LIBERALIZING GLOBAL TRADE IN MODE 5 SERVICES: HOW MUCH IS IT WORTH?

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ABSTRACT

The growing role of services inputs in manufacturing exports ("services in boxes") has led to a proposal for a new modality of exporting services (mode 5 services) beyond the four modes of supply in the GATS. For the vast majority of WTO members the significance of mode 5 services is considerable, both in exports and imports. However unlike traditional GATS services trade, mode 5 services "in boxes" pay tariffs.

This paper estimates that the global GDP gains from liberalizing mode 5 services at multilateral level could reach up to €300 billion by 2025 and world trade could increase by over €500 billion. The paper also examines the interplay between mode 5 services trade and the growing importance of future technological developments (e.g. software, digitalisation, the Internet of Things).

Our preliminary set of results shows that a Mode 5 Services Initiative is important not only because of the positive impact it would have on global trade flows but also because it would facilitate trade-led technological progress in all regions of the world.

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1. Mode 5 services: definition and importance

Services inputs (like engineering, design, banking, software and logistics) play an increasingly important role in global manufacturing as a direct contributor to the value-added incorporated in manufacturing products.

Cross-border trade in services has been traditionally defined as services provided internationally. The different forms of supply envisaged in the WTO General Agreement on Trade in Services (GATS) and adopted widely as part of hundreds of bilateral free trade agreements (FTAs) are referred to as modes:

- Mode 1- cross-border services trade (e.g. online transactions)
- Mode 2 - customers purchase services while abroad (e.g. tourism)
- Mode 3 - a services company sets up a commercial presence abroad
- Mode 4 - a worker crosses the border temporarily to provide a service

In recent years however, policy makers and academics alike have recognised that there are other forms of services supply that are becoming increasingly important in international trade but are not covered by the four traditional modes of supply. These are the services inputs that make up a part of manufactured goods and the growing importance of these services inputs has been referred to as the "*servicification*" of manufacturing.

For instance, a considerable amount of services are used to add value during the production process of a good (e.g. R&D, engineering, design, energy) and the value of these inputs is ultimately treated as a good under the GATT and faces a tariff. When services inputs are incorporated and traded internationally as part of an exported good, such services exports are not covered by the GATS four traditional modes mentioned above. In line with the existing GATS terminology, this new mode of supply has been labelled *mode 5 services*.

As indicated in a series of papers (see Cernat and Kutlina-Dimitrova, 2014, Cernat and Mavroidis, 2014, Cernat and Sousa, 2015), mode 5 services have become an important feature of manufacturing exports and are bound to grow in importance in the future. Mode 5 services can be simply defined as the services content embodied in goods exports. Typical mode 5 services include, *inter alia*, design, engineering and software that are incorporated and traded as part of manufactured products.

Spurred by global supply chains and technological progress, the role of mode 5 services inputs as part of manufacturing exports has increased considerably in recent years, notably for a number of industrial sectors such as motor vehicles, electronics, but also many other more traditional sectors, such as processed food and textiles. The WTO-TiVA database shows that between 1995 and 2009, for instance, the share of embedded services as a percentage of total manufactured exports has witnessed double digit growth, with a diverse set of countries such as Finland, United States, Turkey, Poland, and China witnessing the largest increases in their share of embedded services. For a large majority of countries, the share of embedded services represents around one third of the total value of their manufactured exports, with many OECD countries (such as

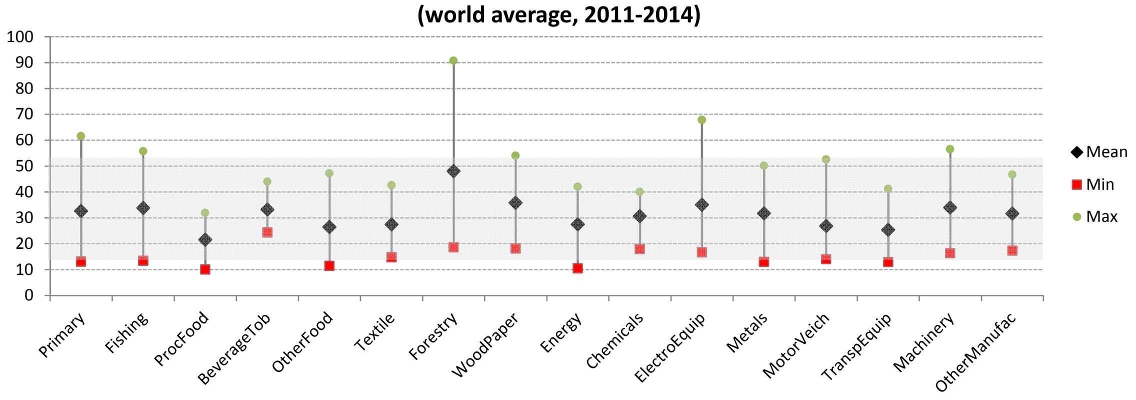
France, Germany, Belgium, Italy, and Spain) having among the highest shares of embedded services in their manufactured exports in 2009.

Several authors have suggested that service inputs affect firms' export capabilities positively and that buying-in more services is linked to higher firm-level export intensity (Lodefalk 2014) as well as to total factor productivity growth, especially in the high-skilled intensive industries (Wolfmayr 2008). Conceptually, the coverage of mode 5 services as used and further modelled in this paper reflects production services which are an inseparable part of the production process of a manufacturing good, *before* the good enters the importing country. Consequently, mode 5 represents a subset of *servicification* rather than *servicification* as a whole.

For the vast majority of WTO members, the significance of mode 5 is considerable across all sectors.

As an example, in order to produce a car there is a need for engineering, consulting and design services as well as electricity and logistics services in order to operate the car factory and to purchase necessary inputs. These are the services which form part of the value of the good *before* it is exported. Another simple rule of thumb to think about mode 5 services is through the lens of the GATT rules that are currently applicable to embedded services in merchandise trade: if the value-added of a service element is included in the value of a product that would be subject to customs duties, then that service can be considered a mode 5 service.[2] For the vast majority of WTO members, the significance of mode 5 is considerable across all sectors, ranging from 20% to 47% (Figure 1).

Figure 1 - Services intermediates share on output, in % by sector (world average, 2011-2014)



Source: GTAP database

[2] As mentioned, this is a simple, conceptual rule of thumb since in reality the specific customs valuation rules and dutiable treatment of products is more complex, as the discussion in subsequent sections will show.

All countries and all sectors would have the potential to benefit from liberalisation of mode 5 services in an international agreement. Mode 5 services represent not only a growing share of global trade in goods but also an important economic activity that support tens of millions of jobs worldwide. For instance, Cernat and Sousa (2016) estimated that over 8 million jobs in Europe (1 out of 4 jobs supported by trade) are actually mode 5 services jobs.

2. Technological progress and the growing importance of mode 5 – some case studies

Several mode 5 services (such as product design, R&D, engineering and IT services) are high-value added and intrinsically linked to technology. Their importance for securing a competitive advantage in manufacturing trade and especially in the context of global production networks is indisputable not just for advanced manufacturing but also for more traditional sectors, including primary sectors like agriculture or mining and processed food.

The importance of mode 5 services is paramount in the automotive sector. The car industry has been at the forefront of the global supply chain revolution, and this was noticed by policy makers early on. One clear illustration is offered by Robert Reich, a former US Labour Secretary, with his Pontiac example:

> When an American buys a Pontiac Le Mans from General Motors, for example, he or she engages unwittingly in an international transaction. Of the $20,000 paid to GM, about $6,000 goes to South Korea for routine labor and assembly operations, $3,500 to Japan for advanced components (engines, transaxles, and electronics), $1,500 to West Germany for styling and design engineering, $8,000 to Taiwan, Singapore and Japan for small components, $500 to Britain for advertising and marketing services and about $100 to Ireland and Barbados for data processing. (Reich 1991: 113)

While disentangling the value of mode 5 services embodied in the GM Pontiac Le Mans is not straightforward, it was clearly much lower than the value of mode 5 services we see in today's cars. Both statistical data and anecdotal evidence points to the growing share of mode 5 services (notably software) in today's cars.

In 2010, the Chevy Volt model (another GM brand) was dubbed one of the most software-intensive manufactured products on earth, with 10 million lines of software codes and the value of its software and electronic components amounting to around 40% of the total value of the car, compared to some 5% in 1980s (Dignan, 2010). Everything from the Volt's usage of the electric battery to engine controls, powertrain and motion sensors, plus plenty of other features, all depended on software. Nowadays, just a few years later, Volt is part of a long history of automotive progress.

Today the headlines are made by Tesla, a newcomer in the automotive industry, which has recently surpassed Ford and GM to become the most valuable US automaker despite having a tiny market share in the US market compared to its competitors. Industry analysts claim that one of the secrets for Tesla's ascent lies in the value of its software and the synergies the company builds between traditional automotive engineering and the new embedded software-driven technological developments (Hull, 2016). Wall Street and business analysts alike believe the software of this Silicon Valley company will give it an upper hand against traditional companies. Software will have an even more critical role if (or rather when) self-driving cars become a reality.

But mode 5 services do not make headlines just in the automotive industry. Take Caterpillar and the Internet of Things (IoT), for instance. In the case of Caterpillar, it is actually the internet of big, yellow things. Running earth-moving machines in remote, harsh environments is costly if such equipment breaks down often and in unpredictable ways, making the repair process long and difficult. By introducing remote sensors and IoT technology in its machines and by applying predictive software analytics, Caterpillar has managed to reduce the typical cost of 900 hours of downtime and $650,000 in repair costs to less than 24 hours and only $12,000 (Financial Times, 2016).

The importance of mode 5 services for securing competitive advantages in many sectors (including primary activities and agriculture) is indisputable.

Just like mining, traditional agriculture is also set to increase its mode 5 services content, notably in terms of digital technologies. Galicia is famous, among other things, for its high quality Rias Baixas white Albariño wines. A new "smart viticulture" project in Galicia uses sensors to measure temperature, ambient humidity, soil moisture and leaf wetness, in real time. This "internet of wine" project launched in 2012 has quickly proven to be a success. The region's wine growers were able to reduce phytosanitary treatments such as fertilizers and fungicides by more than 20 percent, and improve productivity by 15 percent, a welcome outcome on both counts. It has made the wineries more profitable, but also more eco-friendly (Martinez, 2014).

3. The economic impact of a multilateral initiative on mode 5: CGE estimates

3.1 Computable General Equilibrium

To evaluate the possible impact of a multilateral agreement on mode 5 liberalization, we have used a Computable General Equilibrium (CGE) model. The CGE framework builds on general equilibrium theory and rests on consistent microeconomic foundations in which intersectoral linkages, resource constraints (for instance, fixed employment) and policy distortions are the main focus. The main advantages of the CGE approach are its solid micro-theoretical underpinning and its economy-wide scope, as well as its complete and consistent coverage of all bilateral trade flows. Furthermore, changes in welfare can be traced back to the different sectors by performing a welfare decomposition exercise to identify what is generating the gains and losses. Hence a CGE model is an appropriate tool when the policy changes being analysed simultaneously affect many countries and many sectors and have effects on terms-of-trade, factor prices and income.

GTAP is a perfectly competitive comparative static CGE framework (Hertel, 1997). The structure of demand and supply in GTAP, which is homogeneous across regions and products, is built upon the Social Accounting Matrices of individual countries and regions, while its parameters are mostly drawn from the literature.

The GTAP model assumes the presence of representative consumers and producers together with a government sector, and all incomes are assumed to accrue to a single “regional” household. Therefore, all distributional aspects are overlooked, and all consumers are assumed to purchase all goods. By the same token, government costs and revenues do not need to balance, as it is assumed that any discrepancy accrues directly to the households (i.e. the single “regional” household). Government’s consumption behaviour is endogenous, while policies are exogenous (Hertel, 1997).

In the GTAP model, the substitutability among primary factors and with intermediate consumption is modelled in GTAP through a set of nested Constant Elasticity of Substitution systems, while the production of final goods is aggregated through a fixed coefficient function of the Leontief type. On the demand side the representative agent allocates income among savings, government and private consumption through a Cobb-Douglas utility function, while the allocation within different private goods is modelled through a Constant Difference of Elasticity demand system. Bilateral trade flows are modelled through product differentiation on the demand side, with the assumption of imperfect substitutability between similar goods produced in different countries and regions (Armington, 1969). Transaction costs are also accounted for in the model, as transport services are explicitly considered among the activities in the economy.

The most recent available GTAP database version – known as version 9.2 – includes data on up to a maximum of 141 regions and countries, 57 industries and 8 endowments, and has 2011 as a base period. In general, there are two groups of data which are of particular relevance for global models: those on border protection, and those on bilateral trade flows. The GTAP database is built, for imports and exports flows, from the COMTRADE data, supplied by the United Nations Statistical Office, through an ad hoc reconciliation procedure based on a reliability indicator of the information supplied by each importing and exporting country. Tariffs data is retrieved from the MacMap database (http://www.macmap.org/), while data on domestic support in agriculture is based on the OECD Producer Support Estimates (PSE). Export subsidies are directly derived from countries’ notifications to the WTO.

The time horizon we have used is 2011 – 2025. The “*business as usual*” baseline was built by shocking the macro variables, GDP, population and labour supply. The baseline projections are based on the latest available data from the IMF, for GDP, from the ILO and CEPII for population trends and labour supply. Further, all the policy changes that could be relevant for the analysis, (like recent FTA) are also included in the baseline[3]. The geographical and sectoral aggregation is shown in Table 1.

Table 1 - Geographical and sectoral aggregation

Countries/regions	*Sectors*	*Factors*
EU28	Primary	Land
EU_neighb	Fishing	Natural resources
EFTA	RawMilk	Capital
Turkey	ProcFood	Skilled labour
Russia	BeverageTob	Unskilled labour
Australia	OtherFood	
NewZealand	Textile	
USA	Forestry	
Canada	WoodPaper	
Brazil	Energy	
Mexico	Chemicals	
China	ElectroEquip	
India	Metals	
Japan	MotorVeich	
Korea	TranspEquip	
ASEAN	Machinery	
AmericaSouth	OtherManufac	
LDC	Transport	
RestofWorld	Communicat	
	Trade	
	Finance	
	Business	
	Construction	
	OtherSer	
	PubliService	

Due to the relevance of capital in the production of services, for the specific purpose of this work we have used the GTAP-Dyn model. This model extends the comparative static framework of the standard GTAP model developed by Hertel (1997) to a dynamic framework by incorporating international capital mobility and capital accumulation. The dynamic GTAP model allows

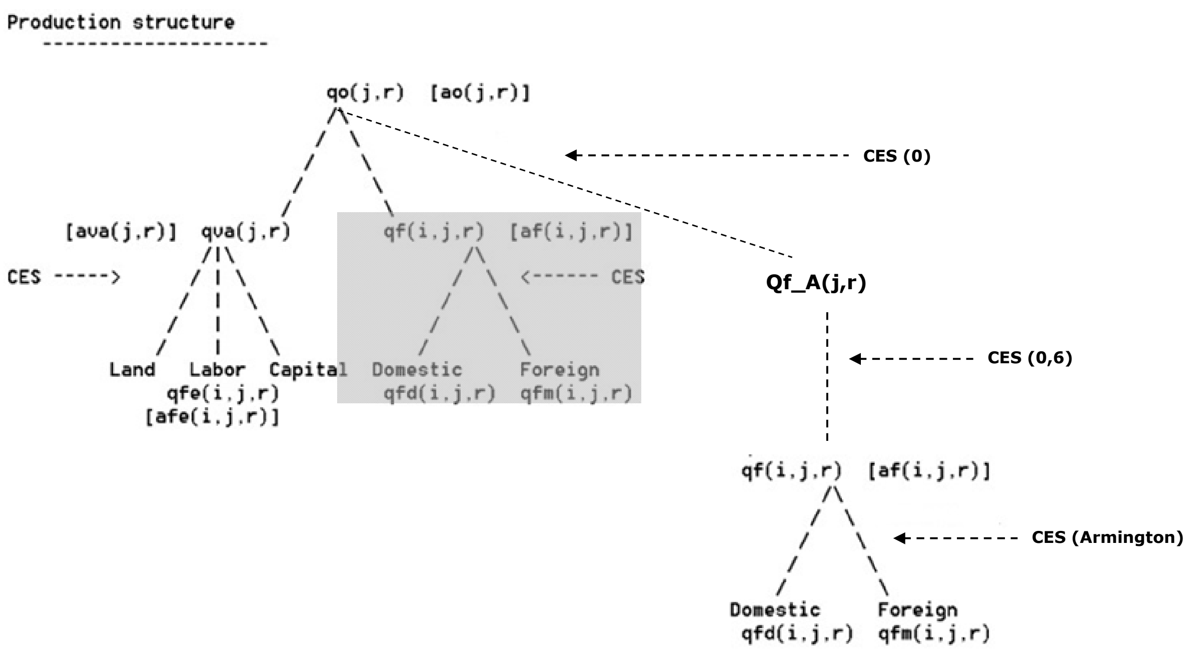
[3] The WTO Information Technology Agreement (ITA) has recently been updated, enlarging the set of products involved. However, it refers only to a very limited set of services, most notably software. However, we didn't include this update in the baseline.

international capital mobility and capital accumulation, while preserving all the features of the standard GTAP, such as constant returns to production technology, perfectly competitive markets, and product differentiation by countries of origin, in keeping with the Armington framework, which assumes that domestic and imported goods are not perfectly substitutes. The dynamic framework also takes into account international investment. By incorporating international capital mobility and ownership, it captures important FTA effects on investment and wealth that are missed by a static model (Ianchovichina and McDougall, 2000). In the dynamic GTAP model, each of the regions is endowed with fixed physical capital stock owned by domestic firms. The physical capital is accumulated over time with new investment. The dynamics are driven by net investment, which is sourced from regional households' savings. The savings in one region are invested directly in domestic firms and indirectly in foreign firms, which are in turn reinvested in all regions. The dynamics arising from positive savings in one region are related to the dynamics from the net investment in other regions. Overall, at global level, it must hold that all the savings across regions are completely invested in home and overseas markets. To sum up, dynamics of investment and capital accumulation and also for saving and wealth accumulation are key features distinguishing GTAP-Dyn from the static version of model.

3.2. Model extension and scenarios

We made some adjustments to the standard model in order to take into account the specific characteristics of mode 5 trade.

In the standard GTAP framework the production function is represented by a CES, nested as showed in the picture below:



However, the elasticity of intermediate input substitution is usually set to 0, i.e. no substitution is allowed in the production intermediates mix. Clearly, for the purpose of our analysis it becomes a limit. We depart from the standard framework of GTAP model by introducing a further nest for the intermediate bundle, with positive value for the elasticity of substitution among intermediates, (Corong et al, 2017). Starting from the assumption used in the Mirage model (http://www.cepii.fr/anglaisgraph/models/mirage.htm), we applied a uniform value of 0.6.

Similarly, in the standard framework of GTAP, the potential impact on labour productivity given by a trade increase is not captured, i.e. labour productivity is exogenously fixed. This rigidity, together with the fixed employment assumption, could generate an overestimation of the impact on the rate of returns for labour. Further, it is not consistent with the idea that higher real wages represent an incentive to invest in productivity, i.e. equality of observed growth rates of real wages and labour productivity is a condition of long run equilibrium. In line with Hellwig and Irmen (2001), the long run average growth rate of labour productivity in the economy must equal the long run average growth rate of real wages. For our analysis this matters due to the relevance of labour in supplying services and to the potential benefit in increasing labour skills thanks to trade.

We changed the model structure to include endogenous labour productivity following the idea that wages and productivity are correlated (Hellwig and Irmen, 2001; Ciuriak and Xiao, 2016). We code this by introducing endogenous productivity, for skilled and unskilled labour, with a coefficient set at 0.3, according to the literature, which links real wages to labour productivity.

To design our policy scenarios, we started by examining the status quo. The WTO Customs Valuation Agreement (CVA) already covers the type of services conceptualised under mode 5. Article 8(1)(b)iv of the WTO CVA allows for duty free importation of the value of certain mode 5 services (engineering, development, artwork and design services), provided these services originate in the country of importation. In other words, if the above mentioned services categories are exported under the traditional GATS modes from one country, and re-imported as part of a product into the same country, the WTO customs valuation rules allow for a duty-free preferential treatment of own mode 5 services.

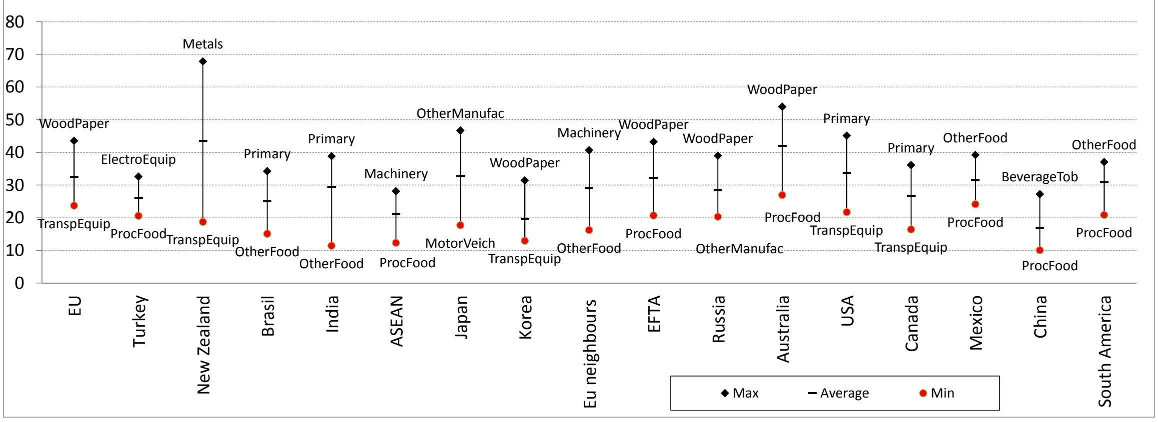
Many mode 5 services are intrinsically linked to technology and innovation and therefore IPR-intensive activities.

In a more general sense, given their nature and position in the supply chain, many mode 5 services are intrinsically linked to technology and innovation and therefore are essential ingredients that can strongly influence the export competitiveness of the products in which they are embodied. For countries all over the world this is significant, given the prominence of IPR-intensive manufacturing exports in the global economy. In the US, for instance, 38% of its GDP is IPR-intensive. For the EU, this kind of IPR intensive services are also crucial, amounting to 42% of EU GDP (USPTO, 2016). The digital revolution best exemplified by the "*internet of things*" and the ability of various objects and products to digitally communicate will increase the technological intensity and R&D content of existing goods, and thus increase the share and importance of mode 5 in world trade.

To simulate the possible impact of a mode 5 initiative we used two scenarios:

In the first one, a tariff cut is introduced between 2022 and 2024 according to the level of services input as an intermediate share in manufacturing goods. Each country receives a cut in tariffs, on a multilateral basis, on its exports according to the services embodied in the goods production. We refer to the services content as the value of services embodied in a physical good which could be exempted from paying tariffs. In other words, if a good is taxed at the border by "*% ad valorem tariffs*", a cut by "*% share*" of services content is applied[4]. Figure 2 shows these shares, which are the ones applied in the simulations. It is worth to know that some sectors, like wood and paper, appear to be often mode 5 intensive. This is explained by the relatively low unit value and the high importance of some services used as inputs. For instance, according to the WIOD database, the paper sector uses many intermediate services inputs (e.g. packaging, advertising, design, legal and translation services).

Figure 2 - Level of tariff cuts, based on the mode 5 services share, by country (%, 2014)



Source: our elaboration on GTAP database.

Following Hertel et al. (2001), we use a technical coefficient as proxy of unobserved trade costs. Changes in its value capture the impact of trade policy on the price of imports from a particular exporter. Thus, a decrease in unobserved costs ensures a fall in the effective domestic price of good *i* exported from country A to country B. We run a mode 5 tariffs cut and we compute the average increase of trade for goods. Then we use the changed trade flows matrix, following the approach used in tariff index theory developed by the Anderson and Neary (2005), to determine a matrix of such technical coefficients, differentiated by sectors and countries. These are equivalent to the original data in terms of the macroeconomics variables of interest, thus unequivocal in their

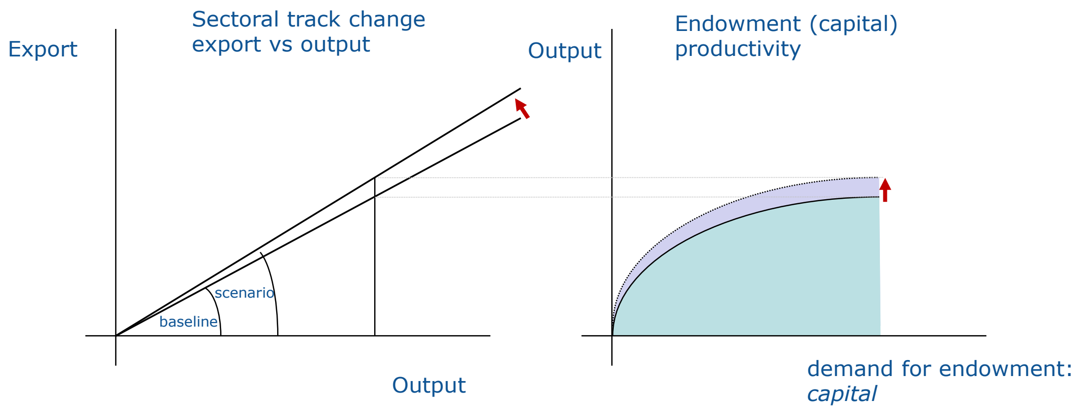
[4] In the real world the reduction is not applied to the tariff but on the value which the tariff is applied. However, working on tariff cuts according to the services share is an acceptable proxy.

interpretation, internationally and inter-temporally comparable. We use this matrix as shocks, in both of our scenarios.

In the second scenario, tariffs are cut like in the first one, but a mechanism for productivity is also included. According to the literature (see for example, Antimiani and Costantini, 2013; Melitz, 2016; Wolfmayr, 2008), trade can boost productivity. Then, according to this linkage, we introduced a variable for productivity in the capital intermediate supply equation.

The productivity is then linked to the change in trade openness, i.e. the change in exports versus output at a sectoral level in each country/region (figure 3). This mechanism allows the model to reproduce knowledge transfer via trade mechanism like the one described in the literature (Grossman and Helpman, 1990; Melitz, 2016). In other words, trade competiveness, technology transfer and capital productivity are influenced by trade policy.

Figure 3 – Endogenous capital knowledge by trade



Source: authors' elaboration.

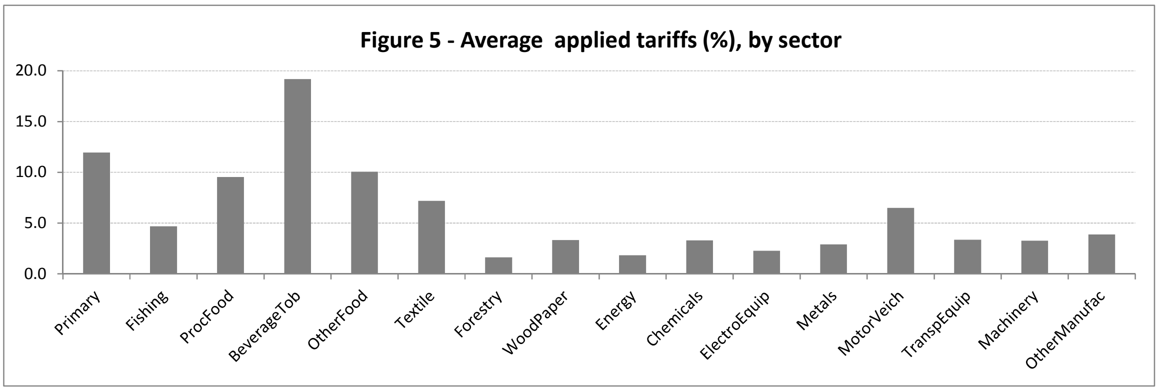
Then, once a sector increases exports more than output (i.e. it increases its trade intensity) a technological shift is possible. As for the elasticity of transmission, we used the estimates by Melitz (2016), where manufacturing productivity in response to growth in trade is slightly over 1 percent per year.

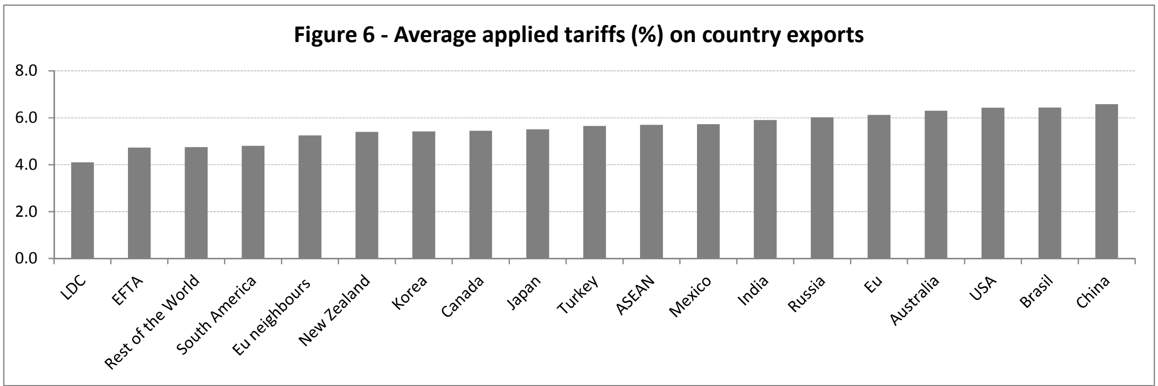
In figure 4, the two scenarios are summarized:

Figure 4 - Scenarios

Scenario 1	Scenario 2
Cuts on tariffs (linked to service's content shares by country) and trade facilitation for services	Scenario 1 + Endogenous capital knowledge

Finally, since the results generated by our model rely directly on the current tariff landscape (taken from the MacMap database), it's worth noting the tariffs paid by sector and by country. A quick look at figures 5 and 6 provides a helpful overview of both the average tariff applied to sectors and to countries.





Source: our elaboration on GTAP database.

It is worth noting that, as with any new trade initiative (be it multilateral, plurilateral, or bilateral) there are certain implementation costs associated with new rules. Expanding the current WTO mode 5 provisions contained in the Customs Valuation Agreement may require some companies to adapt their accounting practices to be able to benefit from these new opportunities. Unfortunately, it is difficult to assess and implement in a CGE model the implementation costs of a mode 5 initiative. Hence, neglecting the implementation costs leads to an overestimation of the economic benefits stemming from a multilateral mode 5 initiative. On the other hand, our results assume that all existing FTAs work perfectly and have 100% preference utilisation rates. In other words, if there is an FTA between country A and B, we assume there is no mode 5 tariff reduction possible since bilateral trade between countries A and B is already duty free. In reality, however, the use of FTA preferences is not perfect.[5] Despite the existence of an FTA, some exports are still

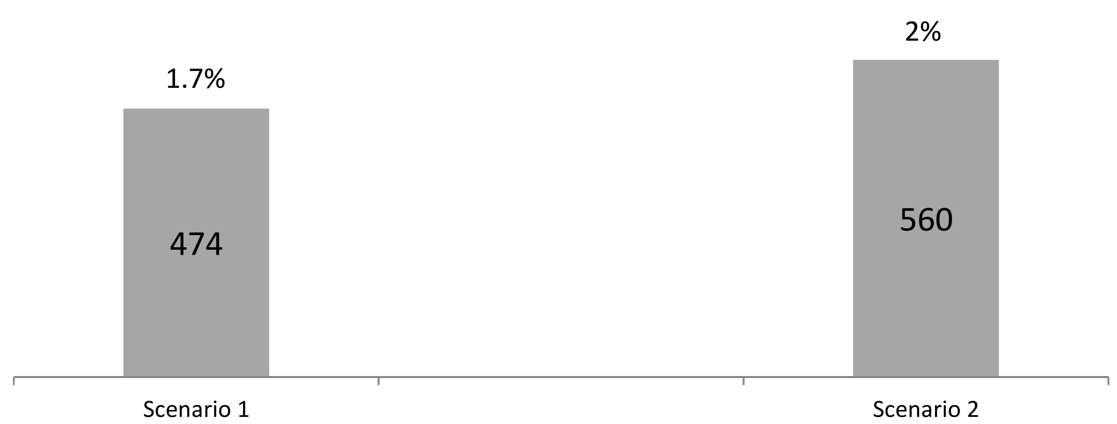
[5] Under the EU-Korea FTA, in the fourth year of its implementation, the overall EU preference utilization rate of EU exports to the Korean market was 65%. In other words, 35% of EU exports to Korea continued to pay full MFN tariffs, despite being eligible for duty free treatment. At EU Member State level, the use of preferences fluctuated between 6% and 91% (European Commission, 2016).

subject to full MFN tariffs. Even when preference utilisation rates are high, they may vary across partner countries or sectors and in such cases dutiable products still pay full MFN duties despite the existence of an FTA. Since we do not account for these imperfect utilisation rates in existing FTAs, our mode 5 results underestimate the full economic potential of such a multilateral initiative.

4. Results

The CGE results show that world trade could increase by 1,7% in Scenario 1 and roughly 2% in scenario 2 (figure 7).

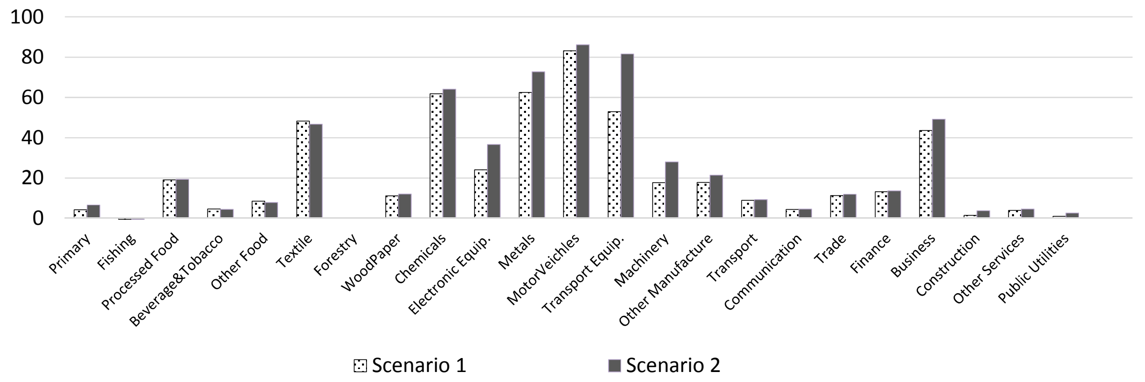
Figure 7 - Change in global export ($ billion and %, 2025)



Source: our elaboration on RunDynam results.

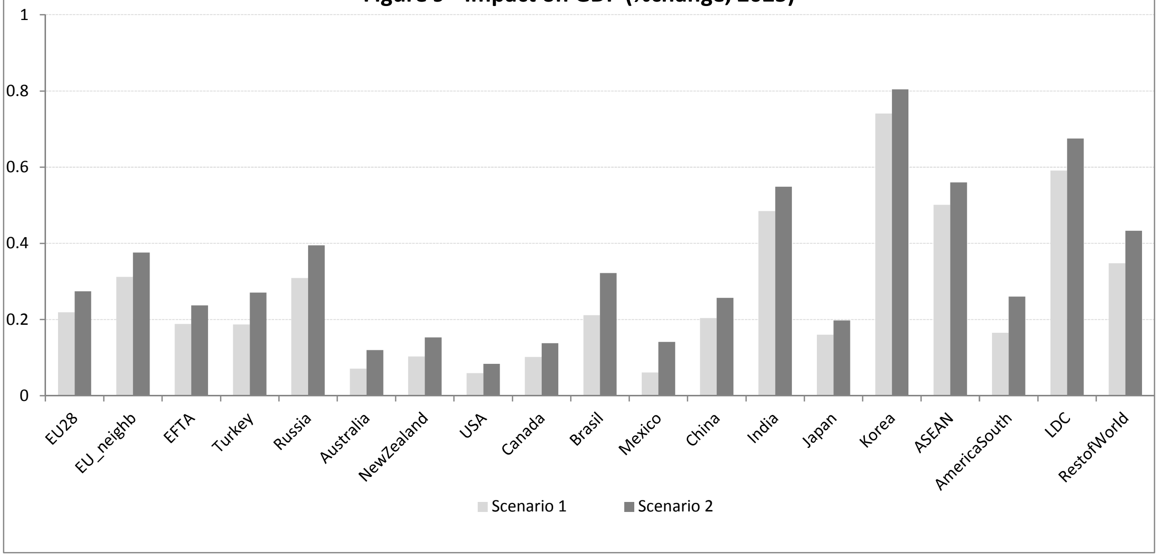
As shown in figure 8, all sectors experience an increase in trade flows. However, manufacturing goods are the ones increasing the most, together with business service. In both scenarios, the impact on GDP is positive for all countries (figure 9). However, it is worth noting that developing countries and the Asian region would benefit (in percentage terms) more from the liberalisation of mode 5 services than the others. Figure 9 also shows that, while all countries gain from a trade increase, developing countries could further benefit from trade-boosted increased productivity (scenario 2).

Figure 8 - Change in world exports of goods and services ($ billion, 2025)



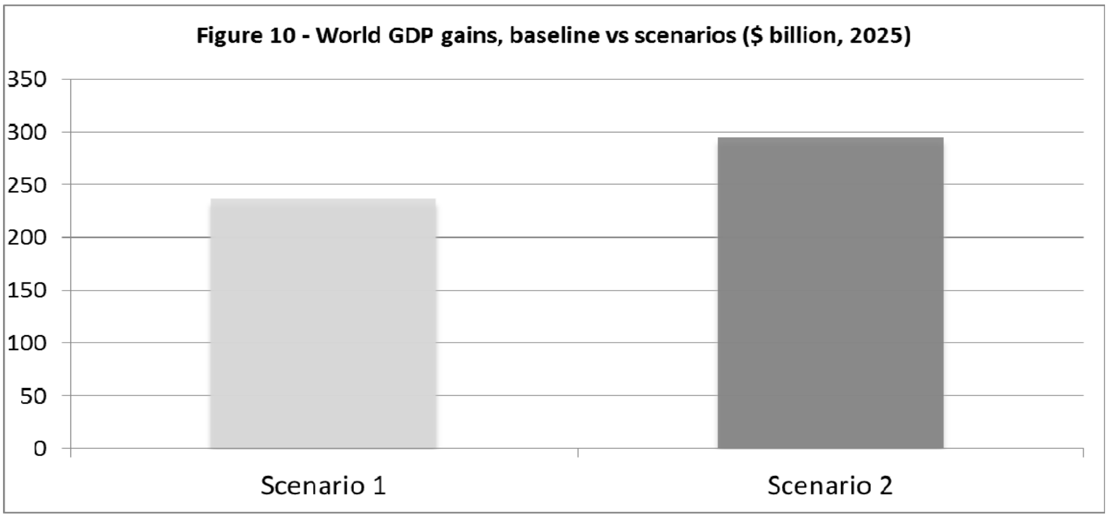
Source: our elaboration on RunDynam results.

Figure 9 - Impact on GDP (%change, 2025)



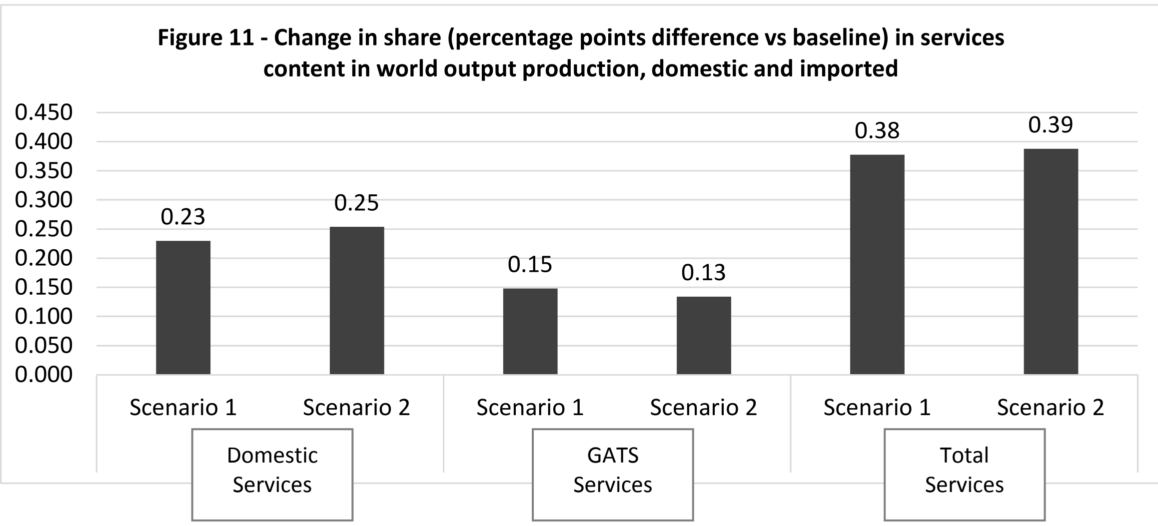
Source: our elaboration on RunDynam results.

In absolute terms, world GDP could gain between $240 and $300 billion, with a gradual increase during the implementation period (figure 10).



Source: our elaboration on RunDynam results.

Another interesting result of the analysis comes from linking services trade and the production function. Figure 11 shows how the mode 5 scenarios could stimulate further servicification, with an increase in the services share in goods production as well as an increase in services trade flows. A possible multilateral agreement on mode 5 could increase domestic output in services, parallel to a strengthening of global services trade under GATS modes. In other words, trade policy could boost both domestic production of services as well as services trade by increasing the economic incentive to servicification.



Source: our elaboration on RunDynam results.

5. Thinking ahead

This analysis leaves little doubt that mode 5 has become an important part of cross-border exchanges of services. From a trade policy perspective this leads to a paradox: when traded ‘in boxes’ as part of products, mode 5 services pay duties and are subject to a different set of non-tariff trade barriers compared to the same services when traded under GATS rules. In a sense the current rules applicable to mode 5 services subjecting them to import tariffs act as an "export tax" on services. This is particularly problematic for the case of embedded software that is at the same time a key priority of other EU policies initiatives, like Industry the EU Digital Agenda Industry 4.0. The current tariffs on mode 5 services therefore act de facto as a tax on technological progress.

Current trade rules are suboptimal: instead of facilitating services trade along global supply chains, they may stifle them.

However, this is a reality that has gone largely under the radar of rulemaking. Few trade experts know that a small subset of embedded mode 5 services are already covered by specific WTO rules and offered a duty free treatment around the world. The WTO Customs Valuation Agreement (CVA) Article 8(1)(b)iv allows for duty free treatment of engineering, development, artwork and design services in determining the value on which duties should be paid, provided these ‘mode 5’ services are actually produced in the country of (re)importation. In other words, the WTO customs valuation rules allow for a duty-free preferential treatment of certain own ‘mode 5’ services exports when re-imported as part of foreign goods.

But, except for these narrowly defined categories, most mode 5 services pay duties when crossing borders as a part of goods. This is the case for software, for example, despite it being a key services input in today's increasingly digital economy.

As we have shown, tariff cuts and regulatory cost reductions for goods have a direct positive impact on services trade. However, such benefits can be reaped only if current rules affecting mode 5 services are made more coherent and in line with global value chains. Products are designed in one country, software is produced in another, and assembly may be carried out in a different continent, with engineering and technological solutions belonging to firms registered in multiple countries. In this process mode 5 services are subject to both GATS and GATT-related rules that are not fully adapted to the way in which design, R&D, software, and other business services are embedded in goods traded internationally.

Current trade rules are suboptimal: instead of facilitating services trade along global supply chains, they may stifle them. The best example that illustrates the inconsistencies of current trade rules when it comes to mode 5 services trade is the fact that the same service (e.g. software) can be traded internationally under GATS (e.g. under mode 1) without paying any customs duties, while a duty rate is applicable if the software is embedded in a car or industrial equipment.

Such inconsistencies could be addressed by refining the existing trade rules, either at the multilateral or bilateral level. The WTO CVA described above is a good example of how the rules can be changed to address these issues. However because software is not included in the list of services that benefit from these rules, the CVA rules are already out of date (at the time of agreement software did not have as prominent a role as it does today). This inconsistency may become more problematic as recent advances in 3D printing, robotics, and the Internet of Things will increase the software intensity and the R&D content of manufacturing, and thus increase the share and importance of mode 5 in world trade.

Trade rules are enshrined in international treaties set to last forever but the rest of the world is more dynamic. Both at the multilateral and the bilateral level, we need to ensure that trade rules will remain up to date with technological changes and business realities. The mode 5 services example provides a good opportunity to further reflect on how GATT and GATS rules operate when it comes to 21st century technology-intensive manufacturing sectors.

The obvious question is then how can we start to address this? For instance, could the existing WTO rules covering mode 5 be extended and included as part of various policy proposals (e.g. services trade facilitation, e-commerce, etc.) in the lead up to the 11th WTO Ministerial? Should mode 5 services feature specifically in plurilateral negotiations, like TISA? Alternatively, can a more ambitious set of coherent mode 5 rules be agreed in a bilateral context as a part of deep and comprehensive FTAs?

The answer is less obvious, as it involves a number of important trade policy considerations, both at multilateral and bilateral level. However, the existing evidence clearly shows that mode 5 services have outgrown by far the narrow trade rules currently governing them.

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