commercial partnership would generate less value-added in 2014 than in 2000 meaning that through this period, the countries and industries started buying their services at a lower cost probably turning into a cheaper workforce available in the developing and mainly in least developed countries that provide services and much competitive prices than the developed ones. As a result if the consumption of services had not expanded through the years the importance of trade of the tertiary sector would be much lower in terms of share of the GDP. This also means that in the future, if the services are bought at a higher price through international regulations guaranteeing a better quality of the product but also a fairer, more sustainable and equitable commercial partnership that would allow better conditions for the labor force of the supplier, the tertiary sector would obtain an even more important role in the global economic growth. This could be done but global international agreements with an aim of better working conditions, a will of a high quality and sustainable products but also the intention of an economic expansion to the countries supplying especially if this concerns the least developed countries that could see a significant alleviation of their poverty and perhaps (under conditions assuring a good and fair management of the income generated) of their inequalities. This should be done especially for services traded as intermediate inputs as the negative effect is twice higher than for final trade. More precisely, the sectors related to legal and accounting activities, activities of head offices and management consultancy activities are the most concerned ones for which companies

seem to turn the most towards cheaper options buying them as intermediate inputs while for the administrative and support services activities they are bought at lower prices and used both as intermediate inputs and final outputs. Regarding the geographical regions that are the most concerned by this decrease of value-added generation per unit of service traded -and that thus should be the principal target of international reforms-are the northern American countries and the BRIIC ones as they have the strongest negative effects per country since they are groups with respectively 3 and 5 countries and are among the groups with the strongest negative impacts. The northern European ones and the ROW aggregate so the least developed countries follow. For the northern European and American countries it could mainly from their variation of suppliers looking for cheaper options of services (even though for the case of Mexico the contrary effect could be the case through their supply of services towards the USA and Canada). For the case of the BRIIC countries both cases could have happened and more deep case by case look would be appropriate to understand whether each country has started importing their services at more advantageous price or exporting them at a more competitive one. Finally the rest of the World aggregate contains mainly the least developed countries so the straightforward most logical assumption would be that the strong negative structure of trade contribution comes from the fact that they have managed to increase their export of services in lower tariffs than before.

For what it concerns the most decisive services sectors, the wholesale trade appears as the most relevant globally for total trade despite having a negative effect through the structure of final trade. Other very prominent sectors for all the variables related to trade in services are the financial sector, retail trade, land transport, administrative and support services and legal and account services.

Northern Europe countries along with the BRIIC are the groups with the most important contribution through total services trade with Northern America countries and the rest of the world following. This latter group had the highest contribution through final trade but a negative one through intermediate trade showing an important turn of the least developed countries to the export of services as final outputs relative to as intermediate inputs. When controlling for the economic weight of the different groups we observe different dynamics in terms of contributions of trade in services with the Eastern Europe countries that appeared as the least important countries having the higher effects of this variable relative to their own total contribution to economic development. The sectoral contribution of the different groups show a negative effect of wholesale trade for the ROW aggregate in parallel with the negative

effect of intermediate trade for this group and an especially important effect of real estate activities for the Southern Europe countries. This means that countries which appear to be trailing in the export of the most contributing sectors could push on their development and facilitate their export abroad through several policies but also a development and facilitation of export of other services that are important in the economy but less through trade and that could be more traded as real estate activities, food and accommodation, computer programming, consultancy and other related activities or the wholesale and retail trade and repair of motor vehicles and motorcycles. The development of tourism or the facilitation of movement of foreign people for studies, work or retirement could be one solution concerning some of these sectors.

## References

- Aggarwal, Archana. "India's Services Sector: Gateway to Development?." *Economic and Political Weekly* (2012): 119-123.
- Akita, Takahiro, and AgusHermawan. "The Sources of Industrial Growth in Indonesia, 1985–95: An Input-Output Analysis." *ASEAN Economic Bulletin* (2000): 270-284.
- Alege, Philip, and AdeyemiOgundipe. "Sustaining Economic Development of West African Countries: A System GMM Panel Approach." (2013).
- Antràs, Pol, and Robert W. Staiger. "Offshoring and the role of trade agreements." *American Economic Review* 102.7 (2012): 3140-83.
- Arda, Mehmet. "The United Nations Conference on Trade and Development." *Greening international institutions*. Routledge (2017) 71-93.
- Ariu, Andrea, Florian Mayneris, and Mathieu Parenti. "One way to the top: How services boost the demand for goods." *Journal of International Economics* 123 (2020): 103278.
- Arnold, Jens, BeataJavorcik, and AadityaMattoo. "The productivity effects of services liberalization: Evidence from the Czech Republic." *World Bank working paper* (2006): 1-38.
- Arnold, Jens Matthias, et al. "Services Reform and Manufacturing Performance. Evidence from India", World Bank, Policy Research Working Paper 5948." (2012).
- Arto, Iñaki, and Erik Dietzenbacher. "Drivers of the growth in global greenhouse gas emissions." *Environmental science & technology* 48.10 (2014): 5388-5394.
- Attiah, Eman. "The role of manufacturing and service sectors in economic growth: an empirical study of developing countries." (2019).
- Awokuse, Titus O. "Trade openness and economic growth: is growth export-led or import-led?." *Applied economics* 40.2 (2008): 161-173.
- Bakari, Sayef, and Mohamed Mabrouki. "The Relationship among Exports, Imports and Economic Growth in Turkey." (2016).
- Baldwin, Richard. "The globotics upheaval: Globalization, robotics, and the future of work." *Oxford University Press* (2019).
- Banga, Rashmi. "Critical issues in India's service-led growth." No. 171. Working paper (2005).
- Barker, Terry. "Sources of structural change for the UK service industries 1979–84." *Economic Systems Research* 2.2 (1990): 173-184.

Beverelli, Cosimo, Matteo Fiorini, and Bernard Hoekman. "Services trade restrictiveness and manufacturing productivity: the role of institutions." *Robert Schuman Centre for Advanced Studies Research Paper No. RSCAS 63* (2015).

Bhardwaj, R. N., and Rajesh Chadha. "Sources of growth and inter-industry linkages in Indian economy with special reference to the manufacturing sector." *Indian Economic Review* (1991): 189-219.

Braga, Carlos Primo. "Services Trade for Sustainable, Balanced, and Inclusive Growth." *Strengthening the Rules-Based Trading System* (2019): 85

Breinlich, Holger, and Chiara Criscuolo. "International trade in services: A portrait of importers and exporters." *Journal of International Economics* 84.2 (2011): 188-206.

Briggs, Kristie, and Kathleen M. Sheehan. "Service trade liberalization and economic growth." *The Journal of Developing Areas* 53.4 (2019).

Buckley, Patricia, and Rumki Majumdar. "The services powerhouse: Increasingly vital to world economic growth." *Deloitte Insights* 12 (2018).

Busse, Matthias, and Jens Königer. "Trade and economic growth: A re-examination of the empirical evidence." *Available at SSRN 2009939* (2012).

Carter, Anne P. "Technological forecasting and input-output analysis." *Technological Forecasting* 1.4 (1970): 331-345.

Chen, Hejing, and John Whalley. "China's service trade." *Journal of Economic Surveys* 28.4 (2014): 746-774.

Chenery, Hollis B. "Patterns of industrial growth." *The American economic review* 50.4 (1960): 624-654.

Chuc, Nguyen Dinh, and Ta Phuc Duong. "Trade, Structural Adjustments and Productivity Growth in Vietnam." *Journal of Southeast Asian Economies* 36.2 (2019): 256-273.

Crozet, Matthieu, Emmanuel Milet, and Daniel Mirza. "The impact of domestic regulations on international trade in services: Evidence from firm-level data." *Journal of Comparative Economics* 44.3 (2016): 585-607.

Dasgupta, Sukti, and Ajit Singh. "Will services be the new engine of Indian economic growth?." *Development and Change* 36.6 (2005): 1035-1057.

Dash, Ranjan Kumar, and Purna Chandra Parida. "FDI, services trade and economic growth in India: empirical evidence on causal links." *Empirical Economics* 45.1 (2013): 217-238.

Daudin, Guillaume, Christine Riffart, and Danielle Schweisguth. "Who produces for whom in the world economy?." *Canadian Journal of Economics/Revue canadienne d'économique* 44.4 (2011): 1403-1437.

Delaunay, Jean-Claude, and Jean Gadrey. "The Tertiary Sector and Post-Industrial Society." *Services in Economic Thought*. Springer, Dordrecht (1992) 75-101.

Dholakia, Ravindra H., et al. "Trends in technical progress in India analysis of input-output tables from 1968 to 2003." (2009).

Dietzenbacher, Erik, and Bart Los. "Structural decomposition techniques: sense and sensitivity." *Economic Systems Research* 10.4 (1998): 307-324.

Dietzenbacher, Erik, Viktoras Kulionis, and Filippo Capurro. "Measuring the effects of energy transition: A structural decomposition analysis of the change in renewable energy use between 2000 and 2014." *Applied Energy* 258 (2020): 114040.

Dollar, David, and Aart Kraay. "Trade, growth, and poverty." *The economic journal* 114.493 (2004): F22-F49.

Eichengreen, Barry, and Poonam Gupta. "The Service Sector as India's Road to Economic Growth?" *Indian Council for Research on International Economic Relations (ICRIER)*. New Delhi (Working Paper Series No. 249) (2010).

El Khoury, Antoine C., and Andreas Savvides. "Openness in services trade and economic growth." *Economics Letters* 92.2 (2006): 277-283.

Eschenbach, Felix, and Bernard Hoekman. "Services policy reform and economic growth in transition economies." *Review of World Economics* 142.4 (2006): 746-764.

Feldman, Paul. "A practical scheme for non-interactive verifiable secret sharing." *28th Annual Symposium on Foundations of Computer Science (sfcs 1987)*. IEEE (1987).

Fosu, Augustin Kwasi. "Primary exports and economic growth in developing countries." *World Economy* 19.4 (1996): 465-475.

Francois, Joseph, and Bernard Hoekman. "Services trade and policy." *Journal of economic literature* 48.3 (2010): 642-92.

Frankel, Jeffrey A., and David H. Romer. "Does trade cause growth?." *American economic review* 89.3 (1999): 379-399.

Freund, Caroline, and Diana Weinhold. "The Internet and international trade in services." *American Economic Review* 92.2 (2002): 236-240.

Fujimagari, David. "The sources of change in Canadian industry output." *Economic Systems Research* 1.2 (1989): 187-202.

Gabriele, Alberto. "Exports of services, exports of goods, and economic growth in developing countries." *Journal of Economic Integration* (2006): 294-317.

Giovanini, Adilson, and Marcelo Arend. "Contribution of services to economic growth: Kaldor's fifth law?." *RAM. Revista de Administração Mackenzie* 18 (2017): 190-213.

Gordon, Mr James PF, and Mrs Poonam Gupta. "Portfolio flows into India: do domestic fundamentals matter?." *International Monetary Fund* (2003).

Hansda, Sanjay K. "Sustainability of Services-Led Growth: An Input Output Analysis of the Indian Economy." *Reserve Bank of India Occasional Papers* 22.1-3 (2001): 73-118.

Hauge, Jostein, and Ha-Joon Chang. "The role of manufacturing versus services in economic development." *Transforming industrial policy for the digital age*. Edward Elgar Publishing (2019).

Hoekman, Bernard M. "Liberalizing trade in services: a survey." (2006).

Hoekman, Bernard, and AadityaMattoo. "Services trade and growth." *Opening markets for trade in services: Countries and sectors in bilateral and WTO negotiations* (2008): 21-58.

Hsiao, Frank ST, and Mei-Chu W. Hsiao. "FDI, exports, and GDP in East and Southeast Asia—Panel data versus time-series causality analyses." *Journal of Asian Economics* 17.6 (2006): 1082-1106.

Ikpesu, Fredrick, Olusegun Vincent, and OlamitunjiDakare. "Growth effect of trade and investment in Sub-Saharan Africa countries: Empirical insight from panel corrected standard error (PCSE) technique." *Cogent Economics & Finance* (2019).

Isard, Walter. "Interregional and regional input-output analysis: a model of a space-economy." *The review of Economics and Statistics* 33.4 (1951): 318-328.

Jain, Dhiraj, K. Nair, and Vaishali Jain. "Factors affecting GDP (manufacturing, services, industry): An Indian perspective." *Annual Research Journal of SCMS Pune* 3 (2015): 38-56.

Jayachandran, G., and AnbuSeilan. "A causal relationship between trade, foreign direct investment and economic growth for India." *International research journal of finance and economics* 42 (2010): 74-88.

Kabeta, ZelalemEjigu, and Inderjeet Singh Sidhu. "Service sector: The source of output and employment growth in Ethiopia." *Academic Journal of Economic Studies* 2.4 (2016): 139-156.

Karam, Fida, and ChahirZaki. "Trade volume and economic growth in the MENA region: Goods or services?." *Economic Modelling* 45 (2015): 22-37.

Karar, Probir, and Smriti Karar Mukhopadhyay. "Growth of Service Sector in India (1983–84 to 2011–12): An Input–Output Analysis." *Applications of the Input-Output Framework*. Springer, Singapore (2018) 137-153.

Khatun, Rabia. "Relation between trade in financial services and economic growth in BRICS economies: Cointegration and causality approach." *Global Business Review* 17.1 (2016): 214-225.

Khatun, Rabia, and Jagadish Prasad Bist. "Financial development, openness in financial services trade and economic growth: A panel data analysis in BRICS economies." *International Trade, Politics and Development* (2019).

Koopman, Robert, et al. *Give credit where credit is due: Tracing value added in global production chains*. No. w16426. National Bureau of Economic Research (2010).

Kumar, Bipin. "Regional Trade in South Asia: An International Legal Analysis." *Shifting Horizons of Public International Law*. Springer, New Delhi (2018) 85-107.

Krishna Dutt, Amitava, and Keun Young Lee. "The service sector and economic growth: Some cross-section evidence." *International Review of Applied Economics* 7.3 (1993): 311-329.

Kumari, Anita. "Liberalisation and sources of Industrial growth in India: An analysis based on Input-Output Approach." *15th International Conference on Input-Output Techniques, June* (2005).

Leontief, Wassily. *The structure of the American economy, 1919-1939*. 2nd ed. New York, N. Y., Oxford University Press. (1951)

Leontief, Wassily. "Domestic production and foreign trade; the American capital position re-examined." *Proceedings of the American philosophical Society* 97.4 (1953): 332-349.

Li, Xiaoying, David Greenaway, and Robert C. Hine. "Imports of services and economic growth: A dynamic panel approach." *INFORMACION COMERCIAL ESPANOLA-MONTHLY EDITION*- 824 (2005): 7.

Loungani, Mr Prakash, et al. "World trade in services: Evidence from a new dataset." *International Monetary Fund* (2017).

Lundquist, Karl-Johan, Lars-Olof Olander, and Martin Svensson Henning. "Producer services: growth and roles in long-term economic development." *The Service Industries Journal* 28.4 (2008): 463-477.

Makki, Shiva S., and Agapi Somwaru. "Impact of foreign direct investment and trade on economic growth: Evidence from developing countries." *American journal of agricultural economics* 86.3 (2004): 795-801.

Mattoo, Aaditya, Randeep Rathindran and Arvind Subramanian. "Measuring Services Trade Liberalization and its Impact on Economic Growth: An Illustration," *Journal of Economic Integration*, (2006) 21:64-98

Miroudot, Sébastien, and Charles Cadestin. "Services in global value chains: From inputs to value-creating activities." (2017).

Miroudot, Sébastien, and Charles Cadestin. "Services in Global Value Chains: Trade patterns and gains from specialisation." (2017).

Muhtaseb, Buthaina MA. "International Trade in Services and Economic Growth: The Case of Jordan." *Jordan Journal of Economic Sciences* 2.2 (2015).

Oosterhaven, Jan, and Alex R. Hoen. "Preferences, technology, trade and real income changes in the European Union An intercountry decomposition analysis for 1975–1985." *The Annals of Regional Science* 32.4 (1998): 505-524.

Oosterhaven, Jan, and Jan A. Van Der Linden. "European technology, trade and income changes for 1975–85: an intercountry input–output decomposition." *Economic Systems Research* 9.4 (1997): 393-412.

Pamukçu, T. E. O. M. A. N., and P. Boer. "A structural decomposition analysis of imports of turkey (1968-1990)." *International Input-Output Association* 13 (2001): 21-25.

Papola, T. S. "Emerging structure of the Indian economy." *Presidential Address to the Indian Economic Association. Mimeo* (2005).

Raei, Ms Faezeh, Anna Ignatenko, and MissBorislavaMircheva. "Global Value Chains: What are the Benefits and Why Do Countries Participate?." *International Monetary Fund* (2019).

Rask, Kolleen J., and Kevin N. Rask. "The Central Role of Services \_ in Economic Development: Extetalities, Growth, and Public Policy." *Journal of Economic Development* 19.2 (1994).

Rath, Deba Prasad, and Raj Rajesh. "Analytics and implications of services sector growth in Indian economy." *The Journal of Income and Wealth* 28.1 (2006): 47-62.

Sandri, Serena, NoohAlshyab, and Abdullah Ghazo. "Trade in goods and services and its effect on economic growth–The Case of Jordan." *Applied Econometrics and International Development* 16.2 (2016): 113-128.

Sastry, D. V. S., et al. "Sectoral linkages and growth prospects: Reflections on the Indian economy." *Economic and Political Weekly* (2003): 2390-2397.

Savona, Maria, and André Lorentz. "Demand and technology contribution to structural change and tertiarisation: an input-output structural decomposition analysis." No. 2005/25. *LEM Working Paper Series* (2006).

Sermcheep, Sineenat. "Services export and economic growth in ASEAN countries." *Journal of Asian Economic Integration* 1.2 (2019): 163-182.

Silberberger, Magdalene, and Jens Königer. "Regulation, trade and economic growth." *Economic Systems* 40.2 (2016): 308-322.

Simas, Moana, Richard Wood, and Edgar Hertwich. "Labor embodied in trade: The role of labor and energy productivity and implications for greenhouse gas emissions." *Journal of Industrial Ecology* 19.3 (2015): 343-356.

Sirari, Arjun Singh, and Narendra Singh Bohra. "Foreign Direct Investment (FDI) in India service sector (A study of post liberalization)." *International Journal of Economic Research* 2.2 (2011): 10-18.

Skolka, Jiří. "Input-output structural decomposition analysis for Austria." *Journal of Policy Modeling* 11.1 (1989): 45-66.

de Souza, Kênia Barreiro, SuzanaQuinet de Andrade Bastos, and Fernando SalgueiroPerobelli. "Multiple trends of tertiarization: A comparative input–output analysis of the service sector expansion between Brazil and United States." *Economia* 17.2 (2016): 141-158.

Stojkoski, Viktor, Zoran Utkovski, and LjupcoKocarev. "The impact of services on economic complexity: Service sophistication as route for economic growth." *PloS one* 11.8 (2016): e0161633.

Sun, JiWu. "Changes in energy consumption and energy intensity: a complete decomposition model." *Energy economics* 20.1 (1998): 85-100.

Thomas, Mini P. "Impact of services trade on economic growth and current account balance: Evidence from India." *The Journal of International Trade & Economic Development* 28.3 (2019): 331-347.

Timmer, Marcel P., et al. "An illustrated user guide to the world input–output database: the case of global automotive production." *Review of International Economics* 23.3 (2015): 575-605.

Triplett, Jack E., and Barry P. Bosworth. "Productivity in the US services sector: new sources of economic growth." *Brookings Institution Press* (2004).

Veeramani, Choorikkad. "Impact of imported intermediate and capital goods on economic growth: A cross country analysis." *Available at SSRN 1325181* (2009).

Vijil, Mariana, Chantal Le Mouel, and MarilyneHuchet-Bourdon. "Aid for trade: a survey." (2011).

Were, Maureen. "Differential effects of trade on economic growth and investment: A cross-country empirical investigation." *Journal of african trade* 2.1-2 (2015): 71-85.

Xu, Yan, and Erik Dietzenbacher. "A structural decomposition analysis of the emissions embodied in trade." *Ecological Economics* 101 (2014): 10-20.

Yüksel, Serhat, and SinemisZengin. "Causality relationship between import, export and growth rate in developing countries." (2016).

Zahonogo, Pam. "Trade and economic growth in developing countries: Evidence from sub-Saharan Africa." *Journal of African Trade* 3.1-2 (2016): 41-56.

# Appendix

## A Dataset Related Tables

**Table A.1:**List of the 44 countries included in the analysis assembled in the different groups

Countries	Acronym	Groups
Austria Belgium Switzerland Germany Denmark Finland France Great Britain Ireland Luxembourg Netherlands Norway Sweden	AUT BEL CHE DEU DNK FIN FRA GBR IRL LUX NLD NOR SWE	Northern Europe countries
Cyprus Spain Greece Italy Malta Portugal Turkey	CYP ESP GRC ITA MLT PRT TUR	Southern Europe countries
Bulgaria Czech Republic Estonia Croatia Hungary Lithuania Latvia Poland Romania Slovakia Slovenia	BRG CZE EST HRV HUN LTU LVA POL ROU SVK SVN	Eastern Europe countries
Canada Mexico United States of America	CAN MEX USA	Northern America countries
Australia Japan Korea Taiwan	AUS JPN KOR TWN	Oceania and Asia countries
Brazil China Indonesia India Russia	BRA CHN IDN IND RUS	BRIIC countries
rest of the world aggregate	ROW	Rest of the World countries

Source: Own elaboration

**Table A.2:** List of the 56 sectors included in the analysis

Sectors	Code	Type of sector
Crop and animal production, hunting and related service activities	r1	Agriculture
Forestry and logging	r2	
Fishing and aquaculture	r3	
Mining and quarrying	r4	
Manufacture of food products, beverages and tobacco products	r5	Manufacturing
Manufacture of textiles, wearing apparel and leather products	r6	
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	r7	
Manufacture of paper and paper products	r8	
Printing and reproduction of recorded media	r9	
Manufacture of coke and refined petroleum products	r10	
Manufacture of chemicals and chemical products	r11	
Manufacture of basic pharmaceutical products and pharmaceutical preparations	r12	
Manufacture of rubber and plastic products	r13	
Manufacture of other non-metallic mineral products	r14	
Manufacture of basic metals	r15	
Manufacture of fabricated metal products, except machinery and equipment	r16	
Manufacture of computer, electronic and optical products	r17	
Manufacture of electrical equipment	r18	
Manufacture of machinery and equipment n.e.c.	r19	
Manufacture of motor vehicles, trailers and semi-trailers	r20	
Manufacture of other transport equipment	r21	
Manufacture of furniture; other manufacturing	r22	
Repair and installation of machinery and equipment	r23	
Electricity, gas, steam and air conditioning supply	r24	
Water collection, treatment and supply	r25	
Sewerage; waste collection, treatment and disposal activities; materials recovery; remediation activities and other waste management services	r26	
Construction	r27	
Wholesale and retail trade and repair of motor vehicles and motorcycles	r28	
Wholesale trade, except of motor vehicles and motorcycles	r29	

Retail trade, except of motor vehicles and motorcycles	r30	
Land transport and transport via pipelines	r31	
Water transport	r32	
Air transport	r33	
Warehousing and support activities for transportation	r34	
Postal and courier activities	r35	
Accommodation and food service activities	r36	
Publishing activities	r37	
Motion picture, video and television programme production, sound recording and music publishing activities; programming and broadcasting activities	r38	
Telecommunications	r39	
	r40	
Computer programming, consultancy and related activities; information service activities		
Financial service activities, except insurance and pension funding	r41	
Insurance, reinsurance and pension funding, except compulsory social security	r42	
Activities auxiliary to financial services and insurance activities	r43	
Real estate activities	r44	
Legal and accounting activities; activities of head offices; management consultancy activities	r45	
Architectural and engineering activities; technical testing and analysis	r46	
Scientific research and development	r47	
Advertising and market research	r48	
Other professional, scientific and technical activities; veterinary activities	r49	
	r50	
Administrative and support service activities		
Public administration and defence; compulsory social security	r51	
Education	r52	
Human health and social work activities	r53	
Other service activities	r54	
	r55	
Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use		
Activities of extraterritorial organizations	r56	

Source: Own elaboration

## B Tables of Results

**Table B.1:** Global contribution of the economic sectors via domestic demand and different types of trade to the income generation variation for 2000 to 2014

in %	TD	ITr	Tr	TTr	Total
Agriculture	7,37	2,96	1,09	4,06	11,42
Manufacturing	16,08	3,33	4,49	7,83	23,91
Services	54,72	5,38	4,56	9,94	64,67

Notes: TD=total domestic effect; ITr=intermediate trade effect; Tr=final trade effect; TTr=total trade effect; Total=total effect

Source: Own elaboration

**Table B.2:** Global contribution of the different services sectors via intermediate, final and total trade to the income generation variation for 2000-2014

in %	ITr	Tr	TTr
Wholesale and retail trade & repair of motor vehicles & motorcycles	0,09	0,09	0,18
Wholesale trade, except motor vehicles & motorcycles	1,07	0,97	2,04
Retail trade, except motor vehicles & motorcycles	0,17	0,30	0,47
Land transport & transport via pipelines	0,39	0,33	0,72
Water transport	0,05	0,09	0,14
Air transport	0,08	0,04	0,12
Warehousing & support activities per transportation	0,24	0,16	0,40
Postal & courier activities	0,02	0,03	0,06
Accommodation and food service activities	0,14	0,12	0,26
Publishing activities	0,08	0,05	0,13
Motion picture, video & television programme production, sound recording & music publishing activities, programming & broadcasting activities	0,03	0,05	0,08
Telecommunication	0,07	0,12	0,19
Computer programming, consultancy & related activities, information and service activities	0,29	0,28	0,57
Financial services activities, except insurance & pension funding	0,57	0,38	0,95
Insurance, reinsurance & pension funding, except compulsory social security	0,11	0,09	0,21
Activities auxiliary to financial services & insurance activities	0,09	0,07	0,15
Real estate activities	0,25	0,20	0,45
Legal & accounting activities, activities of head offices; management consultancy activities	0,53	0,30	0,83
Architectural & engineering; technical testing & analysis	0,17	0,06	0,24
Scientific research & development	-0,03	0,09	0,07
Advertising & market research	0,04	0,04	0,08
Other professional, scientific & technical activities; etc	0,13	0,07	0,19
Administrative & support service activities	0,50	0,34	0,83
Public administration and defence; compulsory social security	0,12	0,05	0,18
Education	0,05	0,06	0,10
Human health & social work activities	0,03	0,03	0,05
Other service activities	0,11	0,13	0,24
Activities of households as employers; undifferentiated goods and services; producing activities of households for own use	0,01	0,00	0,01
Activities of extraterritorial organization & bodies	0,00	0,00	0,00

Source: Own elaboration

**Table B.3:** Global contribution of the different services sectors via intermediate, final and total trade to the income generation variation for 2000-2014 for different group of countries

	Northern Europe			Southern Europe			Eastern Europe		
	ITr	Tr	TTr	ITr	Tr	TTr	ITr	Tr	TTr
Wholesale and retail trade & repair of motor vehicles & motorcycles	0,06	0,03	0,09	0,01	0,01	0,02	0,02	0,01	0,03
Wholesale trade, except motor vehicles & motorcycles	0,33	0,19	0,52	0,05	0,05	0,10	0,04	0,04	0,08
Retail trade, except motor vehicles & motorcycles	-0,04	0,07	0,03	0,00	0,02	0,02	0,03	0,01	0,05
Land transport & transport via pipelines	0,06	0,07	0,14	0,05	0,02	0,07	0,03	0,01	0,05
Water transport	0,04	0,01	0,05	0,01	0,00	0,01	0,00	0,00	0,00
Air transport	0,02	0,01	0,03	0,00	0,00	0,00	0,00	0,00	0,00
Warehousing & support activities per transportation	0,12	0,05	0,16	0,03	0,01	0,04	0,02	0,01	0,03
Postal & courier activities	0,02	0,01	0,03	0,00	0,00	0,00	0,00	0,00	0,00
Accommodation and food service activities	0,03	0,02	0,05	0,02	0,00	0,02	0,00	0,00	0,01
Publishing activities	0,03	0,01	0,05	0,00	0,00	0,00	0,00	0,00	0,00
Motion picture, video & television programme production, sound recording & music publishing activities, programming & broadcasting activities	0,01	0,02	0,03	0,00	0,00	0,00	0,00	0,00	0,00
Telecommunication	0,02	0,03	0,05	0,01	0,01	0,01	0,00	0,00	0,01
Computer programming, consultancy & related activities, information and service activities	0,18	0,05	0,23	0,02	0,01	0,03	0,02	0,01	0,03
Financial services activities, except insurance & pension funding	0,18	0,06	0,25	0,03	0,01	0,04	0,01	0,01	0,02
Insurance, reinsurance & pension funding, except compulsory social security	0,07	0,01	0,08	0,01	0,00	0,01	0,00	0,00	0,00
Activities auxiliary to financial services & insurance activities	0,06	0,01	0,07	0,01	0,00	0,01	0,00	0,00	0,00
Real estate activities	0,09	0,05	0,14	0,05	0,01	0,06	0,02	0,01	0,03
Legal & accounting activities, activities of head offices; management consultancy activities	0,28	0,07	0,34	0,02	0,01	0,04	0,02	0,01	0,03
Architectural & engineering; technical testing & analysis	0,08	0,02	0,10	0,02	0,00	0,02	0,01	0,00	0,01
Scientific research & development	-0,05	0,04	-0,01	0,00	0,00	0,00	0,00	0,00	0,00
Advertising & market research	0,03	0,01	0,04	0,00	0,00	0,00	0,01	0,00	0,01
Other professional, scientific & technical activities; etc	0,04	0,01	0,05	0,02	0,00	0,02	0,00	0,00	0,01
Administrative & support service activities	0,30	0,10	0,39	0,04	0,02	0,05	0,01	0,01	0,02
Public administration and defence; compulsory social security	0,06	0,01	0,07	0,01	0,00	0,01	0,00	0,00	0,00
Education	0,03	0,02	0,05	0,00	0,00	0,01	0,00	0,00	0,00
Human health & social work activities	0,02	0,01	0,02	0,00	0,00	0,01	0,00	0,00	0,00
Other service activities	0,03	0,03	0,06	0,01	0,01	0,01	0,01	0,00	0,01
Activities of households as employers; undifferentiated goods and services; producing activities of households for own use	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Activities of extraterritorial organization & bodies	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

	NorthernAmerica			Oceania and Asia		
	ITr	Tr	TTr	ITr	Tr	TTr
Wholesale and retail trade & repair of motor vehicles & motorcycles	0,00	0,01	0,01	0,01	0,00	0,01
Wholesale trade, except motor vehicles & motorcycles	0,21	0,09	0,29	0,12	0,05	0,17
Retail trade, except motor vehicles & motorcycles	0,00	0,03	0,03	0,05	0,02	0,06
Land transport & transport via pipelines	0,05	0,03	0,08	0,03	0,02	0,05
Water transport	0,00	0,01	0,01	0,01	0,01	0,01
Air transport	0,02	0,01	0,03	0,00	0,00	0,00
Warehousing & support activities per transportation	0,02	0,01	0,03	0,02	0,01	0,02
Postal & courier activities	0,01	0,00	0,01	0,00	0,00	0,00
Accommodation and food service activities	0,01	0,01	0,02	0,02	0,01	0,03
Publishing activities	0,05	0,00	0,05	0,00	0,00	0,01
Motion picture, video & television programme production, sound recording & music publishing activities, programming & broadcasting activities	0,03	0,01	0,03	0,00	0,00	0,01
Telecommunication	0,01	0,01	0,03	0,00	0,01	0,01
Computer programming, consultancy & related activities, information and service activities	0,04	0,02	0,06	0,01	0,01	0,01
Financial services activities, except insurance & pension funding	0,07	0,04	0,11	0,02	0,02	0,05
Insurance, reinsurance & pension funding, except compulsory social security	0,02	0,02	0,04	0,00	0,00	0,00
Activities auxiliary to financial services & insurance activities	0,04	0,01	0,05	0,01	0,00	0,01
Real estate activities	0,03	0,02	0,05	0,02	0,01	0,04
Legal & accounting activities, activities of head offices; management consultancy activities	0,10	0,04	0,14	0,02	0,02	0,03
Architectural & engineering; technical testing & analysis	0,05	0,01	0,06	0,01	0,00	0,02
Scientific research & development	0,02	0,01	0,03	-0,01	0,01	0,00
Advertising & market research	0,02	0,01	0,03	0,00	0,00	0,00
Other professional, scientific & technical activities; etc	0,01	0,01	0,01	0,04	0,01	0,04
Administrative & support service activities	0,09	0,06	0,15	0,03	0,02	0,05
Public administration and defence; compulsory social security	0,04	0,01	0,05	0,01	0,00	0,01
Education	0,01	0,01	0,01	0,01	0,00	0,01
Human health & social work activities	0,00	0,00	0,01	0,00	0,00	0,00
Other service activities	0,00	0,01	0,02	0,01	0,01	0,02
Activities of households as employers; undifferentiated goods and services; producing activities of households for own use	0,00	0,00	0,00	0,00	0,00	0,00
Activities of extraterritorial organization & bodies	0,00	0,00	0,00	0,00	0,00	0,00

	BRIIC			ROW		
	ITr	Tr	TTr	ITr	Tr	TTr
Wholesale and retail trade & repair of motor vehicles & motorcycles	0,00	0,02	0,02	-0,02	0,02	0,00
Wholesale trade, except motor vehicles & motorcycles	0,52	0,13	0,65	-0,20	0,42	0,22
Retail trade, except motor vehicles & motorcycles	0,17	0,05	0,21	-0,04	0,11	0,07
Land transport & transport via pipelines	0,19	0,05	0,24	-0,02	0,12	0,10
Water transport	0,04	0,01	0,05	-0,04	0,05	0,01
Air transport	0,02	0,01	0,02	0,01	0,01	0,02
Warehousing & support activities per transportation	0,04	0,02	0,06	0,00	0,06	0,05
Postal & courier activities	0,00	0,00	0,00	-0,01	0,01	0,00
Accommodation and food service activities	0,03	0,02	0,06	0,03	0,05	0,08
Publishing activities	0,00	0,01	0,00	0,00	0,02	0,02
Motion picture, video & television programme production, sound recording & music publishing activities, programming & broadcasting activities	0,00	0,01	0,00	-0,01	0,02	0,00
Telecommunication	0,03	0,02	0,05	-0,01	0,04	0,03
Computer programming, consultancy & related activities, information and service activities	0,09	0,03	0,12	-0,08	0,17	0,09
Financial services activities, except insurance & pension funding	0,24	0,06	0,29	0,01	0,17	0,18
Insurance, reinsurance & pension funding, except compulsory social security	0,01	0,01	0,02	0,00	0,04	0,05
Activities auxiliary to financial services & insurance activities	-0,01	0,01	0,00	-0,03	0,03	0,00
Real estate activities	0,07	0,03	0,10	-0,04	0,07	0,03
Legal & accounting activities, activities of head offices; management consultancy activities	0,10	0,06	0,16	0,00	0,09	0,09
Architectural & engineering; technical testing & analysis	0,02	0,01	0,03	-0,01	0,02	0,01
Scientific research & development	0,01	0,01	0,02	0,00	0,02	0,02
Advertising & market research	-0,01	0,01	0,00	-0,01	0,01	0,00
Other professional, scientific & technical activities; etc	0,02	0,01	0,03	0,01	0,02	0,03
Administrative & support service activities	0,03	0,04	0,07	0,00	0,10	0,10
Public administration and defence; compulsory social security	0,03	0,01	0,04	-0,02	0,02	0,00
Education	0,01	0,01	0,01	-0,01	0,02	0,01
Human health & social work activities	0,00	0,00	0,00	0,00	0,01	0,01
Other service activities	0,04	0,04	0,08	0,02	0,03	0,05
Activities of households as employers; undifferentiated goods and services; producing activities of households for own use	0,00	0,00	0,00	0,01	0,00	0,01
Activities of extraterritorial organization & bodies	0,00	0,00	0,00	0,00	0,00	0,00

Source: Own elaboration

**Table B.4:** Global contribution of the different services sectors via intermediate and final trade structure to the income generation variation for 2000-2014

in %	H	S
Wholesale and retail trade & repair of motor vehicles & motorcycles	-0,02	-0,01
Wholesale trade, except motor vehicles & motorcycles	0,02	-0,01
Retail trade, except motor vehicles & motorcycles	0,01	0,01
Land transport & transport via pipelines	0,03	0,02
Water transport	0,01	0,03
Air transport	0,00	0,00
Warehousing & support activities per transportation	-0,01	-0,01
Postal & courier activities	-0,01	-0,01
Accommodation and food service activities	0,00	0,00
Publishing activities	-0,01	-0,01
Motion picture, video & television programme production, sound recording & music publishing activities, programming & broadcasting activities	-0,01	0,00
Telecommunication	0,01	0,00
Computer programming, consultancy & related activities, information and service activities	-0,04	-0,02
Financial services activities, except insurance & pension funding	0,04	0,02
Insurance, reinsurance & pension funding, except compulsory social security	-0,01	-0,01
Activities auxiliary to financial services & insurance activities	-0,01	0,00
Real estate activities	-0,02	-0,01
Legal & accounting activities, activities of head offices; management consultancy activities	-0,06	-0,01
Architectural & engineering; technical testing & analysis	-0,01	-0,01
Scientific research & development	-0,01	-0,01
Advertising & market research	-0,01	-0,01
Other professional, scientific & technical activities; etc	-0,03	-0,02
Administrative & support service activities	-0,08	-0,06
Public administration and defence; compulsory social security	-0,02	-0,02
Education	0,00	0,00
Human health & social work activities	0,00	0,00
Other service activities	0,01	0,01
Activities of households as employers; undifferentiated goods and services; producing activities of households for own use	0,01	0,00
Activities of extraterritorial organization & bodies	0,00	0,00

Source: Own elaboration

**Table B.5:** Global contribution of the economic sectors via the different factors to the income generation variation for 2000-2014 (with fd=V&S) for different group of countries

Northern Europe							Southern Europe						Eastern Europe					
in %	C	B	H	V	S	Total	c	B	H	V	S	Total	c	B	H	V	S	Total
Agr.	-0,09	0,05	0,03	0,61	0,03	0,63	-0,04	0,03	0,01	0,27	0,01	0,28	0,00	0,01	0,00	0,15	0,00	0,16
Manuf.	-0,43	0,08	-0,01	3,65	0,01	3,29	-0,23	0,05	0,00	1,37	0,01	1,20	-0,06	0,01	0,00	0,67	0,00	0,62
Services	-0,05	0,35	-0,03	11,31	-0,03	11,55	-0,02	0,15	-0,02	3,73	-0,01	3,84	0,01	0,02	0,00	1,19	0,00	1,22

NorthernAmerica							Oceania& Asia					
in %	C	B	H	V	S	Total	c	B	H	V	S	Total
Agriculture	0,03	0,33	0,04	1,17	0,03	1,60	-0,08	0,31	0,05	0,11	0,03	0,43
Manufacturing	-0,41	0,08	-0,06	4,08	0,00	3,68	-0,59	0,29	-0,03	0,24	-0,03	-0,12
Services	-0,73	0,70	-0,01	14,37	-0,03	14,29	-0,12	0,13	-0,03	0,77	-0,01	0,76

BRIIC							ROW					
in %	C	B	H	V	S	Total	c	B	H	V	S	Total
Agriculture	-0,14	0,19	0,05	4,73	0,02	4,85	-0,14	0,38	0,04	1,95	0,02	2,25
Manufacturing	-1,02	0,07	0,00	11,41	-0,01	10,46	-0,81	0,55	-0,02	4,69	0,00	4,40
Services	0,08	0,80	-0,05	16,32	0,00	17,15	-0,11	0,10	-0,04	9,26	-0,02	9,18

Source: Own elaboration

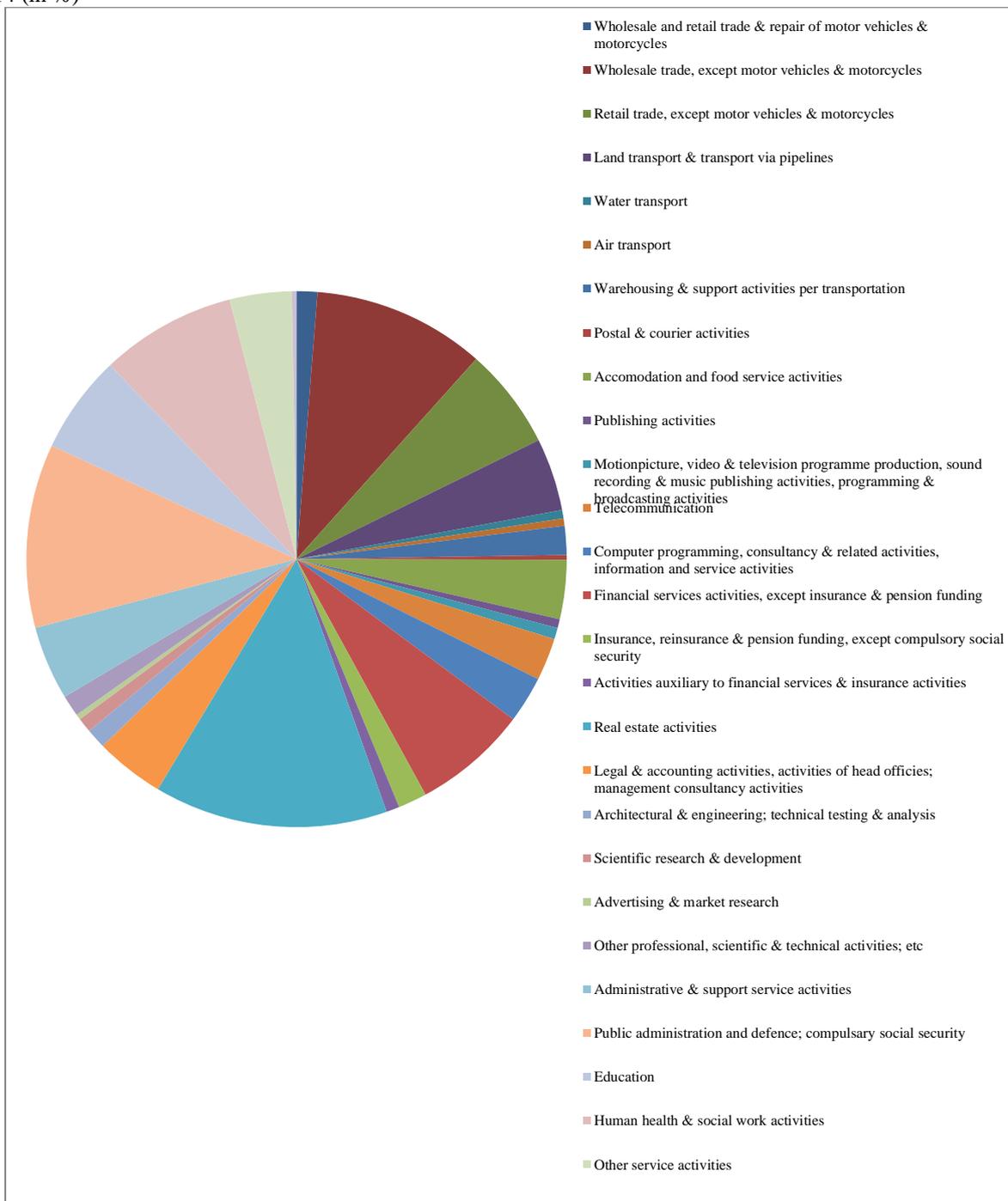
**Table B.6:** Global contribution of the different services sectors via intermediate and final trade structure to the income generation variation for 2000-2014 for different group of countries

	Northern Europe		Southern Europe		Eastern Europe		Northern America		Oceania and Asia		BRIC		ROW	
	H	S	H	S	H	S	H	S	H	S	H	S	H	S
Wholesale and retail trade & repair of motor vehicles & motorcycles	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Wholesale trade, except motor vehicles & motorcycles	0,01	0,01	0,00	0,00	0,00	0,00	0,00	-0,01	0,00	0,00	0,00	0,00	0,01	0,00
Retail trade, except motor vehicles & motorcycles	0,00	0,00	0,00	0,00	0,00	0,00	0,01	0,00	0,00	0,00	-0,01	0,00	0,00	0,00
Land transport & transport via pipelines	0,00	0,00	0,00	0,00	0,00	0,00	0,01	0,00	0,00	0,00	0,01	0,00	0,01	0,01
Water transport	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,02
Air transport	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Warehousing & support activities per transportation	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	-0,01
Postal & courier activities	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Accommodation and food service activities	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Publishing activities	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Motion picture, video & television programme production, sound recording & music publishing activities, programming & broadcasting activities	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Telecommunication	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Computer programming, consultancy & related activities, information and service activities	-0,01	-0,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	-0,01	0,00	0,02	0,00
Financial services activities, except insurance & pension funding	0,01	0,00	0,00	0,00	0,00	0,00	0,01	0,00	0,00	0,00	0,00	0,00	0,01	0,01
Insurance, reinsurance & pension funding, except compulsory social security	0,00	0,00	0,00	0,00	0,00	0,00	0,00	-0,01	0,00	0,00	0,00	0,00	0,00	0,00
Activities auxiliary to financial services & insurance activities	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Real estate activities	-0,01	-0,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01	0,00	0,00
Legal & accounting activities, activities of head offices; management consultancy activities	-0,02	-0,01	0,00	0,00	0,00	0,00	-0,01	-0,01	0,00	0,00	-0,01	0,00	0,01	-0,01
Architectural & engineering; technical testing & analysis	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Scientific research & development	0,00	-0,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Advertising & market research	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Other professional, scientific & technical activities; etc	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01	0,01	0,00	0,00	0,01	0,00
Administrative & support service activities	-0,02	-0,02	-0,01	0,00	0,00	0,00	-0,02	-0,01	0,00	0,00	-0,02	-0,01	0,02	-0,02
Public administration and defence; compulsory social security	0,00	0,00	0,00	0,00	0,00	0,00	-0,01	0,00	0,00	0,00	0,00	0,00	0,00	-0,01
Education	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Human health & social work activities	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Other service activities	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01	0,00	0,00
Activities of households as employers; undifferentiated goods and services; producing activities of households for own use	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01	0,00	0,00	0,00	0,00	0,00
Activities of extraterritorial organization & bodies	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Source: Own elaboration

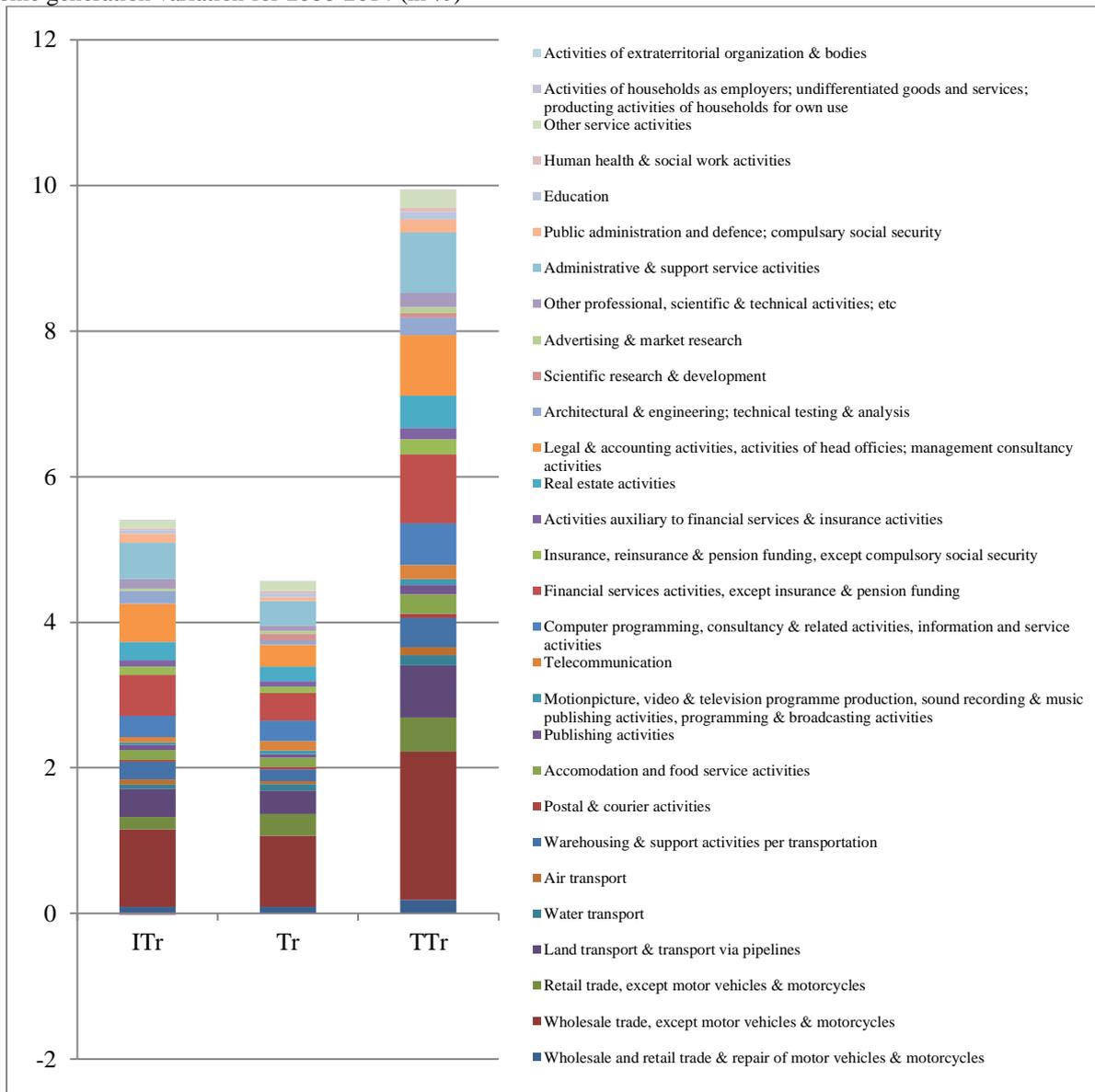
## C Additional Figures of Results

**Figure C.1:** Global contribution of the different services sectors to the income generation variation for 2000-2014 (in %)



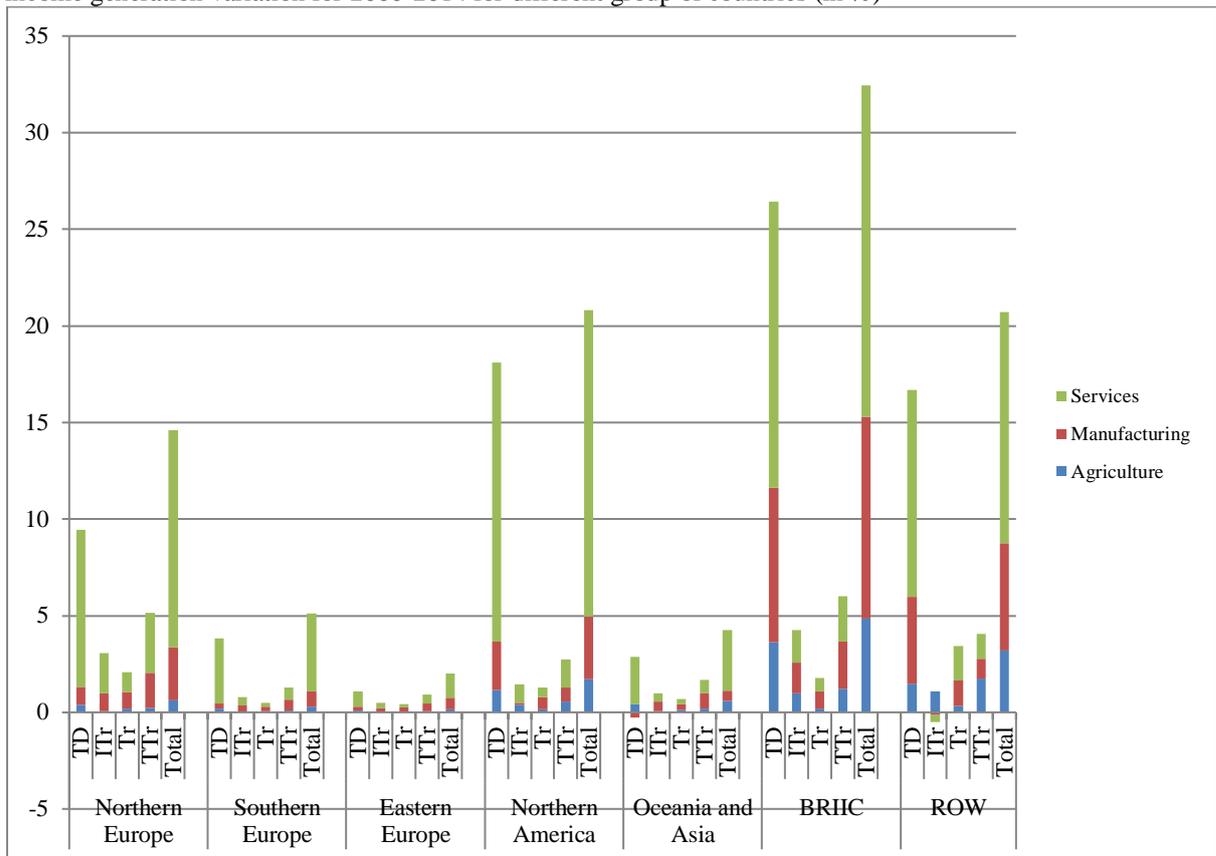
Source: Own elaboration

**Figure C.2:** Global contribution of the different services sectors via intermediate, final and total trade to the income generation variation for 2000-2014 (in %)



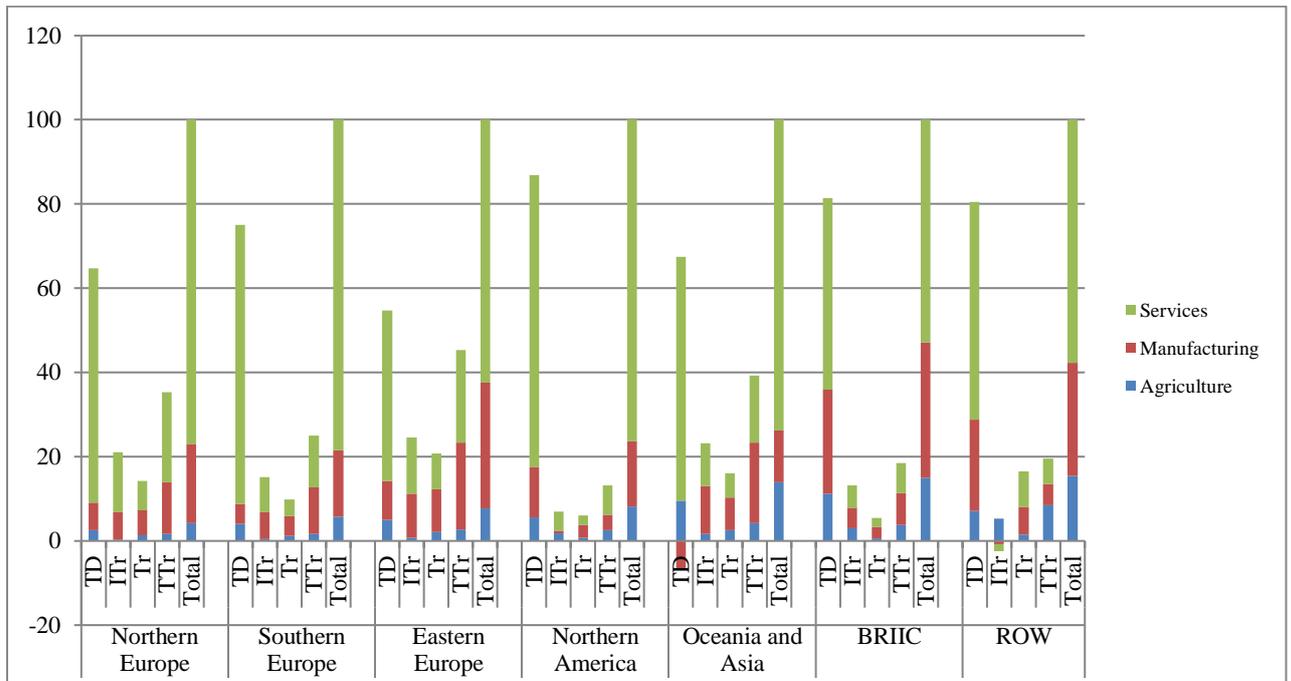
Source: Own elaboration

**Figure C.3:** Global contribution of the economic sectors via domestic demand and different types of trade to the income generation variation for 2000-2014 for different group of countries (in %)



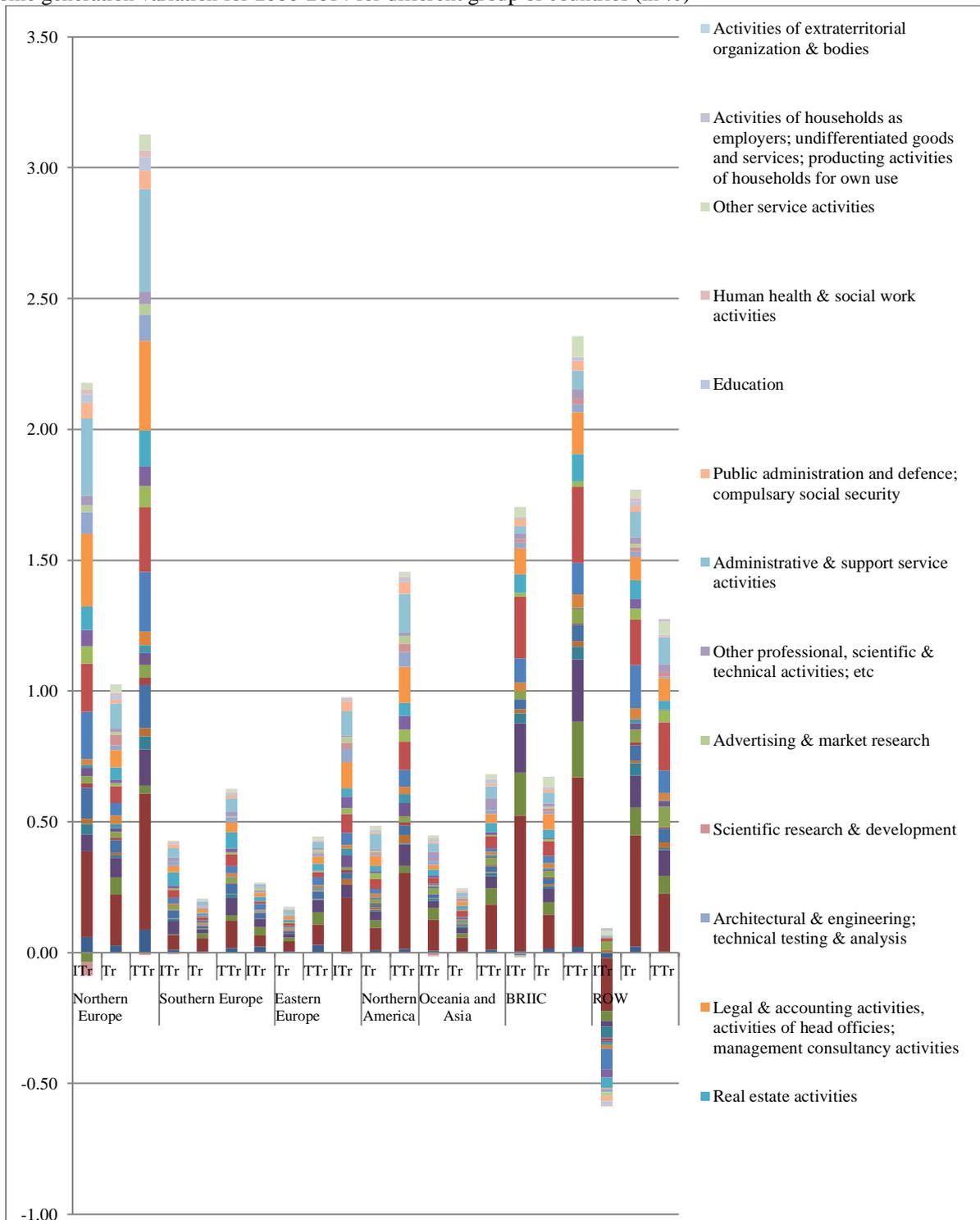
Source: Own elaboration

**Figure C.4:** Contribution of the economic sectors via domestic demand and different types of trade to the income generation variation for 2000-2014 for different group of countries relative each group's contribution (in %)



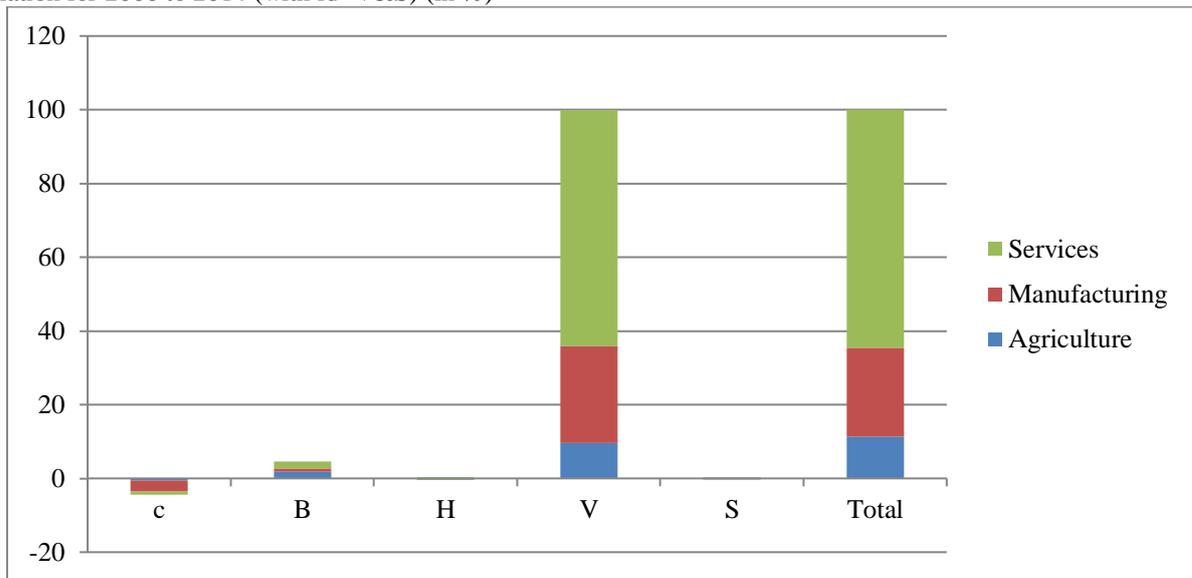
Source: Own elaboration

**Figure C.5:** Global contribution of the different services sectors via intermediate, final and total trade to the income generation variation for 2000-2014 for different group of countries (in %)



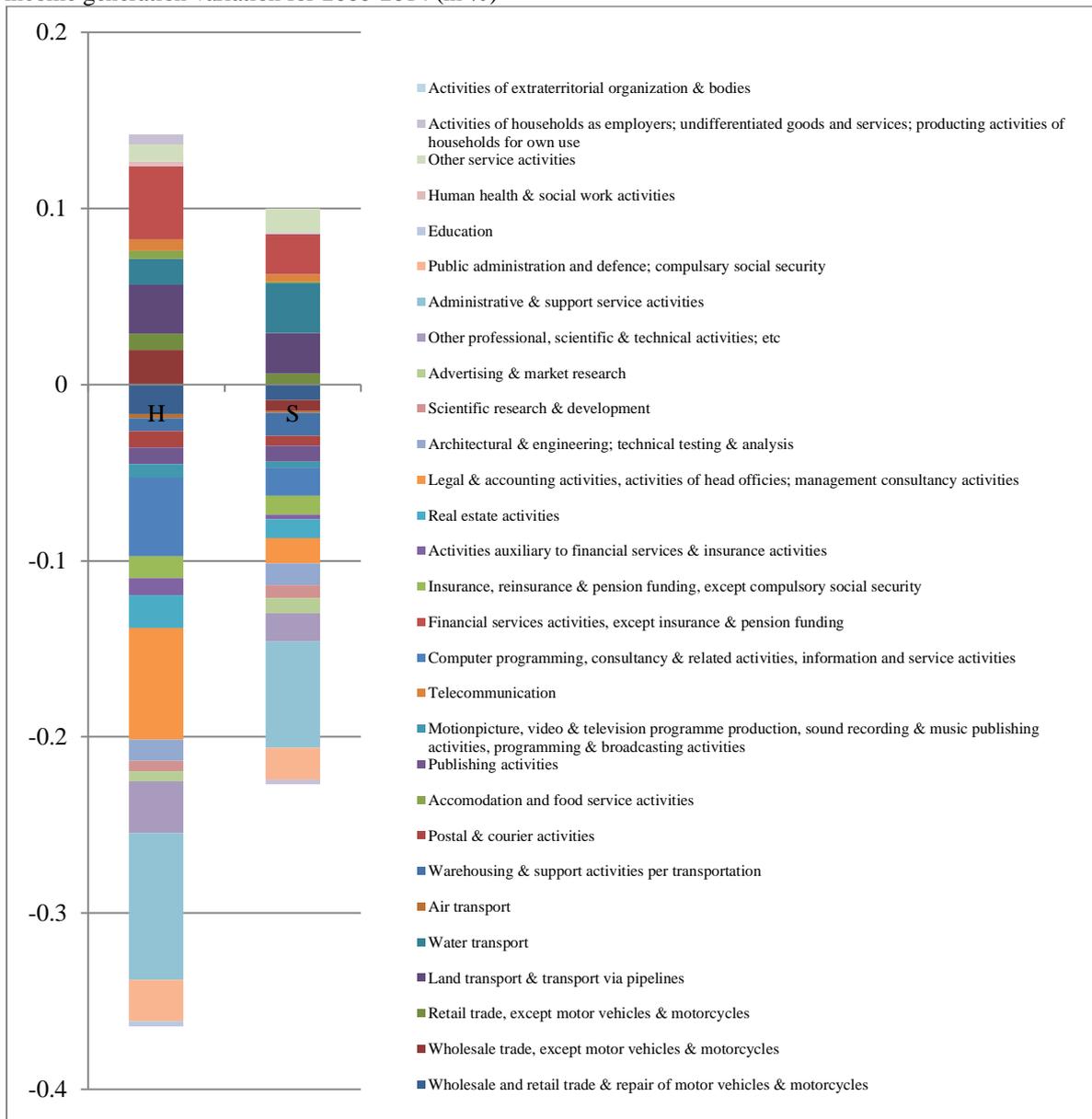
Source: Own elaboration

**Figure C.6:** Global contribution of the economic sectors via the different factors to the income generation variation for 2000 to 2014 (with fd=V&S) (in %)



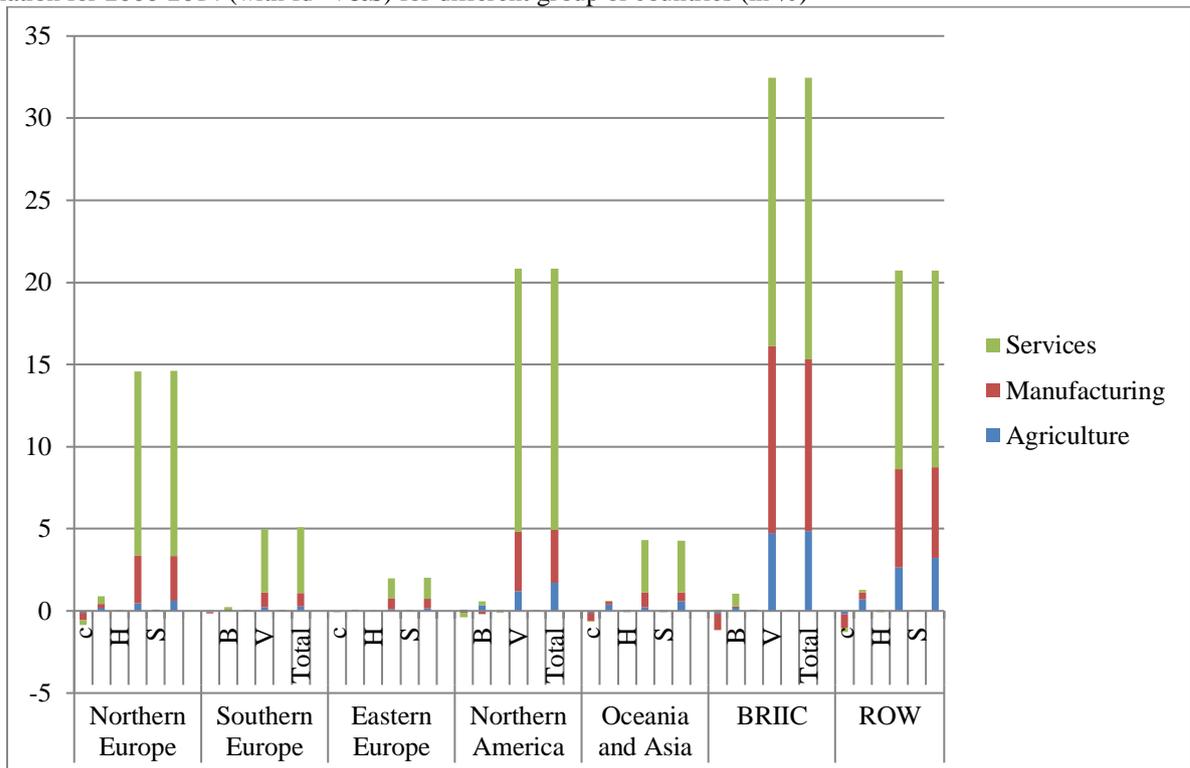
Notes: c=value added coefficient effect; B=technological effect; H=the structure of intermediate trade effect; V= the volumes of final demand effect; S=the structure of final trade effect; Total=the total effect  
 Source: Own elaboration

**Figure C.7:** Global contribution of the different services sectors via intermediate and final trade structure to the income generation variation for 2000-2014 (in %)



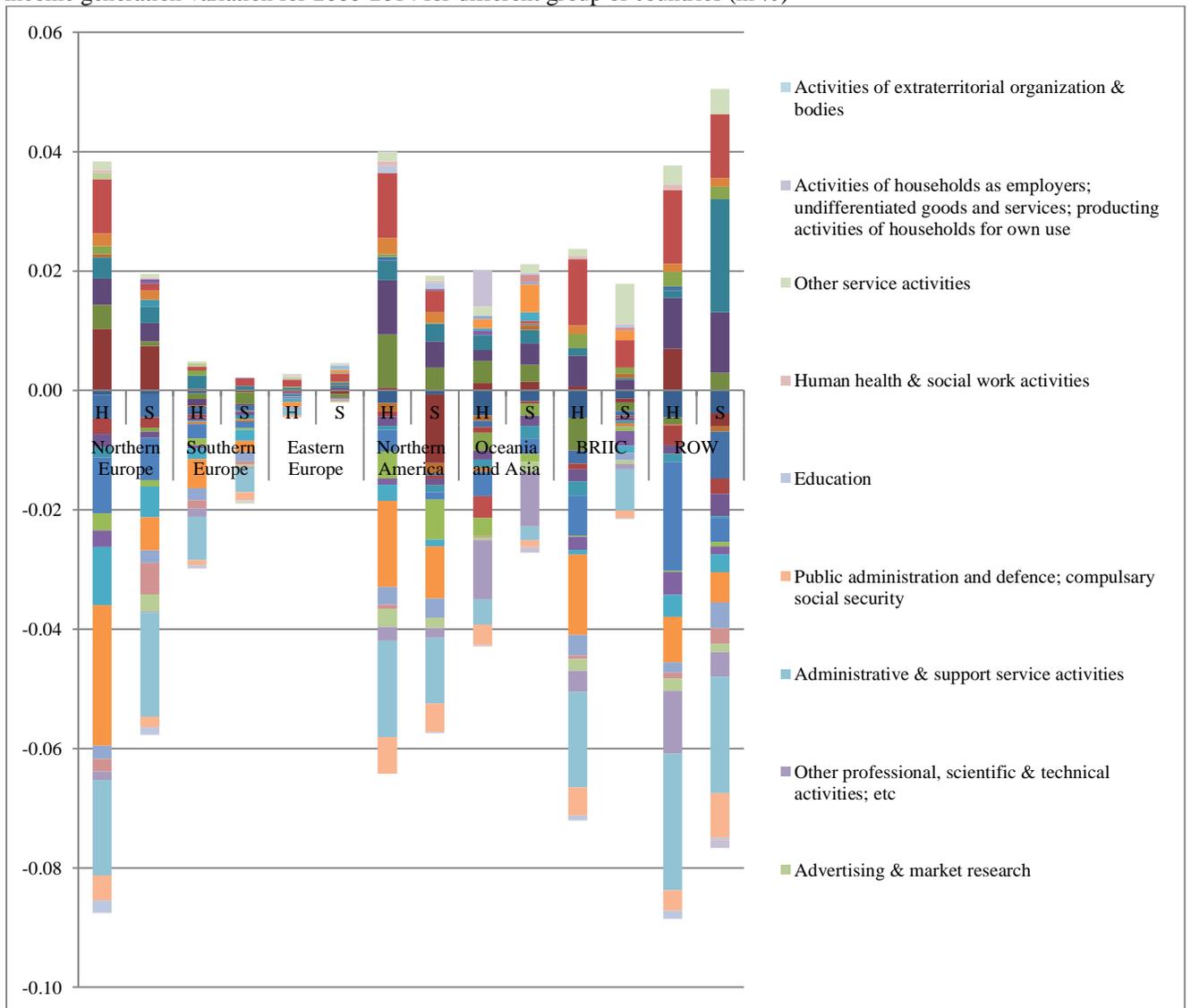
Source: Own elaboration

**Figure C.8:** Global contribution of the economic sectors via the different factors to the income generation variation for 2000-2014 (with fd=V&S) for different group of countries (in %)



Source: Own elaboration

**Figure C.9:** Global contribution of the different services sectors via intermediate and final trade structure to the income generation variation for 2000-2014 for different group of countries (in %)



Source: Own elaboration