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Amara Zongo

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Amara Zongo. Non-Tariff Barriers in services trade, Foreign Direct Investment and international trade. Economics and Finance. Université de Bordeaux, 2022. English. NNT : 2022BORD0147 . tel-03675215

HAL Id: tel-03675215

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THÈSE PRÉSENTÉE
POUR OBTENIR LE GRADE DE
DOCTEUR
DE L'UNIVERSITÉ DE BORDEAUX

ECOLE DOCTORALE ENTREPRISES, ÉCONOMIE ET SOCIÉTÉ (ED 42)
SPÉCIALITÉ SCIENCES ÉCONOMIQUES

Par **Amara ZONGO**

**Non-Tariff Barriers in Services Trade, Foreign Direct
Investment and International Trade**

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et **Jean-Marie CARDEBAT**, Professeur des Universités

Soutenue le 12 Avril 2022

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Dedication

"To my dad and my brother, in loving memory."

Remerciements

Au terme de cette thèse, je tiens à formuler mes sincères remerciements à mes deux directeurs de thèse, Michel DUPUY et Jean-Marie CARDEBAT pour leur incroyable soutien durant ces cinq dernières années. Leurs conseils, suggestions et les différentes discussions m'ont stimulé et poussé à me passionner pour la recherche. Je les remercie également pour la confiance qu'ils m'ont accordée en acceptant de superviser ce sujet très novateur. Ils m'ont appris à toujours travailler dur et à me dépasser. Cette thèse n'aurait pu aboutir à des publications scientifiques sans leur aide et leurs commentaires.

Je suis très reconnaissant à Charlotte EMLINGER et Fabien CANDAU pour l'honneur qu'ils m'ont fait en rapportant cette thèse, ainsi qu'à José-Antonio MONTEIRO et Jaroslaw MROWIEC pour avoir accepté de faire partie du jury. Je tiens également à remercier les économistes du Département de la Recherche Economique et des Statistiques, ainsi que du Département du Commerce des Services et de l'Investissement de l'OMC. En particulier, mes remerciements vont à José-Antonio MONTEIRO, mon superviseur qui m'a permis de mieux appréhender les principes régissant le commerce international, Eddy BEKKERS qui m'a aidé à mieux comprendre le modèle GTAP pendant mes 6 mois de stage à l'OMC. Mes échanges avec Joscelyn MAGDELEINE ont accru mes connaissances sur le commerce des services.

Mes remerciements vont également à l'équipe de Bordeaux School of Economic (Ex LAREFI), le centre de recherche où j'ai réalisé cette thèse. Je tiens à remercier tout particulièrement Jean-Marie CARDEBAT (Directeur), les enseignants-chercheurs et le personnel administratif (Christel CHAINEAUD et Cyril MESMER), pour leur attention et leur disponibilité, qui ont offert un cadre convivial pour mener à bien cette thèse. Je tiens à remercier Raphaël CHIAPPINI qui, à travers les nombreuses discussions, m'a permis d'améliorer cette thèse.

Je tiens à remercier également mes collègues de Bordeaux School of Economic avec lesquels j'ai bien progressé. Je pense en particulier à Whelsy, Myriam, Mehdi et Olie, mes collègues depuis la première année de thèse, je les remercie pour les longs discours sur la thèse, pour les moments agréables hors cadre universitaire et pour leurs différents soutiens. Je tiens à remercier Safilidin, Doriane et Younes pour leur soutien.

En dehors du cadre universitaire, j'ai eu la chance extraordinaire de pouvoir compter sur le soutien continu de mes parents, de mes frères et sœurs sans qui cette thèse n'aurait pas été possible. J'ai eu le soutien de mes amis de longue date, en particulier Frédéric, Denis, Ozias, Alain, Samuel, Luc. Un grand merci à mon pays le Burkina Faso (au Ministère de l'Enseignement Supérieur) pour m'avoir accordé une bourse doctorale pour mener à bien ce projet de thèse.

Acknowledgments

At the end of this thesis, I would like to formulate my sincere thanks to my two supervisors, Michel DUPUY and Jean-Marie CARDEBAT for their incredible support during these last five years. Their advice, suggestions and the different discussions have stimulated and pushed me to be passionate about research. I also thank them for the trust they have placed in me by accepting to supervise this very innovative topic. They taught me to always work hard and to excel. This thesis could not have been successful with the scientific publications without their help and comments.

I am very grateful to Charlotte EMLINGER and Fabien CANDAU for the honor of reviewing this thesis, as well as to José-Antonio MONTEIRO and Jaroslaw MROWIEC for agreeing to serve on the jury. I would also like to thank the economists of the Economic Research and Statistics Department, as well as the Trade in Services and Investment Department at the WTO. In particular, my thanks go to José-Antonio MONTEIRO, my supervisor who helped me to better understand the principles governing international trade, Eddy BEKKERS who assisted me to better understand the GTAP model during my 6 months internship at the WTO. My exchanges with Joscelyn MAGDELEINE have increased my knowledge on trade in services.

My thanks also go to Bordeaux School of Economic team (Ex LAREFI), the research center where I conducted this thesis. I would like to thank in particular Jean-Marie CARDEBAT (Director), researchers and administrative staff (Christel CHAINEAUD and Cyril MESMER), for their attention and availability, which provided a convivial framework for the successful completion of this thesis. I wish to thank Raphaël CHIAPPINI who, through the numerous discussions, helped me to improve this thesis.

I would like to thank my colleagues of Bordeaux School of Economic with who I have made good progress. I think in particular to Whelsy, Myriam, Mehdi and Olie, my colleagues since the first year of my thesis, I thank them for their long speeches on the thesis, for the nice moments in a non-academic setting and for their different supports. I would like to thank Safilidin, Doriane and Younes for their support.

Outside the university framework, I was extraordinarily lucky to be able to count on the continuous support of my parents, my brothers and sisters without whom this thesis would not have been possible. I had the support of my long-time friends, especially Frédéric, Denis, Ozias, Alain, Samuel. Many thanks to my country Burkina Faso (Ministry of High Education) for granting me a doctoral fellowship to carry out this thesis project.

Résumé

Cette thèse de doctorat étudie les effets des Barrières Non Tarifaires (BNT) au commerce des services sur les échanges commerciaux mondiaux. Elle contribue à l'analyse empirique des effets des restrictions sectorielles au commerce des services sur les échanges commerciaux mondiaux. Dans le premier chapitre, nous examinons empiriquement les impacts des BNT dans les services et la disparité réglementaire (transports, logistiques, distribution, financiers et secteur du business) sur les échanges commerciaux de biens alimentaires entre les pays membres de l'OCDE. Les résultats suggèrent des effets négatifs des restrictions sectorielles sauf dans le secteur de la distribution sur le commerce des biens alimentaires. Cependant, la disparité réglementaire entre les pays a un impact négatif et significatif sur le commerce des produits alimentaires. Cet impact diminue lorsque le pays exportateur est fermé aux prestataires de services. Dans le deuxième chapitre, nous analysons empiriquement les impacts des restrictions dans le secteur des IDE (Investissements Direct à l'Étranger) sur les investissements transfrontaliers entre les pays développés (OCDE) et les pays émergents. Nous concluons que les restrictions dans le secteur des services des IDE sont des obstacles aux investissements transfrontaliers entre pays avancés et émergents. Plus loin, les restrictions dans les services entravent les investissements transfrontaliers entre pays développés et celles dans le secteur primaire, manufacturier et ressources naturelles constituent un frein aux IDE entrants dans les pays émergents. Dans le dernier chapitre, nous étudions à travers un modèle théorique les gains de la libéralisation des services sur le commerce intra-Africain dans le cadre de la Zone de Libre-Echange Continentale Africaine (ZLECA). Les résultats montrent des effets positifs de la libéralisation des services sur la croissance du PIB, du revenu, sur le bien-être et sur le commerce intra-africain plus précisément le commerce de biens manufacturiers et ressources naturelles. L'accord ZLECA crée à la fois des créations et des détournements de commerce, mais le gain en bien-être reste positif et significatif à long terme en Afrique.

Mots clés: Barrières Non Tarifaires (BNT); Commerce des services; Commerce des biens alimentaires; Investissements Directs à l'Étranger (IDE); Zone de Libre-Echange Continentale Africaine (ZLECA).

Abstract

This thesis studies the effects of Non-Tariff Barriers (NTBs) to trade in services on international trade. It contributes to the empirical analysis of the effects of sectoral restrictions in services trade on world trade. In the first chapter, we empirically examine the impacts of NTBs in services and regulatory disparity (transport, logistics, distribution, financial and business) on food trade among OECD countries. The results suggest negative effects of sectoral restrictions except in the distribution sector on trade in food products. However, the regulatory disparity between countries has a significant negative impact on food trade. This impact decreases when the exporter country is closed to service providers. In the second chapter, we empirically analyze the impacts of FDI restrictions on cross-border investment between advanced (OECD) and emerging countries. We conclude that restrictions in the services sector of FDI impede cross-border investment across advanced and emerging countries. Furthermore, restrictions in the services sector hinder cross border investment between advanced countries and restrictions in the primary, manufacturing and natural resources sector hamper inward FDI in emerging countries. In the last chapter, we use a theoretical model to study the gains of services liberalization on intra-African trade in the context of the African Continental Free Trade Area (AfCFTA). The results show positive effects of services liberalization on GDP growth, income, welfare and intra-African trade, particularly trade in manufacturing goods and natural resources. The AfCFTA agreement creates both long-term trade creation and diversion, but the welfare gain is still positive and significant over the long term in Africa.

Keywords: Non-Tariff Barriers (NTMs); Services trade; Food trade; Foreign Direct Investment (FDI); African Continental Free Trade Area (AfCFTA)

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General Introduction

In recent decades, there has been an increase in the use of Non-Tariff Measures (NTMs) while tariff barriers have significantly decreased due to the implementation of many trade agreements (Melo and Nicita, 2018). As a result, NTMs are center stage in trade policy debates. The existing literature on the impacts of NTMs has mainly focused on agricultural and manufacturing goods, excluding the services sector. Several studies have found negative and positive effects of NTMs in the goods sector on trade. For example, Disdier et al. (2008) find a negative impact of sanitary and phytosanitary measures (SPS) and technical barriers to trade (TBT) on agricultural trade. Bao and Qiu (2010) analyze the influence of China's technical barriers on imports. By using the frequency index and coverage ratio to quantify technical barriers to trade, they find that technical barriers reduce trade in agricultural products but increase trade in manufactured goods. Crivelli and Gröschl (2016) find a negative impact of SPS measures on the probability of trade (extensive margin) and a positive impact on the volume of trade in agricultural and food products (intensive margin). The effects of these trade barriers are heterogeneous depending on the sector and the level of development of countries. For example, Fontagné et al. (2005) find that SPS and TBT measures have a positive impact on industrial goods and a negative impact on manufactured goods. Developing countries are the most affected by these measures imposed by importers. Disdier et al. (2008) highlight that exports from developing countries are significantly more affected than those from developed countries. Yet, services are becoming a key determinant of economic growth in both advanced and emerging countries, however, the study of NTMs in services and its effects on economic and social aspects is still in its infancy.

So, what characterizes trade in services and what distinguishes it from goods and commodities trade?

The main characteristic of trade in services is the intangible nature of many transactions. Unlike physical goods, which must cross borders and thus are subject to customs procedures and tariffs, services often involve direct transactions between the consumer and the producer (Konan and Maskus, 2006). Trade in services requires the interaction between the producer and the consumer, unlike goods, where cross-border trade is possible without the consent of the consumer. A key characteristic of most services is the joint production requirement that consumption and production must be simultaneous (Hill, 1997). Services are a key determinant of countries' participation in the global economy, including in global value chains. Indeed, services include a wide range of sectors from communication, distribution, finance,

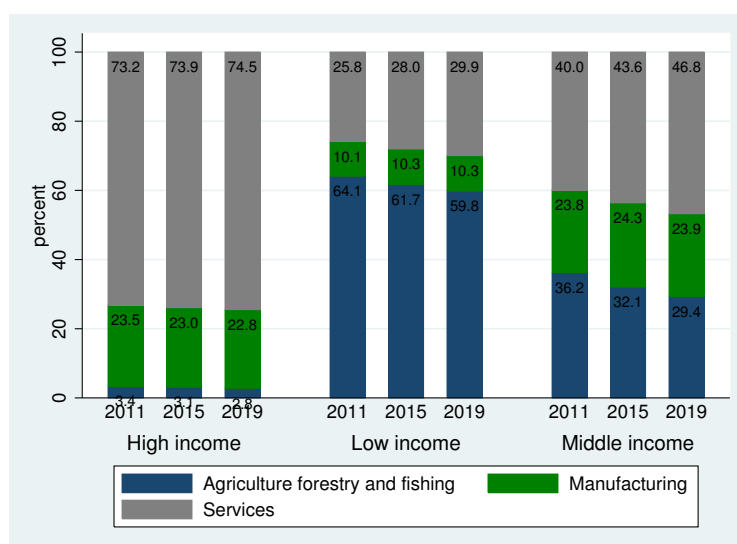
transport, ICT, tourism and environmental services. It contributes to nearly 65% of global GDP in 2019, 50% of GDP in China, 64.17% in Colombia, 72% in the European Union, nearly 70% of GDP in South Africa and 80% in the USA (see Table 1). The employment in the services sector is significant compared to the other activity sector (nearly 50% of total employment in China, 70% in the European Union and nearly 80% in the USA, World Development Indicators data). Employment in services has increased over the past decade, especially in low- and middle-income countries (see Figure 1 and WTO, 2017).

Table 1: Value added by activity in 2019 (% of GDP)

Countries	<i>Agriculture, forestry and fishing</i>	<i>Manufacturing</i>	<i>Services</i>
China	7.42	N/A	53.42
Colombia	7.06	12.06	64.17
European Union	1.77	16.61	72.98
South Africa	2.12	13.22	68.7
USA	0.95	11.34	80.21
World	3.5	14	65

Source: OECD and World Development Indicators databases

Figure 1: Evolution of employment by sectors (% of total employment)

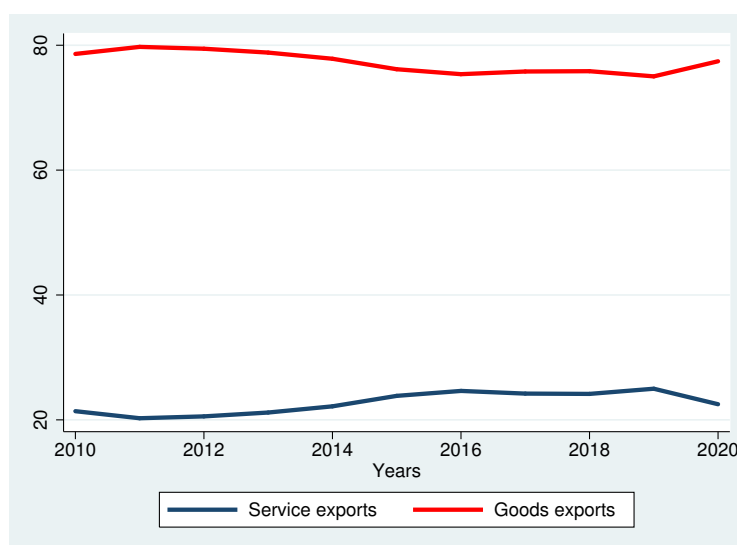


Source: World Development Indicators, World Bank

In terms of trade, services are the most dynamic component of world trade. Figure 2 highlights the evolution of goods and services exports and shows two trends: a growth in services exports relative to goods exports between 2013 and 2019 due to the internet boom and a

decline in services exports relative to goods exports in 2020 caused by the global pandemic crisis (COVID-19). Services play an increasingly large role in the world economy and are very exposed in times of crisis and tension. Based on WTO statistics in 2021, the COVID-19 pandemic led to merchandise trade declining by 8% and trade in commercial services contracting by 21% year-on-year in 2020 (WTO, 2021). These negative effects on services are explained by health measures, including lockdown and travel restrictions, that have affected many services requiring face-to-face interaction.

Figure 2: Share of exports of goods and services of total world exports, 2010-2020



Source: World Development Indicators (WDI), World Bank

Digital services on the other hand have been resilient and increased during the pandemic (According to STRI data on digital). Technological advances and the digitalization of economies have made it easy for services to be exported, making them essential inputs in the production and shipment of goods. In a world economy where more and more commodities are being produced in developing countries, the manufacturing firms themselves have become increasingly service-oriented, partly as a means to remain competitive offering lower costs of production. The intangibility and non-stability of services means that they can be traded internationally in a number of ways, referred to as "modes of supply". The World Trade Organization (WTO) General Agreement on Trade in Services (GATS) classifies trade in services according to four modes of supply:

- Cross-border supply (mode 1), in which services are supplied from the territory of one member (i.e. WTO member) into the territory of any other member, such as through the internet.

- Consumption abroad (mode 2), in which services are provided in the territory of one member to a consumer of any other member, such as tourism.
- Commercial presence (mode 3), in which services are delivered by a supplier of one member through commercial presence in the territory of any other member, such as establishing a controlled affiliate in a foreign country to serve the local market.
- Presence of natural persons (mode 4), in which a supplier of one member provides services through the presence of natural persons in the territory of another member, such as consultants.

Commercial presence in another country (mode 3) is the dominant mode of supply for trading services globally, representing almost 60% of trade in services in 2017 (WTO, 2019). For example, a foreign owned retailer or bank supplies services to local consumers. In 2017 sales through the establishment of foreign-controlled affiliates worldwide were \$7.8 trillion and financial and distribution services together account for around half of this value. It was followed by cross-border supply (mode 1), consumption abroad (mode 2) and presence of individuals in another country (mode 4), which accounted for about 30%, 10% and 3% of total services exports, respectively (WTO, 2019). Cross-border services transactions (mode 1), including through electronic means, totalled \$3.7 trillion in 2017. Cross-border trade is widespread across different services sectors, including transport, professional and business services, distribution services and communications services, as well as computer services and related activities. Table 2 presents the cross-border export of services by category (mode 1). It shows that the transportation sector (land, air, sea, rail) and other business sectors (R&D, legal services, accounting, management consulting, architectural services, etc.) are the most important, accounting for almost 40% of total cross-border services exports worldwide. Exports of financial services represent 10% and telecommunications, computer and information services nearly 10%.

Table 2: Services exports by sector (% of Total), 2015-2020

Sectors	2015	2016	2017	2018	2019	2020
<i>Transport</i>	17.92	16.94	17.08	17.01	16.72	16.65
<i>Other business services</i>	21.75	22.41	22.24	22.21	22.61	26.85
<i>Financial services</i>	9.11	8.9	8.79	8.55	8.32	10.83
<i>Telecommunications, computer and information services</i>	9.57	9.58	9.67	10.41	10.96	14.25

Source: UNCTAD

Services consumed in other countries (mode 2) accounted for \$1.4 trillion, with tourism accounting for more than 60% of the value in 2017 (WTO estimates, 2019). Only \$0.4 trillion are traded worldwide through the temporary movement of workers (mode 4), but this share may vary for individual economies or sectors (WTO, 2019). The financial and distribution sectors are the largest traded services globally due to their importance in world trade. Indeed, wholesalers and retailers have a crucial role in international trade, connecting producers and consumers worldwide, thus ensuring consumer' access to a variety of goods at competitive prices. The financial sector is the backbone of the economy, and one of its key functions is to enable international transactions, facilitating the smooth exchange of goods and services between countries, while managing the risks associated with these flows. The transport services play also a significant role in both world trade in goods and services. They facilitate the delivery of products from production to distribution points, the trade of global value chains, and the movement of people (with a greater impact on the tourism sector). Trade in transport services has grown in recent years due to the rise of low-cost airlines (low barriers to entry into the sector), coupled with the multiplication of direct routes, especially at the regional level. However, transportation service is still a vulnerable sector to macroeconomic shocks. Indeed, "about half of world trade in transport services is driven by trade in goods, including both goods that directly reach consumers and those that are used as inputs in production processes (WTO, 2019). This makes the transport sector vulnerable, as freight shipping rates are volatile and fluctuate with global demand."

Mode 3 of trade in services is made possible by foreign direct investment (FDI). Indeed, FDI determines the mode 3 of services trade. According to the WTO definition of mode 3 of trade in services, the service is provided within a country by a locally-established affiliate, subsidiary or representative office of a foreign-owned and -controlled company (bank, hotel group, construction company, etc.). FDI has significantly increased in recent years which has increased the mode 3 of trade in services. In 2018, inward FDI positions in the EU(27) accounted for nearly 53% of European GDP, almost 15 percentage points higher than before the financial crisis. In the United Kingdom, they accounted for almost 68% in 2018, lower than in 2017 due to the effects of the Brexit (see Table 3). About 40% of total inward FDI in Europe came from United States, the largest investor in Europe before Switzerland, Canada and Japan (WTO, 2019). China (including Hong Kong) is the fifth investor in Europe, with 3.5% all of FDI positions. Focusing on Merger and Acquisition (M&A) flows, which represent the majority of FDI, the amount of cross-border foreign investment has increased in the last years. The value of net cross-border M&As rose 18% to \$816 billion, recovering ground after the 22% fall in 2017 (see Table 4).¹ The increase was driven by large deal sizes, especially in the chemicals industry

¹The value and number of net cross-border M&A activity worldwide is highest in the manufacturing and

and the services sector, while the number of deals actually declined (UNCTAD, 2019).

Table 3: Inward FDI stocks (% of GDP), 2017-2020

Region	2017	2018	2019	2020
United Kingdom	70.66	67.56	72.24	81.43
USA	39.94	35.64	43.68	51.97
OECD	44.13	41	46.41	56.48
EU (27)	59.17	52.87	57.4	75.48

Source: OECD and WDI databases

Table 4: Value and number of net cross-border M&As, by sector and selected industries, 2017-2018

Sector/industry	Value (Billions of US\$)		Growth rate	Number		Growth rate
	2017	2018	(%)	2017	2018	(%)
Total	694	816	18	6967	6821	-2
Primary	24	39	60	550	406	-26
Manufacturing	327	307	-6	1 690	1 600	-5
Services	343	469	37	4727	4 815	2
Top 10 industries in value terms						
Chemicals and chemical products	65	149	129	198	211	7
Business activities	107	112	5	1 817	1 848	2
Financial and insurance activities	59	108	84	617	599	-3
Information and communication	39	90	131	611	612	0.2
Food, beverages and tobacco	88	55	-37	227	205	-10
Transportation and storage	23	47	109	306	269	-12
Electrical and electronic equipment	26	42	65	307	257	-16
Mining, quarrying and petroleum	23	38	70	466	329	-29
Electricity, gas and water	54	38	-30	171	191	12
Trade	12	35	188	486	501	3

Source: UNCTAD, cross-border M&A data

Moreover, the COVID-19 pandemic caused a dramatic drop in global foreign direct investment (FDI) in 2020, bringing FDI flows back to the level seen in 2005. The crisis has had an immense negative impact on the most productive types of investments, namely greenfield investments in industrial and infrastructure projects (UNCTAD, 2021). Global FDI flows dropped by 35% to \$1 trillion, from \$1.5 trillion in 2019. This is almost 20% lower than the level of observed services sectors.

in 2009 after the global financial crisis (UNCTAD, 2021). The decline was heavily skewed toward developed economies, where FDI fell by 58%, partly because of fluctuations caused by corporate transactions and intra-firm financial flows. FDI in developing economies declined by a more moderate 8%, mainly because of resilient flows in Asia (see Table 5). It is therefore important to understand the relationship between FDI and trade in order to analyze FDI correctly:

Is there complementarity between trade and FDI or are they substitutable?

Indeed, if they are complements, trade and FDI should exhibit a positive relationship, and a negative correlation in the case of substitutes (Belke and Domnick, 2021). Foreign investment and trade would be complementary in the case where the production process of multinationals is distributed across countries (vertical FDI), and substitutable for horizontal FDI (commercial presence, thus avoiding trade costs by "tariff jumping", Andrenelli, A. et al., 2019). However, the growth of global value chains (GVCs) through the fragmentation of production has accentuated the interdependencies of trade and FDI. Traditional exports of goods and services as final products to consumers abroad account for only about 30% of total trade in goods and services in today's global economy. Firms organize their production on a global scale through a combination of trade and investment. In reality, about 70% of international trade today involves GVCs, as services, raw materials, parts and components cross borders- often numerous times (OECD's Trade in Value Added (TiVA) database). The two components are complementary, and the COVID-19 crisis highlighted their importance in the globalization of trade.

According to TISMOS (i.e. Trade in Services by Mode of Supply)², trade in services has expanded by 5.4% per year on average since 2005, faster than the 4.6% yearly expansion of trade in goods. However, a disparity in the growth of services trade exists around the world. The contribution of services to economic growth depends on the region or country. So the question is:

Who trades services?

Between 2005 and 2017, developing economies, excluding Least Developed Countries (LDCs), gained over 10 percentage points in their share in global trade, reaching \$3.4 trillion in world services exports (from 14.7% in 2005 to 25.2% in 2007 according to WTO estimates in 2019) and \$4.5 trillion in world services imports (from 23% to 34.4% between 2005 and 2017). This impressive increase is due to the process of structural economic transformation and successful trade diversification from goods to services in several developing economies, particularly

²It is an "experimental" dataset produced by the WTO. These data use both official figures and estimates to cover services exports and imports for some 200 economies from 2005 to 2017.

Table 5: Announced greenfield projects, cross-border M&As and international project finance deals, by group of economies, 2019-2020

Group of economies	Type of FDI	Value (Billions of US\$)		Growth rate	Number		Growth rate
		2019	2020	(%)	2019	2020	(%)
Developed economies	Cross-border M&As	424	379	-11	5 802	5 225	-10
	Greenfield projects	346	289	-16	10 331	8 376	-19
	International project finance	243	175	-28	543	587	8
Developing economies	Cross-border M&As	82	84	2	1 201	907	-24
	Greenfield projects	454	255	-44	7 240	4 233	-42
	International project finance	365	170	-53	516	443	-14
Transition economies	Cross-border M&As	1	12	716	115	69	-40
	Greenfield projects	46	20	-58	697	371	-47
	International project finance	26	21	-18	59	31	-47

Source: UNCTAD, cross-border M&A database (www.unctad.org/fdistatistics) for M&As, information from the Financial Times Ltd, FDI Markets (www.fdimarkets.com) for announced greenfield FDI projects and Refinitiv SA for international project finance deals.

in Asia, and new ways to trade in services (WTO, 2019). Moreover, the participation of developing economies in services trade is not yet inclusive. Indeed, the data analysis shows that trade in services is very concentrated, with the same five developing economies that are major exporters also being major importers of services. In 2017, China was the largest trader in services, followed by Hong Kong (China), the Republic of Korea, Singapore and India. These five Asian economies accounted for 56.7% of developing economies' exports and 58.1% of imports in 2017 (WTO, 2019). They are the main drivers of the impressive trade performance of developing economies, with services exports rising by over 12% on annual average since 2005, almost three times faster than in developed economies.

By contrast, in the same period, LDCs increased their share in global services exports by 0.1 percentage points. In 2017, LDCs accounted for only 0.3% of world services exports, or \$38.3 billion and, in imports, their participation was at less than 1%, with services imports totaling \$124.1 billion (WTO, 2019). The advanced economies have the largest shares in cross-border trade in services worldwide. The United Kingdom and the United States have the highest share of services exports in the world, with nearly \$853 billion and \$401 billion respectively in 2019, while imports amount to \$567 billion and \$272 billion (see, Table 6). The largest EU exporters are Germany and France, with \$341 billion and \$293 billion in services exports, respectively. Imports from the two countries are around \$369 billion and \$270 billion. Developed country FDI flows have declined since 2015 leading to a drop in global FDI (see Figure 3). The drop is

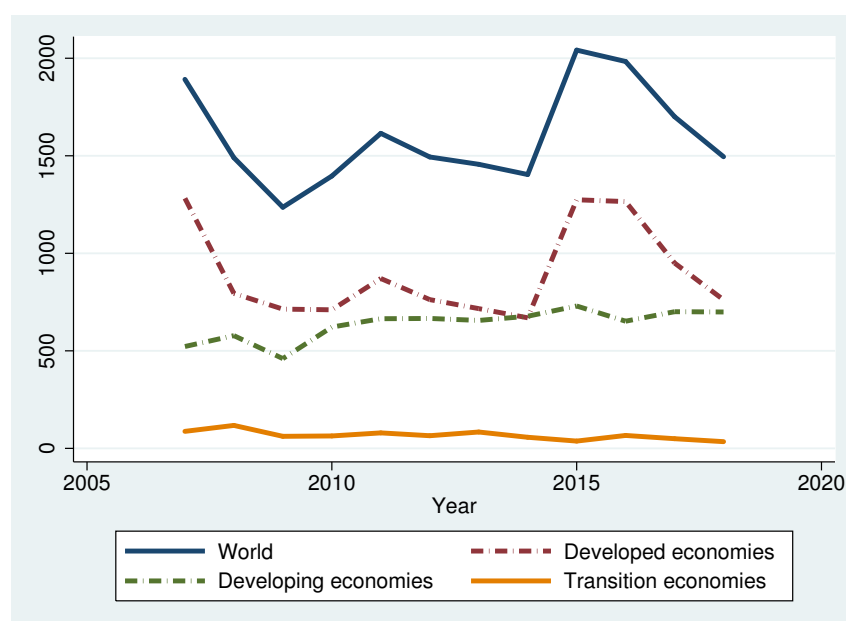
more pronounced from 2017 to 2018 mainly due to large repatriations of accumulated foreign earnings by the United States multinational enterprises (MNEs) in the first two quarters of 2018, following tax reforms introduced at the end of 2017.

Table 6: Commercial services exports and imports by economies and partners (Millions of US\$), 2019

Countries	World		Partners			
	Exports	Imports	Exports		Imports	
United States of America	853842	567121	Ireland	57421	United Kingdom	62059
			Canada	69035	Canada	38476
			Switzerland	45256	Germany	31764
			Mexico	32330	Switzerland	24821
			Singapore	25266	Bermuda	23709.00
United Kingdom	401429.53	272717.26	EU(27)	153093.05	EU(27)	129479.40
			United States of America	101616.56	United States of America	53195.81
			Switzerland	15054.02	India	8429.44
			Australia	9874.34	Japan	7325.34
			Japan	8670.68	Switzerland	7478.51
Germany	341078.14	369368.38	United States of America	50053.94	United States of America	46858.96
			United Kingdom	29060.44	United Kingdom	29499.27
			Switzerland	29614.58	Netherlands	20497.58
			France	25544.17	Ireland	17768.30
			Netherlands	20531.16	France	22649.21
France	293568.76	269940.01	United States of America	33948.07	Germany	35618.32
			United Kingdom	33399.52	United Kingdom	30418.36
			Germany	30054.53	United States of America	27429.36
			Switzerland	20608.41	Belgium	14834.16
			Belgium	20315.10	Ireland	14311.36

Source: WTO (Integrated Trade Intelligence Portal)

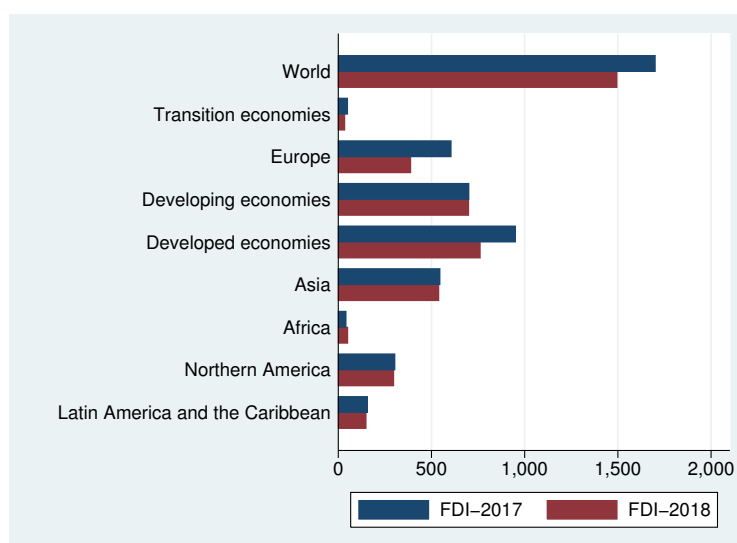
Figure 3: FDI inflows, global and by economic group, 2007-2018 (Billions of US\$)



Source: UNCTAD, FDI/MNE database

Indeed, FDI flows to developed economies reached their lowest point since 2004, falling by 20% from 2017 to 2018. FDI flows to Europe more than halved to \$217 billion, while those to North America remained more resilient, falling by 2% to \$6.4 billion. FDI flows to developing economies were stable, declining by almost 0.2% with significant differences across regions (see Figures 3 and 4). Developing Asia and Latin America and the Caribbean recorded lower FDI flows in 2018, while inward FDI to Africa rose significantly (nearly 21% between 2017 and 2018).

Figure 4: FDI inflows, global and by economic group, 2017-2018 (Billions of US\$)



Source: UNCTAD, FDI/MNE database

Services accounts for a large share of GDP in developed and emerging countries but for only 20% of world trade (Figure 2). The reason is that barriers to international trade in services appear to be high compared to trade in goods and commodities (Francois and Hoekman, 2010; WTO, 2019). The WTO Trade Cost Index highlights the evolution of trade costs over time, the impact of trade costs between economies and sectors (goods and services). It shows significant trade costs in the services sector. Trade in goods is more affected by transport, information and transaction costs and trade in services is more impacted by trade policies and regulatory heterogeneity and ICT connectedness (see Table 7). Several restrictive measures exist and have a significant impact on trade in services: barriers to entry, barriers to competition, discriminatory measures, etc. Barriers to entry to service suppliers are wide-ranging and affect both the supplier, its equipment, its activities and the movement of people. In 2001, the European Commission issued a report on remaining barriers to trade in services (European Commission, 2001). The report revealed that a majority of European firms were facing difficulties to export their services because they were facing heavy regulatory barriers. As a result,

services trade policies are an important determinant of international cross-border trade, FDI, participation in global value chains, productivity, and manufactured exports.

Table 7: Trade Cost Index, 2010-2018

Region Name	Sector	Transport and travel cost	Information and transaction cost	ICT connect- edness	Trade and policy regulatory differences	Gover- nance quality	Other
Between lower- income economies	Goods	0.255	0.156	0.066	0.202	0.132	0.189
	Services	0.201	0.168	0.08	0.253	0.116	0.182
Between high- income economies	Goods	0.318	0.188	0.031	0.131	0.166	0.167
	Services	0.266	0.164	0.058	0.158	0.135	0.218
Between high- and lower- income economies	Goods	0.266	0.145	0.034	0.176	0.129	0.25
	Services	0.209	0.123	0.056	0.196	0.097	0.32

Source: WTO (WTO Trade Cost Index)

In order to better regulate trade in services, the WTO adopted in 1995 the GATS (General Agreement on Trade in Services). It aimed at creating a credible and reliable system of international trade rules; to ensure fair and equitable treatment of all participants (principle of non-discrimination); to stimulate economic activity through guaranteed political bindings; and to promote trade in services and development through progressive liberalization (WTO, 2013).³ Indeed, the goal of the agreement is to eliminate arbitrary or unjustifiable discriminatory measure or a disguised restriction on trade in services. However, similar to the SPS and TBT agreements at the WTO, national policies implemented by governments must be justified and legitimate. Indeed, the GATS expressly recognizes the right of members to regulate the supply of services in pursuit of their own policy objectives. However, the agreement contains provisions ensuring that services regulations are administered in a reasonable, objective and impartial manner. It covers all the modes of supply of trade in services mentioned above (from Mode 1 to 4) with two exceptions. Article I (3) of the GATS excludes "services supplied in the exercise of governmental authority". These are services that are supplied neither on a commercial basis nor in competition with other suppliers. Cases in point are social security schemes and any other public service, such as health or education, that is provided at non-market conditions. Furthermore, the Annex on air transport services exempts from coverage measures affecting air traffic rights and services directly related to the exercise of such rights. The GATS attempts to create a multilateral framework for the liberalization of services trade, but the objectives of this agreement risk being undermined by the proliferation of bilateral

³All WTO members are parties to the GATS.

and regional trade agreements, most of which now include provisions on services. However, discriminatory treatment may distort services trade and reduce efficiency gains (Lehmann et al., 2003). December 2021, 67 WTO members accounting for over 90% of global trade in services, have successfully concluded the negotiations on Services Domestic Regulation. This agreement aimed to reduce administrative costs and creating a more transparent operating environment for service providers hoping to do business in foreign markets.

Services trade policies are crucial in international trade. Indeed, barriers to global services trade however, remain pervasive, as national trade and regulatory policies in individual services sectors are often developed with limited regard for economy-wide impacts. Moreover, due to the intangible nature of services, quantifying restrictions in services is difficult and it is only recently that the OECD and the World Bank have launched services trade restrictiveness indices (STRI).⁴ Indeed, the implementation of policies promoting services trade requires the assessment of the level of services restrictions. These indices are unique, evidence-based tools that provide information on regulations affecting trade in services in several service sectors. These databases highlight the restrictions that most impede trade, providing them with data on current trade policies and businesses the key market access information about compliance requirements. One important question is:

What is the level of restrictions in the services sector after the GATS agreement? Are we heading towards a progressive liberalization of services or, on the contrary, more and more restrictive policies?

The report of the OECD's Services Trade Restrictiveness Index trend (OECD, 2020) shows that barriers to services trade are rising. The index data demonstrate an accelerated shift toward increasing trade restrictive measures across most services sectors. The level of services trade restrictions in 2019 was 30% higher. At the same time, the pace of services trade liberalisation slowed by 60% compared to 2018. In addition the new restrictions are impacting the entire economy affecting foreign investment, conditions related to business establishment, and the temporary movement of service providers. The digital sector has encountered growing restrictions in 2019 affecting digital trade. Indeed, analysis of the index reveals an increasing level of restrictiveness affecting trade in digitally enabled services in 2019.

⁴STRI= Services Trade Restrictiveness Index. The OECD also launched the FDI Regulatory Restrictiveness Index (FDI RRI) that measures statutory restrictions on foreign direct investment (FDI).

Table 8: Evolution of Services Trade Restrictiveness Index (STRI), 2014-2020

Sectors	Countries	2014	2019	2020	Change in points (2014-2020)	Change in points (2019-2020)
Digital	OECD countries	0.134	0.144	0.145	0.011	0.001
	Emerging countries	0.276	0.343	0.339	0.063	-0.004
Logistics	OECD countries	0.212	0.212	0.212	0	0
	Emerging countries	0.397	0.383	0.384	-0.013	0.001
Transport	OECD countries	0.282	0.281	0.282	0	0.001
	Emerging countries	0.459	0.447	0.448	-0.011	0.001
Accounting	OECD countries	0.286	0.287	0.288	0.002	0.001
	Emerging countries	0.493	0.5	0.502	0.001	0.002
Legal	OECD countries	0.355	0.357	0.359	0.004	0.002
	Emerging countries	0.484	0.488	0.487	0.003	-0.001
Broadcasting	OECD countries	0.276	0.28	0.281	0.005	0.001
	Emerging countries	0.461	0.476	0.479	0.018	0.003

Source: OECD STRI database

Trade restrictive measures affected key service sectors that play an important role in enabling digital trade, such as telecommunications services, computer services, and audio-visual services. The European Economic Area (EEA) services market continues to liberalise. Indeed, the liberalisation through EU/EEA and domestic reforms of EU member states affected cargo handling, commercial banking and insurance services. However, Mustilli and Pelkmans (2013) find that despite significant services liberalization within the single European Market, a high level of regulatory heterogeneity prevails among countries in several sectors, notably in professional services (legal, accounting). Restrictions in services have increased from 2014 to 2020 and remained higher in emerging markets.⁵ Sectors such as transportation and logistics affected by the health crisis experienced growth in restrictions from 2019 to 2020 (see Table 8). However, the restrictions to trade in digital services have dropped in 2020, in order to facilitate remote working and online business operations caused by the COVID-19 pandemic. The most open sectors in advanced countries are distribution, telecommunication, insurance, logistics freight forwarding and motion pictures while in emerging countries the sectors are sound recording, engineering, computer and logistics. In addition, we find a similarity in the more restrictive sectors in both advanced and emerging countries: air transport, rail freight,

⁵Emerging countries include Brazil, China (People's Republic of), India, Indonesia, Kazakhstan, Malaysia, Peru, Russia, South Africa, and Thailand.

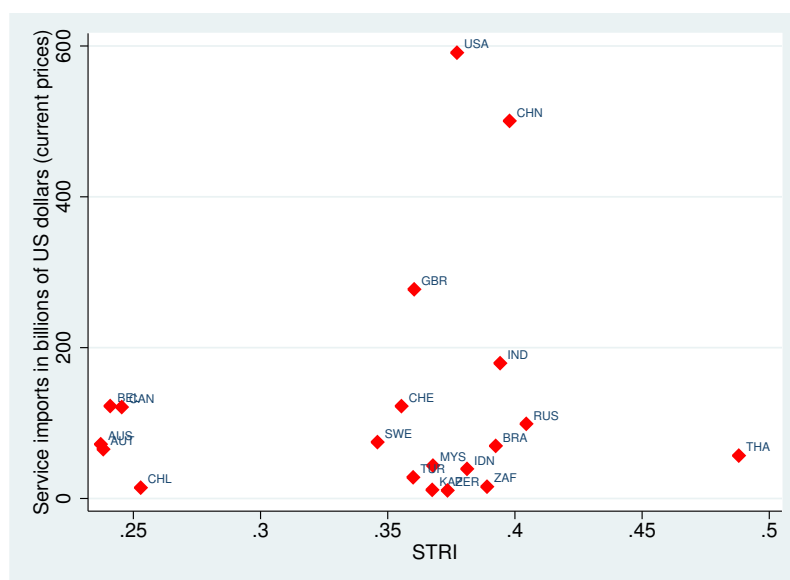
accounting, legal and broadcasting (see Table 9). Moreover, there is a negative correlation between the level of services restrictions and services imports. Indeed, the countries that are most closed to services suppliers are those that import fewer services, such as Thailand, Malaysia, South Africa, Brazil (see Figure 5).

Table 9: The 5 least and most restrictive service sectors by region

Region	<i>Sectors with Low STRI</i>	<i>Values</i>	<i>Sectors with High STRI</i>	<i>Values</i>
OECD members	Distribution	0.18	Rail freight transport	0.26
	Telecom	0.19	Broadcasting	0.28
	Insurance	0.19	Accounting	0.29
	Logistics freight forwarding	0.2	Legal	0.36
	Motion pictures	0.2	Air transport	0.41
Emerging countries	Sound recording	0.28	Broadcasting	0.48
	Engineering	0.29	Air transport	0.48
	Computer	0.31	Legal	0.49
	Logistics customs brokerage	0.32	Accounting	0.5
	Logistics freight forwarding	0.32	Rail freight transport	0.59

Source: STRI database

Figure 5: Correlation between service imports and STRI, 2019



Source: UNCTAD and OECD databases

Figures 3 and 4 show that trade in services is more pronounced in advanced countries. Therefore, the importance of services in economies depends on the level of development of coun-

tries. These results suggest a positive correlation between the wealth of nations and the performance of services sector. Indeed, the 2019 World Trade Report (WTO, 2019) notes commercial services production in LDCs represents, on average, 40% of GDP, well below middle-income economies (over 50%) and high-income economies (typically over 70%). The same report highlights that as the income of a country increases, richer consumers spend increasingly larger amounts on skill-intensive services, such as financial and insurance services, and richer countries tend to specialize in the production of these services. The traditional trade theory can explain this fact. Indeed, Francois and Reinert (1996) note that the importance of services in relative terms increases as countries become richer, and that this is also reflected in an increasing variety of market services (product differentiation).⁶ They also observe that even if services are not traded directly, they are embodied in the output of both tradable and non-tradable activities, and thus are a key determinant of overall employment and productivity. The rise in the share of services in production as countries become richer can be explained by the fact that differences in services endowments lead to a specialization of countries, particularly advanced countries.⁷ This specialization will subsequently lead to the exchange of services through the market ("outsourcing") with an associated increase in variety and quality that may raise the productivity of firms and welfare of final consumers.⁸ This will increase demand for purchased services and competitiveness of countries (Siggel 2006).

The comparative advantages in services described above are similar to those in the goods sector. The endowment factor behind the comparative advantage of advanced countries in trade in services is, however, difficult to explain. Indeed, the heterogeneity of services means that for some services, specific modes of supply are either technically impossible (e.g., construction services via mode 2) or virtually excluded. With factors of production whose mobility determines the tradability of services and with immobile factors which are defined locally rather than nation-wide, it is difficult to explain the comparative advantage in services through labor or capital endowments (Langhammer, 2004). The literature has identified a broad range of factors determining the comparative advantages of services trade. First, domestic policy measures in the host country explain this comparative advantage. Indeed, trade policy in services is essentially determined by domestic policies but not through border measures. The domestic regulation of services affects the export performance of services. Hence, when services are supplied through movement of capital (mode 3 of supply), the impact of trade policies on comparative advantage will depend on whether foreign companies are allowed to supply their

⁶They use the input-output tables to analyze the contribution of services activities to user industries and final (consumer) demand.

⁷Capital and skilled labor endowments can explain the specialization in services of advanced countries.

⁸This refers to the theory of Revealed Comparative Advantage (RCA) of Ricardo (1817) and Heckscher and Ohlin (1991).

services to local residents through subsidiaries or affiliates in consuming countries (market access) and which conditions they face relative to domestic competitors once they are in the domestic market (national treatment).

When services are provided through mode 4 of trade in services, it is critical whether the temporary presence of foreign service providers in the country of consumption is allowed and not discredited as a circumvention of restrictive migration policies (market access), and whether or not foreign providers are treated less favourably in the domestic market than local competitors (national treatment). Trade policies limiting market access through cross-border supply (mode 1) are rarer, for instance by hindering local demand from using the Internet or by suppressing foreign providers' access to local demand (Langhammer, 2004). Domestic policies related to services trade are relevant to explain the comparative advantage of advanced countries.⁹ Moreover, Table 10 shows that North-North trade (between advanced countries) is more significant than North-South trade (between advanced and emerging countries). Nearly 60% of US services exports go to OECD countries, compared with 26% to emerging countries. The attractiveness of national policies for trade in services in advanced countries would be the source of this comparative advantage. The United States have a comparative advantage in services exports because the regulations of other advanced countries are very attractive and competitive. However, emerging countries are restrictive to foreign service suppliers and some emerging and developing countries are still in the process of industrialization.

⁹Domestic policies can include market access policies, tax policies, labour legislation, rules referring to corporate governance and policies regulating the repatriation of investment income etc.

Table 10: Bilateral service exports (US Dollar, Millions), 2018-2019

	<i>Partners</i>									
	2018					2019				
	<i>World</i>	<i>OECD</i>		<i>Emerging</i>		<i>World</i>	<i>OECD</i>		<i>Emerging</i>	
Economies	Values	values	%	values	%	values	values	%	values	%
<i>United States of America</i>	862433	536186	62.17	225580	26.16	875826	549617	62.75	224922	25.68
<i>United Kingdom</i>	409415.7	319001.915	77.92	79744.95	19.48	416307.4	320969.56	77.1	52012.58	12.49
	World	<i>OECD</i>		<i>Emerging</i>		<i>World</i>	<i>OECD</i>		<i>Emerging</i>	
	Values	Values	%	Values	%	Values	Values	%	Values	%
<i>UE (27)</i>	2175216	1059434	48.70	N/A	N/A	2195627	1065482	48.53	N/A	N/A

Source: OECD database (International Balanced Trade Statistics)

Second, the quality of institutions and legal systems are key factors explaining services trade. The quality of institutions as a source of comparative advantage is based on the idea that institutions are not the same everywhere, so political and legal systems are different from one country to another, creating uncertainty on the relations with foreign partners. This uncertainty increases transaction costs (Belloc, 2006). The link between institutional quality, legal systems and trade in services may be observed in the insurance sector. Indeed, insurance services require that the client trust that contracts will be honoured if a claim is made. Thus, differences in legal and regulatory systems affect the degree of confidence that a foreign client has in a firm, and this can affect its export success. For example, Djankov et al. (2007) highlight the fact that the lengthy resolution of simple business disputes can work against the interests of entrepreneurs. Yue et al. (2010) find that sound contract enforcement and a good quality legal system enhance the export activities of firms. The findings of Gani and Clemes (2016) reveal a statistically significant positive correlation of rule of law and regulatory quality with the exports and imports of insurance and financial services. Referring to the World Bank's indicators of good governance data (Kaufmann et al., 2010), we note a huge gap in rule of law achievements between developing and advanced economies. The quality of institutions in advanced countries would therefore be a comparative advantage in trade in services.

Finally, an additional factor explaining the comparative advantage of advanced countries' trade in services would be the demographic change such as aging of the population. According to the United Nations' 2015 world population prospects report, the number of persons aged 60 or more has increased significantly in recent years in most countries and regions and this trend will continue in the near future (United Nations, 2015). It shows that the aging process is most advanced in high-income countries. Japan is home to the world's most aged population: 33% were aged 60 years or over in 2015. Japan is followed by Germany (28% aged 60 years or over), Italy (28%) and Finland (27%). Aging of the population gradually changes the composition of service demand in many countries (UNCTAD, 2018). Oliveira et al. (2005) estimate, by using OECD data, that aging of the population leads to a rise in the demand shares for health care, followed by energy consumption and housing expenditures, in most of the countries in their sample. Similarly, Bodier (1999), by using French expenditure surveys, finds that the consumption patterns of young and old generations are different. While young people tend to consume equipment, older people are more likely to spend a larger share of their consumption expenditures on leisure, health care, or private services.

These factors explaining the comparative advantage of trade in services are important to understand or assess the negative impacts of NTBs in services on trade. An empirical literature examines the effects of domestic services regulation and services trade. These studies that

used country-level data on bilateral trade in services from OECD countries show that domestic regulations in the origin and destination country have a strong negative impact on aggregate exports of services (Nicoletti et al., 2003; Kox and Nordås (2007); Lennon, 2009; van der Marel and Shepherd, 2013; Nordås and Rouzet, 2016). Other studies control for the firm-level determinants of export performance. Using firm-level data, they show the effects of domestic services regulation on international trade in professional services. Their results show a robust and sizeable negative impact of domestic regulations on both the decision to export and the values exported by each firm (Crozet et al., 2016). Other authors focused on the FDI sector, showing the negative effects of restrictive measures on cross-border investment, particularly in the secondary and tertiary sectors (Mistura and Roulet, 2019; Gregori and Nardo, 2021). In addition, others have linked service sector reforms and the productivity of manufacturing industries relying on service inputs. Using firm-level data, they show the interdependence of the two sectors. Reforms liberalizing upstream services have positive effects on the productivity of downstream manufacturing firms (Arnold et al., 2011; Duggan et al., 2013; Ariu et al., 2019; Ariu et al., 2020).

The study of the impact of services liberalization is relevant because the gains are higher than those of goods. Services are used as both key inputs in the goods sector and key intermediate inputs in the production of all services, if we consider financial, communication and professional services. A reduction in trade costs could improve overall productivity (Lipsey, 2001; Markusen, 1989). The literature about the gains from services liberalization is still recent and most authors assess the effects of liberalization through computable general equilibrium (CGE) models. Most studies focus on developing and emerging countries due to the large gains from services liberalization in these countries relative to advanced countries (WTO, 2019). Authors such as Konan and Maskus (2006) quantify the impact of services liberalization (FDI) on welfare, output and factor prices in Tunisia. They compare these effects to those of goods liberalization. They find that goods-trade liberalization yields a modest gain in aggregate welfare. Reducing service barriers generate relatively large welfare gains and low adjustment costs. Services liberalization increases economic activity in all sectors and raise the real returns to both capital and labor.¹⁰ Using a CGE model, Balistreri et al. (2009) examine the impact of liberalization of regulatory barriers against foreign and domestic business service providers in Kenya. The ad valorem equivalent of barriers to foreign direct investment has been estimated based on detailed questionnaires completed by specialists in Kenya. They conclude that Kenya gains very significantly from regulatory liberalization in business services and additional gains from uniform tariffs. The estimated gains increase to 50% of consumption in the

¹⁰These findings confirm those of Hoekman and Djankov (1996), who note the potentially large gains in well-being for Tunisian citizens of services liberalization.

long run. The largest gains for Kenya will derive from the liberalization of costly regulatory barriers that are non-discriminatory in their impact between Kenyan and multinational service providers. The study by Jensen, Rutherford and Tarr (2010), very similar to Balistreri et al (2009), assesses the impact of liberalization of regulatory barriers against foreign and domestic business service providers in Tanzania. Using the same methodology as above, the authors find significant gains to Tanzania from services liberalization, particularly in the banking, maritime, and road transportation sectors. Decomposition exercises reveal that the largest gains would derive from the liberalization of non-discriminatory regulatory barriers. Latorre (2016) investigates the impact on female and male workers of tariff reform and the reduction of regulatory barriers faced by domestic and foreign firms operating in business services in Tanzania. Using the same methodology as Jensen, Rutherford and Tarr (2010), she finds that FDI liberalization in services benefits both males and females, but it benefits males more, due to the greater skill levels required in business services. Jensen, Rutherford, and Tarr (2007) use a computable general equilibrium model of the Russian economy to assess the impact of accession to the World Trade Organization (WTO), which encompasses improved market access, tariff reductions and reduction of barriers against multinational service providers. They estimate that Russia will gain about 7.2% of the value of Russian consumption in the medium term from WTO accession and up to 24% in the long term. They find that the largest gains to Russia will derive from liberalization of barriers against multinational service providers.

The impact of services liberalization on employment is crucial because services accounted for nearly 65% of total employment in 2019 (WDI, data). However, few studies examined the link between services trade liberalization and employment. This literature, both theoretical and empirical, analyzes the effects of services liberalization on employment. Indeed, by using CGE model, Konan and Maskus (2006) argue that lower adjustment costs in the services sector contribute to relatively higher employment gains from service trade liberalisation compared to those from goods trade. Even after the liberalisation, they argue, services will continue to be provided locally and thus support domestic employment. Manning and Aswicahyono (2012) compare the contribution of exports on employment by sector in Indonesia. By using input-output tables, the study estimates that exports account for almost two-thirds of the new jobs created in the country during the period 1995-2005. The study by UNCTAD (2018) similar to the previous ones examines the link between employment and trade in services by using the World Trade Organization and Organization for Economic Cooperation and Development Trade in Value Added (WTO-OECD TiVA) database. It finds a greater percentage increase in employment in merchandise exports compared with services exports; in absolute terms, services have the potential to create a higher number of jobs than the manufacturing sector.

In sum, NTMs in services are higher than in goods and have a greater impact on trade. Indeed, trade in services has traditionally faced higher costs compared to trade in goods, largely due to the "proximity burden" of services trade (i.e., the necessity for suppliers and consumers of services to be in close physical contact), and more complex policy regimes than those applied to goods trade (WTO, 2019). NTBs in services seem to be the major impediment to trade in advanced and emerging countries. Interestingly, the literature suggests that the gains from liberalization in services are larger than those in goods and services are crucial inputs into the productivity of manufacturing firms. However, this literature does not study in detail the contribution of disaggregated services to production and trade. Most studies so far have focused on aggregate services. The revealed comparative advantage of trade in services depends on the level of development of countries but also on the type of services considered. The COVID-19 crisis had a greater impact on certain service sectors such as restaurants, tourism, travel and transport sector than on the financial and computer services, which grew during the lockdown (WTO, 2021).

Although most studies on services trade focus on emerging and developing countries, very few cover the African continent. The effects of services liberalization on intra-African trade remain poorly developed. Indeed, most African studies focus on agriculture and manufacturing with a limited coverage on services. Yet, most African countries are moving from agriculture-based economy to service-based economy, by passing a manufacturing-based economy. Africa is still the continent with a marginal share of services trade, accounting for about 2% of world services exports in 2018 according to UNCTAD data. This is partly due to very high restrictions in the services sector and higher intra-block trade. The proportion of employees in the services sector continues to increase in both developed and developing economies. At the same time, the proportion of workers in agriculture and manufacturing sectors is declining or stagnating (WTO, 2017). Interestingly, over the last few years, Africa has been growing along a very different trajectory. As Hoffman et al. (2019) point out, across the region, agriculture's share of GDP has declined and manufacturing has stagnated. Services, in contrast, are increasing as a share of total employment and GDP, driving value addition and providing critical inputs to boost other economic activities. The African Continental Free Trade Area (AfCFTA) project will become the largest trade area in the world, with an estimated population of more than 1.30 billion, which is expected to reach 1.68 billion in 2030 and 2.48 billion in 2050, with a combined gross domestic product (GDP) estimated at \$2.5 trillion (Ekobena et al., 2021). By significantly reducing tariffs and non-tariff barriers, this agreement could boost intra-African trade, investment and production. Most studies assessed the effects of this agreement on welfare, GDP, and intra-African trade, focusing on the agricultural and manufacturing sectors, leaving the services sector (Vanzetti, Peters, and Knebel,

2018; Abrego et al., 2019; Bengoa et al., 2021).¹¹

This thesis contributes to the literature by investigating the effects of sectoral restrictions in services on international trade. *Should services trade be more liberalized in order to stimulate trade in goods?* The objective of this thesis is to firstly investigate the effects of sectoral restrictions in services on trade and FDI and finally to examine the gains of services liberalization on trade. Therefore, it is organized around 3 main chapters.

In the **first chapter**, I empirically examine, using a gravity model, the impact of service restrictions and regulatory disparity on agri-food trade between OECD countries from 2014 to 2018. This chapter extends the literature about the effects of restrictions in services on manufacturing trade. Ariu et al. (2019) explore the interaction between international trade products and restrictions on services in Belgium using firm-level data. Ariu et al. (2020) investigate the importance of services in the exports of Belgian manufacturing firms. However, this chapter differs from previous studies because it focuses on the food sector, which is still a manufacturing sector highly dependent on services and whose contribution to the GDP of OECD countries is significant. To our knowledge, this chapter is the first to examine the effects of non-tariff barriers in services on food trade. Using the OECD input-output table, we find that the food sector is one of the manufacturing sectors that uses more services as inputs. We consider four service sectors (transportation, distribution, logistics, finance, and other business sectors) that are highly relevant to food production. The results confirm the findings of previous studies that restrictions in services impede trade in manufacturing goods. Interestingly, restrictions in the distribution sector have positive and significant effects on both exports and imports of food products. However, the regulatory disparity between countries has a significant negative impact on food trade. This impact decreases when the exporter country is closed to service providers.

The second chapter empirically assesses through a gravity model the effects of restrictive measures on cross-border investment in advanced and emerging countries from 2010 to 2019. Indeed, FDI is important because it is the source of mode 3 of supply of trade in services. Therefore, the study of FDI restrictions is relevant. However, the effects of NTBs on FDI depend on both the FDI sector and the level of development of countries. Indeed, as mentioned above, inward FDI in advanced countries is larger than in developing countries. Moreover, inward FDI is more important in the manufacturing and services sectors, so NTBs will have more negative effects in these sectors than in others. This chapter examines the real impact of global and sectoral restrictive measures on FDI depending on whether the FDI destina-

¹¹They find that African nations enjoy growth in gross domestic product, employment, and intra-African trade.

tion country is an advanced, large, or small emerging country. The literature focuses only on the effects of types of restrictions on cross-border FDI among advanced and large emerging countries. It provides an explanation of the sectoral restrictive measures that hamper foreign investment across countries at different levels of development. The results show that NTMs in services hinder cross-border FDI between advanced countries. Moreover, NTMs in primary and manufacturing FDI are obstacles to foreign investment in large emerging countries. Restrictions on FDI in natural resources hamper foreign investment in African countries.

In the **third chapter**, the objective is to evaluate the gains from services trade liberalization. It aims to answer the following research question: *Could restrictive barriers to entry for foreign suppliers be the reason for Africa's marginal share of world trade?* It consists of assessing the effects of the African Continental Free Trade Area (AfCFTA) agreement on intra-African trade in the short and long term. In this chapter, we highlight the role of service sector in intra-African trade. Most studies on the effects of AfCFTA have focused on the goods sector. To the extent of our knowledge, **chapter 3** is one of the first studies to identify the impact of services liberalization on intra-African trade through a CGE model. The effects are observed on trade in agricultural products, manufactured goods, processed food, natural resources, wood and paper products, textiles and clothing. This chapter shows a significant contribution of services to economic growth and intra-African trade. The manufacturing and natural resources sectors are the most affected by the reduction of barriers to services trade in Africa. Moreover, this trade agreement creates both long-term trade creation and diversion, but the welfare gain is still positive and significant over the long term in Africa.

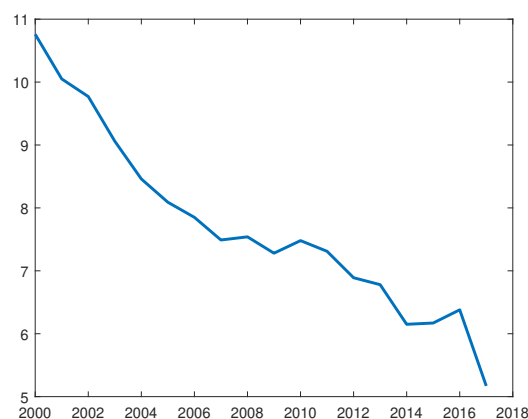
Overall, the three chapters highlight the positive impact of services liberalization on international trade. The reduction of barriers to entry for service suppliers increases the export performance of manufacturing and services industries. Services significantly contribute to the growth of countries' GDP and trade at all levels of development.

The impact of services trade restrictiveness on food trade*

1.1 Introduction

Since the GATT agreements in 1948 (General Agreement on Tariffs and Trade), tariffs have decreased significantly in world trade. For decades, high tariffs were the main obstacle to trade. However, under many implemented trade agreements (multilateral, bilateral and regional), tariffs have fallen to low levels (the simple average world tariff rate declined from 10.13% in 2000 to less than 7% in 2015, see Figure 1.1). At the same time, we have observed a huge increase in Non-Tariff Barriers (NTBs), particularly production standards, which represent the main obstacle to global economic growth (Kee et al., 2009). Indeed, market access that depended on traditional trade policies (tariffs and quotas) is now subject to compliance with regulatory measures (UNCTAD, 2013).

Figure 1.1: Tariff rate, applied, simple mean, all products (%)



Source: World Integrated Trade Solution database

Non-tariff barriers include a diverse array of measures from trade policy instruments (quotas,

*This chapter has been published in *International Economics*, vol. 166(C), pp. 71-94.

subsidies, export restrictions) to non-trade policy instruments, for example technical measures (SPS and TBT).¹ These latter measures, considered as rules that establish production characteristics and procedures, aim at optimizing the reliability of products and ensuring food safety, animal and plant health, and environmental protection. Although they are important to address legitimate market failures, these measures have restrictive effects on international trade in food products (UNCTAD, 2013). These technical, health and quality regulations generate high compliance costs (product adaptation costs, costs related to equipment, technology and necessary skills). Therefore, the existence of fixed costs may influence the decision to export (WTO, 2005).

Services are also affected by national regulations and trade in services is more impacted by these restrictions than trade in goods (Kox and Nordås, 2007). For commodities, production and quality requirements only apply to goods. For services, they encompass the supplier, its foreign personnel and equipment. For some authors, the level or stringency of service restrictions is not an obstacle, but regulatory heterogeneity between countries appears to be restrictive (Kox and Nordås, 2007). However, it is not the level of regulation that discourages foreign suppliers, but rather the difference in regulations between origin and destination markets. Thus, additional compliance costs to establish a firm in a foreign country would be minimal if standards and qualifications were recognized in the home country. Service restrictions not only prevent foreign providers from accessing domestic service markets, but may also deter them from making new investments once they are established in the market; this is the so-called **behind the border regulations** (maintenance costs or operational restrictions²).

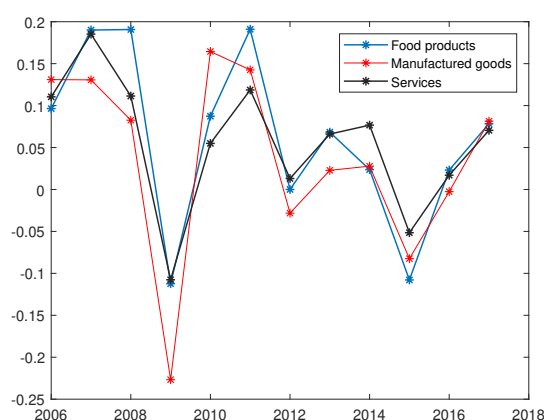
The food, manufacturing, and services sectors in OECD countries have registered significant export growth since 2015 (see Figure 1.2) and the services sector is a key factor in the production and distribution of agricultural and manufactured goods. Table 1.2 describes the average intermediate consumption by industry for OECD countries in 2015. It shows that consumption by the food, beverages, and tobacco industry in services is larger than manufacturing and agriculture inputs excluding the service sector. Average consumption is around 37% for services, followed by 34% for industrial goods and 30% for agriculture, forestry and fishing goods.

¹Sanitary and Phytosanitary Measures and Technical Barriers to Trade.

²Maintenance costs include costs related to the tax burden, the social security system, limiting the variety of services, imposing fixed prices for certain services.

The food, beverages and tobacco sector has services as a significant input among industrial sub-sectors. As shown in Table 1.3, in 2015, the food industry in OECD countries consumed more than half of all intermediate consumption in distribution services, 12% in transport and logistics, and nearly 20% in financial, insurance and other business sectors.

Figure 1.2: OECD countries' annual export growth from 2005 to 2017



Source: UNCTAD database

The food sector requires a lot of transport and logistics services to carry out efficient and cost-effective import or export operations: the so-called "transit time". It provides vital distribution for production, as well as essential personal mobility, connecting companies to global markets. Exports of food products require more transport and logistics for the movement, storage and warehousing of products (example of the seeds and perishable products that are most often transported by airplane, meat and dairy products are often shipped in refrigerated containers and trucks). The quality of food products will depend on the mode and regulation of transport, as well as the efficiency of logistics, especially for perishable products. These sectors have a significant impact on the food supply chain. Maritime and road transport are the most important modes of transport for the food industry (see Table 1.1).

Table 1.1: Food miles by transport method in 2010

Transport mode	Tonne kilometers (tkm)	%
Air	15.00 million tkm	0.16
Rail	930.00 million tkm	9.9
Road	2.91 billion tkm	30.97
Water	5.54 billion tkm	58.97

Source : Poore, J and Nemecek, T. (2018)

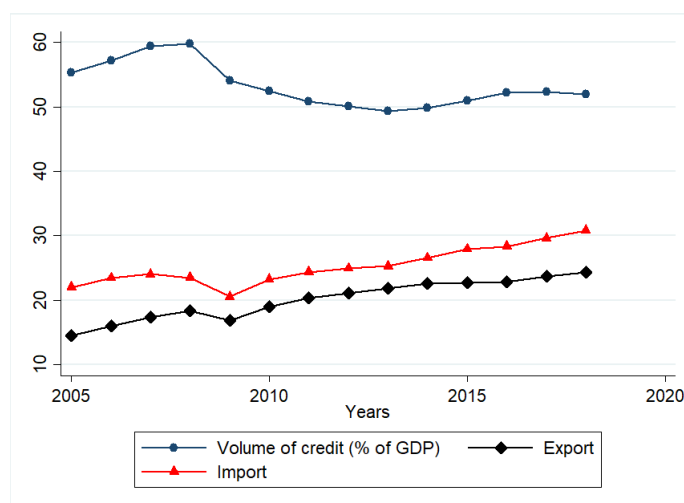
As the basic link between producer and consumer, the distribution sector is vital to the functioning of a market economy. Optimal regulation of this highly competitive sector has positive effects on consumer welfare through a wide choice of food products and associated services at attractive prices. Financial and insurance services facilitate transactions and provide access to financing for investments and for food export and import activities. These sectors address the risks of food trade activities. Indeed, food trade is risky, as importers may not pay after receiving the goods and exporters may not deliver if they pay in advance. To reduce the risks inherent to international trade, banks offer trade-specific finance products, the most common of which are letters of credit (LC) and documentary collections (Amiti and Weinstein, 2011;³ Paravisini et al., 2014⁴).

Using monthly US import data, Chor and Manova (2012) find that countries with higher interbank rates and stricter credit conditions exported less to the United States during the crisis. These effects were particularly pronounced in sectors that require significant external financing. Moreover, Bricongne et al (2010) find that French firms' exports in the sectors most dependent on external financing were more affected by the recent global crisis. The global financial crisis is an example of a strong impact of credit on trade (see Figure 1.3).

³They showed that, in Japan, firms linked to under-performing banks reduced their exports.

⁴They found that a reduction in credit supply to firms led to a decline in exports in Peru.

Figure 1.3: US import, export and volume of credit from 2005 to 2017



Source: World Bank, World Development Indicators data

Legal and accounting services are part of the institutional framework required to support a healthy market economy (OECD, 2008). Accounting has emerged as a standardized service. It enables the management of the food industry through tracking revenues and expenses, ensuring compliance with legislation and providing investors with information on the financial situation, which can be used to make business decisions. Restrictions in this sector lead to high transaction costs.

This paper examines the effects of service restrictions on food trade between OECD countries from 2014 to 2018 and discusses how to mitigate these restrictive impacts. Some studies have focused on the effects of the liberalization of services on economic growth (e.g. Francois and Schuknecht, 2000; Mattoo, Rathindran and Subramanian, 2001). Authors such as Doove et al. (2001) have examined the impacts of regulatory policies in services on the service sector performance (productivity, prices, and quality of services). Other authors have investigated the effects of services regulation on trade in services (Nordås and Rouzet 2016; Borchert, I et al., 2012; Van der Marel and Shepherd, 2013) and on the performance of manufacturing firms (Arnold et al., 2011; Duggan et al., 2013). Few studies have highlighted the effects of service restrictions on food trade.

Our study makes three main contributions to the existing literature on the impacts of restrictions in services on international trade. First, we use a gravity model to assess the effects of restrictions in services on food trade. This paper is the first to investigate the effects of non-

tariff barriers in services on food trade. Most works using gravity as an empirical framework focused on the effects of restrictions on trade in services. Second, to examine the effects of restrictions on trade, we use the Services Trade Restriction Index (STRI) and the Regulatory Heterogeneity Index of the OECD. The first captures the level of restrictions in 22 service sectors in 48 countries while the second measures the disparity of regulatory policy in these sectors across country pairs, ranging from 0 (less restrictive) to 1 (closed to service providers). This index is more recent (2014-2020) and more sectoral than the World Bank's Services Trade Restrictions Database, which includes 13 services sectors in 103 countries from 2012-2016. The last contribution relates to the structure of our dependent variable: we study the effects of NTBs in services on both the pooled and disaggregated food trade among OECD countries. The pooled food data provide a sample large enough, for which the assumption of homogeneous effects across commodities for the restrictiveness index would not be too great (Niven, W et al., 2012). Disaggregated food data allow the estimation of sector-specific gravity equations in the food industry.

Our results suggest that higher restrictions in the logistics and transport sector lead to lower exports of food commodities. Also restrictions in the financial and other business sectors are associated with lower imports. Interestingly, restrictions in the distribution sector have positive and significant effects on both exports and imports. A reduction of 0.05 points in STRI in logistics and transport increases exports by 36 percent in the short-run, that in the financial and other business sectors rises imports by 24 percent, while deregulation in the distribution sector reduces exports and imports respectively by 17.5 and 40 percent. The most strongly affected sectors are food, live animals and perishable products (milk, eggs and meat). Regulatory disparity in the logistics sector is a barrier to trade, but disparity in the transport sector boosts food exports. The overall disparity in the services sector has a significant negative impact on food trade. The result suggests that a 0.05 point lower regulatory heterogeneity is associated with a 10 percent rise on average in food trade across all sectors. Moreover, regulatory differences have a less significant marginal impact on trade flows the higher the level of trade restrictiveness in the exporting country. Indeed, the negative effect of regulatory disparity decreases when the exporter country is closed to foreign service providers.

The remainder of this paper is structured as follows. In the first part, we review the literature on the effects of these restrictive measures on trade flows. In the second part, we describe our

econometric model with data, sources, types of regressions and methodology used. The last section presents our different results and the discussion.

Table 1.2: OECD average intermediate consumption in agriculture, industry and services in 2015 : Input-Output Table

Sectors in column Intermediate Products in row	Agriculture sector		Manufacturing sector							Service sector	
	Agriculture, forestry fishing		Food products, Mining beverages and tobacco	Textiles, wearing, apparel leather and related products products	Wood, Leather and Paper	Petroleum, Chemicals and Plastics	Metal	Electronics, Construction Computers, Transport equipment and others	Services		
Agriculture, forestry and fishing	Consumption (millions US) Ratio(%)	190957.9 23.6051	649047 29.5546	894.1 0.2300	10249.7 3.0020	51008.2 6.8831	21060.7 0.6651	1424.91 0.0003	6297.4 0.1024	8316.8 0.2977	92203.4 0.4483
Manufacturing	Consumption (millions US) Ratio(%)	325868.8 40.2820	743497.2 33.8554	273054.9 70.2463	196298.8 57.4941	433633.5 58.5150	2107019.8 66.5411	367813053.9 94.3329	4254438.9 69.2253	1791808.7 64.1558	4179606.8 20.3234
Services	Consumption (millions US) Ratio(%)	292140.1 36.1127	803548.2 36.5899	114761.5 29.5236	134875.3 39.5037	256420.9 34.6017	1038412.1 32.7937	22094825.91 5.6666	1885048.2 30.6722	992774.2 35.5463	15601237.1 75.8612
Total (millions US)		808966.8	2196092.4	388710.5	341423.8	741062.6	3166492.6	389909304.7	6145784.5	2792899.7	19873047.3

Source: Data computed by the author with the OECD Input-Output Table, In 2015 (2018 edition) using the GTAP's sectoral aggregation

Table 1.3: Average intermediate consumption of food, beverages and tobacco in service in 2015: Input-Output Table

Services	Food, beverages and tobacco	
Wholesale and retail trade repair of motor vehicles	Consumption (millions US)	467526.4
	Ratio(%)	58.1827
Transportation and storage	Consumption (millions US)	98997.2
	Ratio(%)	12.3200
Accommodation and food services	Consumption (millions US)	5404.3
	Ratio(%)	0.6725
Publishing, audiovisual and broadcasting activities	Consumption (millions US)	1036.6
	Ratio(%)	1.2904
Telecommunications	Consumption (millions US)	5138.9
	Ratio(%)	0.6395
IT and other information services	Consumption (millions US)	8281.3
	Ratio(%)	1.0305
Financial and insurance activities	Consumption (millions US)	34595.9
	Ratio(%)	4.3053
Real estate activities	Consumption (millions US)	13048.1
	Ratio(%)	1.6238
Other business sector services	Consumption (millions US)	122488.9
	Ratio(%)	15.2435
Public administration and defence compulsory social security	Consumption (millions US)	5801.9
	Ratio(%)	0.7220
Education	Consumption (millions US)	3828.5
	Ratio(%)	0.4764
Human health and social work	Consumption (millions US)	22472.5
	Ratio(%)	2.7966
Arts, entertainment, recreation and other service activities	Consumption (millions US)	5594.7
	Ratio(%)	0.6962
Private households with employed persons	Consumption (millions US)	0
	Ratio(%)	0
Total (million US)		2196092.4

Source: Data computed by the author with the OECD Input-Output Table, In 2015 (2018 edition) using the GTAP's sectoral aggregation

1.2 Literature review

Studies that examine the impact of restrictions in services on international trade use two main methods: analysis of bilateral trade and firm-level data. Indeed, the economic literature that investigates the impact of standards in services on international trade uses the OECD and World Bank Trade Restrictiveness Index. The first analysis focuses on the impacts of

these indices on bilateral trade and the second on service exports and the performance of manufacturing firms through firm-level data.

1.2.1 Service trade restrictiveness index (STRI) and service trade: Gravity analysis

The existing literature on service restrictions and trade is exclusively empirical. To evaluate the effects of regulatory barriers in services on international trade as measured by the sectoral STRI index, we use a gravity model. Although specific to trade flows in goods and commodities, it has been applied by some authors to services and has been found to be adapted to trade in services (Head et al., 2009; Walsh, 2008). However, Kox and Nordås (2009) using a gravitational approach, it is possible to examine trade flows in transport and business services, and their interaction with an overall regulatory indicator. The analysis by Kox and Nordås (2007) considers financial services and other business services in their model.

Nordås and Rouzet (2016); Nordås (2016) apply the gravity model to analyze the impacts of the STRI index and the regulatory heterogeneity index on trade in services. Based on a gravity model with aggregate data and the PPML (Pseudo-Maximum Likelihood Estimator) as the estimation method, they find that the most restrictive countries in the service sector, import and export significantly fewer services. In addition, the negative impact of restrictions in services on exports is about twice as large as on imports. The most affected sectors are the banking, financial and transport sectors, considered as service providers. Examining the regulatory disparity between countries, they find that regulatory heterogeneity in services has negative impacts on cross-border trade in services. In this case, countries trade more with partners with similar regulations. A low heterogeneity index (harmonization or convergence of standards) is associated with a strong stimulation of trade in services. According to their study, if the STRIs of importer and exporter countries are low, harmonization stimulates trade in services, but if the STRIs are high, harmonization attempts to limit this trade.

Another approach that differs from the first is the analysis by Borchert, I et al., 2012. They use the restrictiveness index developed by the World Bank, rather than the OECD measure, to capture the impact of regulatory policies on trade in services.⁵ Through the PPML estimate, they find that higher levels of STRI discourage investment. Van der Marel and Shepherd's

⁵Foreign investment inflows and access to financial services through the provision of bank lending.

(2013) analysis (very similar to the previous one) also finds a negative relationship between the World Bank's bilateral restrictiveness index and cross-border trade in transport and financial services. Riker, D (2015) highlights the impact of restrictions on foreign suppliers (import restrictiveness index) and cross-border trade in services. He also finds negative effects of the latter on cross-border trade in services. Further, his study simulates the effect that would be made on U.S. financial services exports if its trading partners eliminated restrictions on these imports from all countries. He notes that while China and India do not apply any barriers to market entry, the United States has recorded a significant rise in its financial services exports, both in dollars (\$186.0 million and \$42.2 million) and rate change (10.14% and 3.76%). On the other hand, in a country like Germany, US exports have increased slightly (7.7 million dollars or 0.23%). Indeed, according to Riker, in the financial services sector, Germany is a relatively large export market for the United States, after the United Kingdom, but the impact on trade is lower because the level of restrictiveness in this country is relatively low compared to countries like China or India.

1.2.2 Service regulation, manufacturing firm performance and service exports: Firm-level data

Several previous studies estimated the effects of services regulation on manufacturing firm performance and service exports through firm-level data. The study of Arnold et al. 2011 highlights the link between services sector reforms and the productivity of manufacturing industries that depend on services inputs. Many aspects of services reform are considered, namely the presence of foreign suppliers, privatization and the level of competition. The results, based on firm-level data from the Czech Republic, show a positive relationship between services sector reforms and the performance of domestic firms in downstream manufacturing sectors. Reforms that allow foreign entry into service industries appear to be the key channel through which services liberalization contributes to improving the performance of manufacturing sector.

Duggan et al. (2013) investigate the extent to which policy restrictions on foreign direct investment in the Indonesian services sector affected the performance of manufacturers over the period 1997-2009. They use firm-level data on manufacturers' total factor productivity and the OECD index on regulatory restrictions on foreign direct investment, combined with data from Indonesia's input-output tables regarding the intensity with which manufacturing

sectors use service inputs. Controlling for firm-level fixed effects and other relevant policy indicators, they find that policy relaxing FDI policies in the services sector is associated with improved manufacturing sector performance.

Bas (2014) analyzes the relationship between the reform of energy, telecommunications, and transport services in India in the mid-1990s and manufacturing firms' export performance. The empirical analysis relies on exogenous indicators of the regulation of Indian service sectors and detailed firm-level data for India in 1994-2004 period. It finds that reform of the upstream services sector has increased the probability of exporting and the export sales share of downstream manufacturing industries. The results suggest that the effect of services liberalization on manufacturing firms' export performance is stronger for initially more productive firms. The analysis of Arnold et al. (2016) similar to the above looks at the link between reforms in services and the productivity of manufacturing firms in India. Using panel data on about 4,000 Indian firms for the period 1993-2005, they find that banking, telecommunications, insurance, and transportation reforms all had significant positive effects on the productivity of manufacturing firms. Services reforms benefited both foreign and domestic manufacturing firms, but the effects on foreign firms tended to be stronger.

The study by Crozet et al. (2016) different from those above examines the impacts of domestic services regulations on values exported and the probability of export by French professional services firms over three years of observations (1999, 2003, 2007). Their analysis combines the OECD Domestic Regulation Index (Non-Manufacturing Regulations) and French data on firm-level bilateral exports of professional services. Their results show that French firms are less likely to export to highly regulated markets. Controlling for the export probability, the values exported decrease with the level of regulation in the destination market. These results hold when we focus on importing countries from the European Union, where French firms do not face discriminatory barriers. The average ad valorem tariff equivalent of domestic regulation was 60% in 2007.

Ariu et al. (2018) explore the interaction between international trade products and restrictions on services. They consider data from Belgian firms from 1995 to 2005, PMR index (Product Market Regulation) data and that on customs duties on goods and services. The results suggest that a joint good-service liberalization would boost Belgian imports from the US by 22% for goods and 11% for services. Assuming the same increase for the whole of the EU would

imply an increase in imports of respectively, 60 and 24 billion dollars. An important element in their results is that the gains from liberalizing both goods and services together are higher than the sum of liberalizing goods and services separately. Ariu et al. (2020) investigate the importance of services in the exports of Belgian manufacturing firms from 1997 to 2005. The analysis is conducted on firms that export goods and those that export both goods and services (bi-exporters). The results show that the provision of services accounts for up to 22.4% of the manufacturing exports of bi-exporters and 11.8% of overall goods exports from Belgium.

This analysis shows that restrictions in services have negative impacts on trade flows. Restrictions in banking, transportation, and logistics have a significant impact on trade flows. The divergence of regulations between countries has a significant negative impact on trade. Our work is an extension of previous studies that have addressed the issue of standards in international trade.

1.3 STRIs and food exports : Augmented gravity models

To conduct an empirical analysis of the effects of restrictive measures on trade flows, we use the gravity model developed by Anderson (1979), which has established itself as the workhorse framework in international trade. The general formulation of the gravity equation is as follows:

$$X_{ij,t} = G_t \frac{\pi_{i,t} \Phi_{j,t}}{T_{ij,t}} \quad \forall i, j$$

$X_{ij,t}$ is the value of exports from country i to country j at time t , $T_{ij,t}$ denotes all bilateral frictions between i and j , which may include transportation costs, trade policies, etc.; $\pi_{i,t}$ and $\Phi_{j,t}$ capture all possible exporter and importer characteristics, respectively, e.g. country size and multilateral resistance terms of Anderson and Van Wincoop (2003). Finally, G_t is a gravity constant whose structural interpretation is as a function of the value of output in the world at time t .

To estimate this equation, we need to linearize it. Using the logarithm of each variable in the model, the equation becomes:

$$\ln X_{ij,t} = a_0 + a_1 \ln Y_{i,t} + a_2 \ln Y_{j,t} + a_3 \ln T_{ij,t} + a_4 \ln \Pi_i + a_5 \ln P_j + \varepsilon_{ij,t} \quad (1.1)$$

Where a_0 is the constant, $a_3 = 1 - \sigma$, $Y_{i,t}$ and $Y_{j,t}$ the GDP of exporting and importing countries at time t , $t_{ij,t}$ bilateral costs between our pairs of countries, Π_i terms measuring barriers to trade between each country and the rest of the world, P_j the price index of the importing country, $\varepsilon_{ij,t}$ the error term.

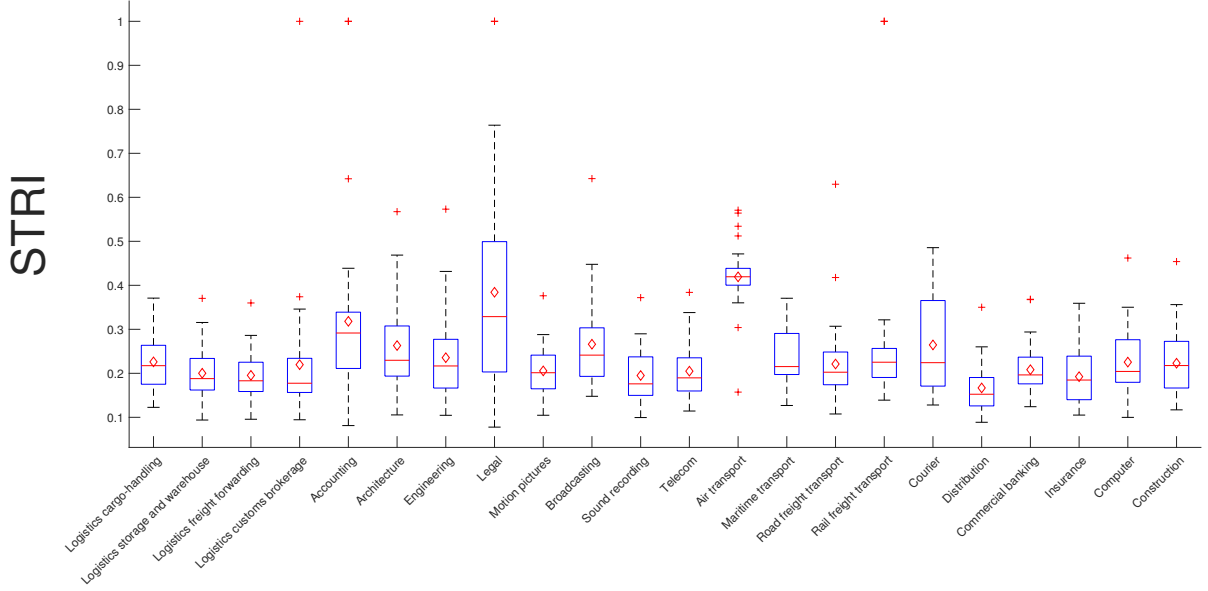
Using the model of Anderson and Van Wincoop (2003); Anderson and Van Wincoop (2004), our baseline regression equation is the following:

$$X_{ij,t}^k = \exp[\beta_{0,k} + \beta_1 Z_{ij,t} + \beta_2 t_{ij} + \beta_3 STRI_{i,t}^s + \beta_4 STRI_{j,t}^s + \mu_{i,t} + \gamma_{j,t} + \alpha_t + \alpha_s] + \varepsilon_{ijk,t} \quad (1.2)$$

$X_{ij,t}^k$ denotes the nominal exports of food commodities in sector (k) from exporter (i) to importer (j) in year (t). We use nominal exports and not those deflated by U.S. aggregate price indices to avoid bias problems. Since there are global trends in inflation rates, the inclusion of this term probably creates biases via spurious correlations (Baldwin and Taglioni, 2006). $Z_{ij,t}$ is a time-variant vector of bilateral variables. We have a binary variable that equals 1 if i and j share the same regional trade agreement (RTA) and 0 otherwise, and average custom tariffs imposed by the importer country on the exporter country on food products in year t ($\ln(1 + tariff_{j,t})$). t_{ij} is the vector of the time-invariant bilateral control variables: bilateral distance ($\ln dist$), common language ($lang$), common border ($border$).⁶ $STRI_{i,t}^s$ and $STRI_{j,t}^s$ are the STRI indices of respectively the exporter and the importer on a scale of 0 to 1, they represent our explanatory variables of interest and capture the level of restrictions in exporter and importer countries in the service sector s . As shown in Table 1.3 and Figure 1.4 show, we use restrictiveness indices in four service sectors (transport, logistics, distribution, finance and other business sectors) considered as crucial inputs in the food industry, and the restrictions are still significant. The logistics sector includes cargo handling, storage and warehouse, freight forwarding, and customs brokerage logistics. The transport sector comprises air, maritime, road and rail freight transport. The financial and other business sector covers accounting, banking and insurance. The distribution sector covers general wholesale and retail sales of consumer goods, and e-commerce. μ_{it} and γ_{jt} are other variables that vary respectively according to exporter and importer country in year, α_t is a year fixed effect (capturing the global macroeconomic cycle), α_s reflects the sector fixed effects and $\varepsilon_{ijk,t}$ is an error term. β_3 and β_4 are our coefficients of interest and are negative according to the literature.

⁶Dummy variables equal 1 if countries share a common border and common language and 0 otherwise.

Figure 1.4: OECD countries' sectoral STRIs in 2017



Source: OECD STRI database

The inclusion of exporter and importer STRIs in the equation is relevant because restrictions in both countries have a significant impact on trade. Many restrictions in the exporter country's services have negative effects on production and trade through network services (transports, logistics, etc.). Once a food product arrives at the frontier of the importer country, logistics services are required, particularly storage, warehousing and customs services, as well as transport for the delivery of the product to distribution services. Also, we cannot include both individual STRIs and country time fixed effects because the latter absorbs the former and we cannot perceive the effects of the STRI. We therefore include an interaction term between the STRI of the two countries as follows:

$$X_{ij,t}^k = \exp[\beta_0,k + \beta_1 Z_{ij,t} + \beta_2 t_{ij} + \beta_3 STRI_{ij,t}^s + \mu_{it,k} + \gamma_{jt,k}] + \varepsilon_{ijk,t} \quad (1.3)$$

With $STRI_{ij,t}^s = STRI_{i,st}^{GDPserv_i/GDPserv_{(i+j)}} * STRI_{j,st}^{GDPserv_j/GDPserv_{(i+j)}}$. Where $GDPserv_i$ and $GDPserv_j$ are the value added of services as a % of GDP in exporter and importer countries. The bilateral variable $STRI_{ij,t}^s$ is the geometric average of the importer's index and the exporter's index, weighted by the respective shares of their services in the value added of services in joint (% of GDP). $\mu_{it,k}$ and $\gamma_{jt,k}$ are dummy variables representing the exporter and

importer country's sector time fixed effects. The variable of interest $STRI_{ij,t}^s$ has negative effects on food exports, i.e. restrictions in services in both countries have limiting effects on trade.

Moreover, the importer and exporter country's STRI have the same impact on trade, i.e. limiting imports of services. Considering the bilateral STRI in equation (1.3) can be ambiguous. The main drawback of such an approach is that it assumes that the impacts of the importer's and exporter's regulations are symmetrical given the added value of their services (Nordås and Rouzet, 2016). In addition, the two countries may have different restrictions on the services sector (one more restrictive and the other less restrictive or vice-versa) rendering the results difficult to interpret. To address this issue, we estimate country-specific STRIs with international and intra-national trade as follows:

$$X_{ij,t} = \exp[\beta_0 + \beta_1 Z_{ij,t} + \beta_2 t_{ij} + \beta_3 STRI_{i,t-1}^s * INTL_{ij} + \beta_4 STRI_{j,t-1}^s * INTL_{ij} + \mu_{it} + \gamma_{jt} + \pi_{ii}] + \varepsilon_{ij,t} \quad (1.4)$$

Where $X_{ij,t}$ denotes nominal food trade flows, which include international and intra-national trade ($X_{ii,t}$) in year t. $INTL_{ij}$ is an "international trade" dummy variable. It takes a value of one for international trade between countries i and $j \neq i$, and zero otherwise (i.e. when the exporter and the importer are the same country, therefore trade is intra-national). The interaction terms $STRI_{i,t-1}^s * INTL_{ij}$ and $STRI_{j,t-1}^s * INTL_{ij}$ represent respectively the effect of changes in the STRI score of exporter i and importer j in sector s on the estimated flow of food exports from country i to country j relative to the consumption of domestically sourced food commodities in country i and j and π_{ii} represents the intra-national trade fixed effects.

1.4 Data sources

As mentioned above, our paper attempts to analyze the effects of restrictive measures in services on food trade. We use panel data on trade in food products between 36 OECD countries from 2014 to 2018.⁷

Our dependent variable is pooled bilateral food trade between OECD countries. We use information about bilateral food exports (annual frequency) from the United Nations Conference

⁷The data for 2014-2018 are based on the implementation and evolution of the STRI index.

on Trade and Development database (UNCTADstat), which uses the Classification Standard International Trade (SITC Rev.3).⁸ The food industry has four sectors (SITC 0+1+22+4): food and live animals, beverages and tobacco, oil seeds and oleaginous fruits, animal and vegetable oils, fats and waxes.

It is difficult to have data on intra-national food trade between 2014 and 2018. We therefore compute intra-national trade as the difference between gross production value data and total exports. Gross production data by food industry are extracted from the OECD STAN industrial database (Structural Analysis Database)⁹ and total exports from the UNCTAD database. However, the sectoral classification of the food industry in the STAN (ISIC Rev.4, less aggregated) differs from the UNCTAD classification (SITC Rev.3, more aggregated). The analysis of international and intra-national trade will therefore be done on the total aggregated food trade (SITC 0+1+22+4).

As independent variables, we have an index that captures the level of restrictions in these service sectors (STRI). The STRI Index provides a database of regulations affecting trade in 22 service sectors in 50 countries.¹⁰ For each sector the database covers 5 policy areas: restrictions on the entry of foreigners, restrictions on the movement of people, other discriminatory measures, barriers to competition and regulatory transparency. The qualitative information on these 5 areas has been converted into quantitative indices by sector ranging from 0 to 1 (where 0 corresponds to no restrictions and 1 to a sector completely closed to service providers) (Geloso Grosso et al., 2014). Data are available from the OECD STRI database.¹¹ The data on bilateral tariffs on food products are extracted from World Integrated Trade Solution Trade Stats (WITS) of the World Bank. Bilateral resistance variables such as the bilateral distance between the two capitals, common border, and language, are from the Centre d' Etudes Prospectives et d' Informations Internationales (CEPII), with binary variables that materialize regional trade agreements extracted from the WTO (Regional Trade Agreements Information

⁸Data can be accessed at: <https://unctadstat.unctad.org/wds/TableViewer/dimView.aspx>.

⁹The STAN database provides data on industrial performance in different countries. It includes annual measures of production, labor input and investment.

¹⁰36 OECD countries plus Brazil, People's Republic of China, Colombia, Costa Rica, India, Indonesia, Malaysia, Russia, South Africa, Thailand and Singapore.

¹¹<https://stats.oecd.org/Index.aspx?DataSetCode=STRI>.

System, RTA-IS).¹²

1.5 Econometric issues

Several questions related to the estimation of the standard gravity equation are considered in our study. Recently, researchers have identified eight problems inherent to gravitational models. The most important in this study are terms of multilateral trade resistance, gravity with disaggregated data, zero trade flows, heteroskedasticity of trade data, bilateral trade costs, adjustment to trade policy changes, endogeneity of trade policy and non-discriminatory trade policy (Yotov et al., 2016; Piermartini and Yotov, 2016).

This section reviews the main problems and highlights relevant solutions that have been proposed in the literature to address these challenges.

1.5.1 Multilateral resistances and disaggregated trade data

Multilateral resistance terms (Π_i and P_j) are theoretical constructs and are not directly observable. A gravity estimation without proper control of its resistance terms leads to an omitted variable bias ("Gold Medal Mistake", Baldwin and Taglioni, 2006).

The first solution is provided by Anderson and van Wincoop (2003) who use custom non-linear least squares iterative programming to account for multilateral resistances in a static framework. They first estimate trade cost parameters without controlling for multilateral resistances. Next, they use the estimated trade costs to construct a first set of multilateral resistances. Finally, they re-estimate the gravity model to obtain a new set of trade costs... until convergence is achieved. The second solution is an approximation of multilateral resistance terms by remoteness indices constructed as a function of bilateral distance and gross domestic product (GDP) (Baier and Bergstrand, 2009). Head and Mayer (2014) criticize such reduced-form approaches as they bear little resemblance to the theoretical counterpart of the multilateral terms. For some authors the multilateral resistance terms can be controlled using appropriate ratios based on the structural gravity equation (Head et al., 2010 and Novy, 2013). The recommended approach is that of Hummels (2001) and Feenstra (2016). They suggest the use of directional (exporter and importer) fixed effects in cross-sectional estimates. More

¹²We use trade agreements on both goods and services, as we study the effects of restrictions in services on food products.

recently, Olivero and Yotov (2012) demonstrated that multilateral resistance terms should be accounted for by export-time and import-time fixed effects in a dynamic gravity estimation framework with panel data.

In addition to accounting for unobservable multilateral resistance terms, the exporter and importer time fixed effects will also absorb the size variables (GDP, population, etc.) of the structural gravity model as well as all other observable and unobservable country-specific characteristics which vary across these dimensions, including various national policies, institutions, and exchange rates. Our dependent variable is sectoral. Taking into account the terms of resistances must be sectoral in order to deal with the problems of gravity estimation with disaggregated data (Larch and Yotov, 2016; Yotov et al., 2016). Our exporter and importer time fixed effects become country time sector fixed effects.

1.5.2 Zero trade flows and heteroskedasticity of trade data

The estimation of the gravity equation is conducted with an OLS estimator. However, the results of this estimator may constitute a bias in the presence of "Zero trade" in the presence of heteroskedasticity, and the OLS estimation may not be consistent. Indeed, this estimator, which does not include countries not trading with each other, compromises our results, because zero trade reveals crucial information (lack of information, high transport costs, landlocked countries), so omitting it can constitute a considerable bias in our study.¹³ Problems with zeros become more pronounced when the trade data are disaggregated. This is the case in our paper.

Futhermore, the Tobit model proposed by Martin and Pham (2008) as an econometric solution to the presence of zero trade causes a disconnect between estimation and theory; Helpman et al. (2008) developed a two-stage estimation procedure that focuses both on the extensive estimation (export decision from i to j) and the intensive margins (export volume) of trade. While this approach offers a better understanding of the determinants of trade flows, it provides biased estimates in the presence of heteroskedasticity in the trade data (Santos Silva and Tenreyro, 2013). To avoid biased estimation results, we use the Pseudo-Maximum Likelihood estimator (PPML) suggested by Santos Silva and Tenreyro (2006). The PPML is used in our case in order to deal with the constraints of zero trade between States, and also estimates

¹³Indeed, zero commerce is associated with high bilateral fixed costs of trade.

the non-linear shape of the gravity model in the presence of heteroskedasticity. However, an important assumption of the PPML estimator is equidispersion, which means that the conditional variance of the dependent variable and its conditional mean are equal. PPML estimation can be assessed by solving the following condition:

$$\sum_p [X^p - \exp(Z^p \beta)] = 0 \quad (1.5)$$

Where p is the country pair, X^p is unilateral trade (i.e. exports or imports) between country pairs in non-logarithmic levels and Z^p is the complete vector of the gravity equation as defined above.

1.5.3 Bilateral trade costs and adjustment to trade policy changes

The standard gravity model requires the introduction of bilateral trade costs, $(1 - \alpha) \ln t_{ij,t}$. Moreover, these must be replaced by series of observable variables in the gravity estimation (bilateral distance, common border, common language, regional trade agreements, bilateral tariffs).

The implementation of trade policies does not have an instantaneous effect on trade. Indeed, the establishment of rules in a specific sector does not have an immediate effect; there is an adaptation period before a measure comes into force. Trefler (2004) criticizes trade estimates pooled over consecutive years. As Cheng and Wall (2005) point out, the estimation of fixed effects applied to pooled data over consecutive years is sometimes criticized on the grounds that dependent and independent variables cannot fully adjust in a single year's time.

In order to account for this issue, some authors have used panel data with intervals instead of data pooled over consecutive years: Trefler (2004) uses 3-year intervals, Anderson and Yotov (2016) use 4-year intervals, and Baier and Bergstrand (2007) use 5-year intervals. Through empirical studies, Olivero and Yotov (2012) show that gravity estimates obtained with 3-year and 5-year interval trade data are very similar, while estimates performed with panel pooled over consecutive years produce suspicious estimates of trade cost elasticity parameters. Our data are spread over 5 years and an estimate over 3-year and 5-year intervals is difficult to perform, we will conduct estimates with two-year intervals.

1.5.4 Endogeneity of trade policy

The gravity specification stipulates that trade policy variables RTA and bilateral tariffs are endogenous, because it is possible that trade policy may be correlated with unobservable cross-sectional trade costs. For instance, trade policy variables may suffer from "reverse causality", because, all else equal, a given country is more likely to liberalize its trade with another country that is already a significant trade partner.

The estimation of the gravity model without taking into account the endogeneity of the RTA produces biased estimated coefficients. As a result, the RTA dummy variables are potentially correlated with the error term. The first authors to attempt to consider the endogeneity of trade policy variables in cross-sectional analysis used the instrumental variable approach (Trefler, 1993 and Lee and Swagel, 1997). However, Magee (2003) finds that the instrumental variable approach is not efficient in addressing the issue of endogeneity bias of the RTA due to its binary form. The appropriate method to control for the potential endogeneity issue of RTA is to estimate the gravity model including country pair fixed effects in panel data (Baier and Bergstrand, 2007). Indeed, these country pair fixed effects eliminate or account for, respectively, unobservable links between the endogenous trade policy covariate and the error term in the gravity regressions. Moreover, they will absorb all bilateral time-invariant covariates (e.g. bilateral distance, common language, common border, etc.), but will have the advantage of accounting for any unobservable time-invariant component of trade costs (Egger and Nigai, 2015; Agnosteva et al., 2014).¹⁴

1.5.5 Unilateral and non-discriminatory trade policy

Non-discriminatory and unilateral trade policies such as export subsidies, most-favored nation (MFN) tariffs or restrictions in services are important and their estimation of trade flows using the gravity equation remains difficult. Indeed, the issue with non-discriminatory trade policy covariates is that they are exporter-and/or importer-specific and therefore they will be absorbed, respectively, by the exporter-time and by the importer-time fixed effects that need to be used to control for multilateral resistance in the structural gravity model. More generally, in the presence of importer and exporter fixed effects, the gravity model can no longer esti-

¹⁴They show that country pair fixed effects are a better measure of bilateral trade costs than the standard set of gravity variables.

mate the impact of any variable (i) affecting exporters' propensity to export to all destinations (e.g. being an island); (ii) affecting imports without regard to origin (e.g. country-level average applied tariff); and (iii) representing sums, averages, and differences of country-specific variables (Head and Mayer, 2014).

We use the approach proposed by Heid et al. (2017) to estimate the effects of STRI on trade flows. It consists in estimating the structural gravity model with international and intra-national trade flows by capitalizing on the fact that while non-discriminatory trade policies are country-specific, they do not apply to intra-national trade. As a result, the inclusion of intra-national trade implies that country-specific STRIs variables become bilateral in nature, making their identification and estimation possible.

As noted by Heid et al. (2017), the estimates of non-discriminatory trade policies in the structural gravity model are less likely to be subject to endogeneity concerns as compared to their bilateral counterparts for two reasons. First, it is unlikely that a non discriminatory trade policy will be influenced by any bilateral trade flow. Second, the directional fixed effects in the structural gravity model will absorb much of the unobserved correlation between the non-discriminatory trade policy covariates and the gravity error term. This approach resolves the "distance puzzle" in trade, by measuring the effects of distance on international trade relative to the effects of distance on internal trade (Yotov, 2012)

1.6 Empirical results and discussion

We estimate the effects of restrictions in four service sectors on food trade between OECD countries from 2014 to 2018. Tables 1.4 and 1.5 present the baseline gravity model results for food trade using sectoral bilateral STRIs (equation 3). Table 1.4 presents the results on pooled trade in food goods (columns 1 to 6). In the other cases, we have the results on disaggregated food trade according to the SITC classification. We use the OLS as the estimation method and, to account for heteroskedasticity and zero trade, we apply the PPML estimator. We also include the importer and exporter sector fixed effects to control for structural multilateral resistances and omitted variables.

In the different estimates, we find the following effects: standard gravity model variables such as distance, common language, and common border have the expected signs and magnitudes

and are statistically significant. our dummy variable, representing the regional trade agreements, has positive and significant impacts on food trade among OECD countries. Tariffs on food products imposed by the importer country on the exporter country have significant negative effects on food exports (Niven, W et al., 2012).

In terms of variables of main interest- Service Trade Restrictiveness Indices (STRI)- we find that restrictions in both countries have a significant negative impact on food trade. The results suggest that more barriers in services, particularly in logistics, financial and other business sectors, lead to a reduction in the value of overall food exports. However, restrictions in the distribution sector have positive effects on exports. The resulting coefficients range between -7.3 for logistics services, -6.6 for financial and other business sectors and 8.75 for the distribution sector. The transport sector has non-significant effects on trade (Column 6 of Table 1.4).¹⁵ The coefficients are significant at 1 percent level. PPML and OLS estimates give the same effects.

¹⁵PPML estimation results with country time and sector fixed effects. Similar results with Column 5.

Table 1.4: The impacts of bilateral STRIs on cross-border exports of food commodities

Specification Dependant variable	OLS-PPML Estimate									
	All Food Products (Pooled)						Disaggregated Food Items			
	SITC 0+1+22+4						Food and Live Animal SITC 0		Beverage and Tobacco SITC 1	
	Log-linear OLS			Poisson-PML			Poisson-PML		Poisson-PML	
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$STR I_{ijt,Logistics}$	-2.2040*** (0.8417)	-3.6592*** (1.0686)	-3.5890*** (0.8872)	1.1673 (1.0627)	-7.6906*** (1.8916)	-7.3176*** (1.5895)	1.0270 (1.2753)	-8.7171*** (1.9182)	0.3956 (1.7309)	-3.9922** (1.8484)
$STR I_{ijt,Financial-Business}$	-3.7262*** (1.0393)	-7.4321*** (1.6834)	-8.2251*** (1.4040)	-5.4759*** (1.4605)	-6.8823*** (2.3890)	-6.6244*** (2.0004)	-5.7850*** (1.7260)	-5.5933** (2.4400)	-0.2720 (1.8983)	-9.2144** (3.8924)
$STR I_{ijt,Transports}$	-2.6893*** (0.9855)	0.1284 (1.0304)	0.3055 (0.8870)	0.3198 (1.3027)	1.9993 (2.3698)	2.1451 (2.1118)	0.1760 (1.5091)	1.0772 (2.4268)	0.2431 (2.3164)	4.5805 (3.6618)
$STR I_{ijt,Distribution}$	0.6063 (1.1014)	3.3974*** (1.1616)	3.7232*** (0.9812)	-0.1561 (1.0055)	9.7833*** (2.0444)	8.7531*** (1.7437)	-0.4111 (1.2266)	9.8613*** (1.9847)	-1.5779 (1.4468)	3.7368 (2.4762)
$RTA_{ij,t}$	0.8347*** (0.1087)	0.5558*** (0.1210)	0.5546*** (0.1021)	0.7477*** (0.1755)	0.3806*** (0.1156)	0.4912*** (0.1059)	1.0001*** (0.2186)	0.6635*** (0.1245)	-0.0452 (0.2939)	-0.0973 (0.1771)
$Ln(1 + tariff_{ji,t})$	-0.2838*** (0.0335)	-0.3402*** (0.0431)	-0.3242*** (0.0354)	-0.1216*** (0.0444)	-0.2962*** (0.0542)	-0.3299*** (0.0470)	-0.0970* (0.0522)	-0.3430*** (0.0517)	-0.3427*** (0.0601)	-0.2363** (0.1004)
$Ln dist_{ij}$	-1.4801*** (0.0988)	-2.6728*** (0.1621)	-2.7729*** (0.1517)	-1.0980*** (0.1454)	-1.8028*** (0.1036)	-1.8199*** (0.0936)	-1.0622*** (0.1736)	-1.8171*** (0.1091)	-1.1017*** (0.2211)	-1.6341*** (0.1787)
$lang_{ij}$	0.2324 (0.1415)	0.3663*** (0.1386)	0.3947*** (0.1076)	0.0175 (0.1519)	0.2071** (0.1049)	0.2379*** (0.0867)	0.0107 (0.1763)	0.2145** (0.1038)	0.3403 (0.2484)	0.5555*** (0.1127)
$border_{ij}$	1.8042*** (0.1207)	1.4345*** (0.1402)	1.4196*** (0.1355)	0.8916*** (0.1579)	0.7335*** (0.0876)	0.7499*** (0.0810)	0.9583*** (0.1842)	0.8148*** (0.0916)	0.3435 (0.2640)	0.1775 (0.1529)
Exporter-Importer Controls	Yes	No	No	Yes	No	No	Yes	No	Yes	No
Time-FE	Yes	No	No	Yes	No	No	Yes	No	Yes	No
Sector-FE	Yes	Yes	No	Yes	Yes	No	No	No	No	No
Exporter-time-FE	No	Yes	No	No	Yes	No	No	Yes	No	Yes
Importer-time-FE	No	Yes	No	No	Yes	No	No	Yes	No	Yes
Exporter-time-sector-FE	No	No	Yes	No	No	Yes	No	No	No	No
Importer-time-sector-FE	No	No	Yes	No	No	Yes	No	No	No	No
R^2	0.563	0.670	0.753	0.686	0.922	0.9396	0.688	0.943	0.465	0.857
Observations	21314	21314	21314	24867	24867	24763	6217	6217	6217	6217
$Chi - 2$						2321.34***				

Notes: The dependent variable is nominal bilateral food product from i to j at to t in sector k as in equation (1.3). Regression 6 is performed using the ppmlhdfc STATA command written by Correia, Guimarães, Zylkin (2019). It is a Pseudo-Maximal Likelihood Poisson estimator (PPML) with multi-way fixed effects. Exporter-importer controls are the GDP of both countries. Standard errors are reported in parentheses and clustered by country-pair level. *, **, *** denote significance at the 10% 5% and 1% level respectively.

Table 1.5: The impacts of bilateral STRIs on cross-border exports of food commodities: Continued

Specification Dependant variable	Poisson-PML Estimate Disaggregated Food Products: Continued							
	Animal and Vegetable Oil SITC 4		Oils Seeds and Oleaginous Fruits SITC 22		Perissable Products SIT 01+02+03		Agricultural Raw Materials SITC 2-22-27-28	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$STR_{ijt,Logistics}$	5.5133* (2.8967)	-9.1559** (4.4723)	1.7973 (3.2355)	1.8751 (5.3077)	-2.0541 (1.6099)	-5.8127*** (1.7456)	-0.6668 (1.9363)	-4.5768** (1.7919)
$STR_{ijt,Financial-Business}$	-4.9304 (4.0123)	-11.8046** (5.6818)	-22.3322*** (5.1395)	-9.6235* (5.4747)	-2.7303 (1.9420)	-7.7929*** (2.9628)	-7.1694*** (2.3205)	-0.7987 (2.3679)
$STR_{ijt,Transports}$	-0.8465 (3.0821)	10.1418* (5.7410)	3.1490 (5.0761)	8.0895 (7.3048)	-2.8991 (1.8701)	2.3046 (3.0008)	4.5795** (1.9481)	1.2332 (2.5449)
$STR_{ijt,Distribution}$	-1.5097 (2.4359)	4.9427 (4.4101)	10.9460*** (2.6604)	3.0329 (6.1658)	-2.3521 (1.6748)	10.8735*** (2.3696)	0.9511 (1.5969)	-1.6446 (3.1360)
$RTA_{ij,t}$	0.3047 (0.3820)	-0.4210 (0.2625)	-0.0584 (0.3233)	-0.4036 (0.3388)	1.0733*** (0.2534)	0.9627*** (0.1753)	0.4598** (0.2117)	0.3697*** (0.1432)
$Ln(1 + tariff_{j,t})$	-0.2305* (0.1203)	-0.2962*** (0.1008)	0.3657*** (0.0977)	-0.5692** (0.2458)	-0.0812 (0.0666)	-0.4023*** (0.0771)	0.0204 (0.0612)	-0.3178*** (0.0785)
$Ln dist_{ij}$	-1.8587*** (0.2992)	-2.7756*** (0.3036)	-0.9175** (0.3601)	-0.9930** (0.4222)	-0.7795*** (0.1823)	-1.4888*** (0.1479)	-1.3007*** (0.2275)	-1.4064*** (0.1469)
$lang_{ij}$	-0.2381 (0.3161)	-0.2388 (0.1850)	-0.7881*** (0.2980)	-0.3022 (0.3665)	0.0869 (0.1879)	0.4280*** (0.1182)	-0.0483 (0.2260)	-0.1192 (0.1830)
$border_{ij}$	0.8501*** (0.2898)	0.8630*** (0.1843)	1.6517*** (0.3843)	1.2367*** (0.2165)	0.8593*** (0.1834)	0.7475*** (0.1021)	0.9749*** (0.2422)	1.0363*** (0.1035)
Exporter-Importer Controls	Yes	No	Yes	No	Yes	No	Yes	No
Time-FE	Yes	No	Yes	No	Yes	No	Yes	No
Exporter-time-FE	No	Yes	No	Yes	No	Yes	No	Yes
Importer-time-FE	No	Yes	No	Yes	No	Yes	No	Yes
R^2	0.395	0.875	0.381	0.782	0.553	0.878	0.637	0.959
Observations	6217	6217	6216	6112	6217	6217	6217	6217

Notes: The dependent variable is nominal bilateral food product from i to j at to t in sector k as in equation (1.3). Exporter-importer controls are the GDP of both countries. Standard errors are reported in parentheses and clustered by country-pair level. *, **, *** denote significance at the 10% 5% and 1% level respectively.

Moreover, these results are difficult to interpret because the effects of STRI in the two countries are assumed to be symmetrical. The marginal impact is only relevant when the combined STRIs of the two trading parties increase or decrease, which may be a wrong assumption. This is mitigated by estimating equation (1.4), i.e. the impacts of country-specific STRIs on total food trade, including intra-national trade and PPML as an estimator (Table 1.6). Both countries may introduce more restrictions in services if they face more competition. This will result in the reverse causality problem between our interest variables and trade. To solve this problem, we use the one-year lagg of the STRI ($STRIT_{t-1}$). The logistics and transport sectors are considered as one sector to avoid the correlation between these variables, which emerge as two quite similar sectors.¹⁶ Columns (1) and (2) present results over the entire sample to identify the short-term effects of STRIs and (3) and (4) over two-year intervals to address the issue of adjustment to trade policy changes. Columns (1) and (3) include intra-national fixed effects to control for country-specific intra-national trade costs and "home bias" effects and any other country-specific time-invariant characteristics that may drive a wedge between internal and international trade. Columns (2) and (4) include bilateral country-pair fixed effects to control for the endogeneity of trade policy and time-invariant bilateral trade costs (Baier and Bergstrand, 2007; Egger and Nigai, 2015).

The results show different effects of country-specific STRIs on food trade and have the expected signs and effects when including the country-pair fixed effects. The first result which is novel suggests that restrictions in logistics and transportation sectors have negative impacts on food exports (negative and significant coefficient of the exporter country's STRI). A higher STRI in logistics and transport services is associated with significantly lower food exports with a negative and significant coefficient on food exports. The result interpreted in terms of liberalization shows that a 0.05 point reduction of the STRI in these services in a country would increase its food exports by 36 percent in the short-run.¹⁷ The strong negative relationship between the STRI in these sectors and food exports could be explained by the fact that the STRI captures barriers to competition and also that the lack of foreign competition in the transport and logistics sectors. The absence of foreign competition makes the prices of

¹⁶The logistics sector includes the transport of goods, but also relate to storage, handling, packaging and inventory.

¹⁷The percentage change in exports and imports from a 0.05 points reduction in the STRI index in services sector is calculated as follows: $[\exp(-0.05 \cdot \text{coefficient}) - 1] \cdot 100 = [\exp(-0.05 \cdot (-6.1449)) - 1] \cdot 100 = 35.96\%$. The calculation is based on the regression data described in Table 1.6 column 1.

transport and logistics services high and therefore export prices. Local food companies have less incentive to expand beyond local markets because it is more expensive to produce and sell abroad. Restrictions exclude small exporters from foreign markets.

Table 1.6: The effects of country specific STRIs on export values

Specification Dependant variable	Poisson-PML Estimate Total Food Exports <i>SITC 0+1+22+4</i> ($X_{ij,t} + X_{ii,t}$)			
	Consecutive Panel 2014-2018		Intervals 2014, 2016, 2018	
	Country-FE (1)	ENDG (2)	Country-FE (3)	ENDG (4)
$STR I_{i,t-1} * INT L_{ij}$ <i>Logistics – Transports</i>	-6.1449** (2.5107)	-8.5200*** (1.5201)	-4.5252 (2.9205)	-9.8905** (3.8505)
$STR I_{i,t-1} * INT L_{ij}$ <i>Financial – Business</i>	2.4745 (2.3869)	2.2301 (2.1168)	0.3865 (3.7695)	0.0066 (6.0382)
$STR I_{i,t-1} * INT L_{ij}$ <i>Distribution</i>	3.8415*** (0.6415)	4.1779*** (0.4953)	6.5643*** (0.8792)	6.9934*** (0.8440)
$STR I_{j,t-1} * INT L_{ij}$ <i>Financial – Business</i>	-4.3400*** (0.6835)	-3.1463*** (0.6589)	-7.2997*** (1.0499)	-5.4550*** (0.6875)
$STR I_{j,t-1} * INT L_{ij}$ <i>Logistics – Transports</i>	1.2727 (0.8281)	1.2151* (0.7306)	1.1318 (1.0153)	0.6990 (0.7720)
$STR I_{j,t-1} * INT L_{ij}$ <i>Distribution</i>	10.2138*** (1.1053)	8.8493*** (1.0532)	14.8791*** (1.5875)	14.0966*** (1.3761)
$RT A_{ij,t}$	0.6449*** (0.1363)	-0.0938 (0.0576)	0.6093*** (0.1324)	0.0083 (0.1916)
$Ln(1 + tariff_{j,t})$	-0.4544*** (0.0596)	-0.1384 (0.0895)	-0.4941*** (0.0622)	-0.7562** (0.3838)
$lang_{ij}$	0.2139** (0.1048)		0.2325** (0.1068)	
$border_{ij}$	0.9990*** (0.0944)		1.0034*** (0.0963)	
$Ln distance_{ij}$	-1.0400*** (0.1044)		-1.0215*** (0.1138)	
Country-pair-FE	No	Yes	No	Yes
Intra-national fixed effects	Yes	No	Yes	No
R^2	1.00	1.00	1.00	1.00
Observations	6328	6324	3763	3759
Chi-2	1531.40***	303.29***	1405.13***	393.71***

Notes: The dependent variable is aggregated bilateral trade flows of food products ($X_{ij,t}$), including domestic trade ($X_{ii,t}$). Constructed domestic trade flows are set to missing if negative. All regressions are performed using the `ppmlhdf` STATA command written by Correia, Guimarães, Zylkin (2019). All regressions include exporter-year and importer-year fixed. In addition, columns (2) and (4) also add pair fixed effects. Columns (1) and (3) include intra-national fixed effects. Standard errors are reported in parentheses and clustered by country-pair level. *, **, *** denote significance at the 10%, 5% and 1% level respectively.

The second finding is that the estimated impact on food trade of the importer's STRI in the financial and other business sectors is negative and significant (significant at 1 percent level in the different specifications). Indeed, countries that impose restrictive regulations in these sectors discourage cross-border imports of food products. Deregulation policies leading to a 0.05 point reduction of the STRI in these services would increase a country's food imports by 24 percent in the short-run (column 1 of Table 1.6). A high STRI is associated with lower competition in the market, so incumbent financial institutions raise the interest rates, the cost of accounting and auditing services, and insurance premiums in order to increase their profit margins (Rouzet and Spinelli, 2016). The consequence would be a reduction in credit and insurance to finance trade and household consumption expenditures. The impact is negative and significant on food imports as they are more important in bilateral trade among OECD countries (see Table 1.7).

Table 1.7: OECD bilateral food trade in thousands of US dollars

	2014	2015	2016	2017
<i>Importations</i>	6.57E+08	5.97E+08	6.09E+08	6.55E+08
<i>Exportations</i>	6.43E+08	5.75E+08	5.87E+08	6.33E+08

Source: UNCTAD database

The last result, which is striking and counterintuitive, suggests that the restrictions in the distribution sector have significant and positive effects on both exports and imports of food commodities (positive and significant coefficient of the exporter and importer country's STRI at 1 percent level in the different specifications). A 0.05 point increase in STRI in the distribution sector is associated with a rise in exports and imports respectively by 17.5 and 40 percent in the short-run, the impact on imports appears to be strongest (column 1 of Table 1.6). This sector is vital because it links buyers and sellers and therefore the pricing of food commodities. The positive correlation between STRIs and food trade flows is explained by wholesalers' and retailers' profit margins (Rouzet and Spinelli, 2016). A high STRI is associated with more barriers to investment¹⁸ and competition.¹⁹ Indeed, a high STRI in this sector increases the food prices and thus the profit margins of wholesalers and retailers while limiting competi-

¹⁸More foreign ownership restrictions and, in some cases, a legal monopoly on the distribution of certain products or a product reserved for domestic distributors.

¹⁹Store hours and price regulations.

tion in the production markets. It is beneficial to import food products when the prices in the distribution market are high. The study by Cheptea, Emlinger, and Karine (2018) shows a positive relationship between the establishment of distribution services and the export activity of French agri-food firms.

These results confirm those found above that the restrictions in both countries have significant effects on trade in food commodities. Based on the results in Tables 1.4 and 1.5, the most affected food sectors are food, live animals and perishable products. These products are the most traded between OECD countries and are very sensitive to time and to the quality of logistics and transports. Perishable products are the most widely sold in retail and wholesale markets. This study shows the detrimental impact of restrictions in services on food global value chains and quality of products. The novel conclusion is that the food industry is strongly linked to services that are used as inputs in production and trade. It also shows that regulation of a country's services sector has negative effects on its export performance and import penetration.

1.7 Regulatory differences in services and food trade

In this section, we investigate the impact of the regulatory differences in services between pairs of countries on food exports. Following Kox and Nordås (2007), the regulatory difference between pairs of countries emerges as the most restrictive trade policy compared to individual country restrictions. Indeed, this regulatory disparity is considered as a bilateral trade cost and affects trade through gravity estimation.

Using the index of regulatory heterogeneity between country pairs of OECD countries in services, we estimate its effects on food exports. The index is constructed as follows: from the database of country-specific STRIs, for each sector we create a matrix where each cell contains countries i and j for measure m .²⁰ If the pair of countries has the same answer for measure m , the cell is scored as zero and 1 otherwise. For each country pair and each measure, a heterogeneity index is created by computing a weighted average of these scores (an average of the 5 measures).

We have two types of index, one based on qualitative responses in the presence or absence of

²⁰Barriers to entry, competition, restrictions on movement of persons, other discrimination, regulatory transparency.

regulations and another on the score that highlights the restrictiveness of regulations. Similarly to the individual STRI measures, they are scored on a scale of 0 to 1 (less restrictive to completely closed to foreign suppliers).

To capture the effect of the regulatory difference on bilateral food flows, we construct an interaction variable between the individual STRI variables (exporter and importer) and the regulatory heterogeneity variable. Indeed, regulatory disparity has lower effects on trade if the importer or exporter country is completely closed to service providers, and significant impacts if the countries are open to services (Nordås and Rouzet, 2016). Our gravity equation is as follows: small

$$X_{ij,t}^k = \exp[\alpha_0 + \alpha_1 STRI_{ij,t} + \alpha_2 STRI_{ij,t} * STRI_{i,t} + \alpha_3 STRI_{ij,t} * STRI_{j,t} + \alpha_4 t_{ij} + \alpha_5 Z_{ij,t} + \mu_{ik,t} + \gamma_{jk,t} + \varepsilon_{ijt}] \quad (1.6)$$

With $STRI_{ij,t}$ the overall regulatory difference between country pair (ij) in the four service sectors at year t,²¹; $STRI_{i,t}$, $STRI_{j,t}$ are STRIs of exporter and importer countries²²; $\mu_{ik,t}$, $\gamma_{jk,t}$ dummy variables that represent the exporter-importer sector-time fixed effects (inward and outward multilateral resistance).

The results with PPML as an estimator are presented in Table 1.8. Columns 1 to 3 represent the results of the sectoral regulatory disparity on trade flows, columns 4 to 6 the impacts of overall regulatory heterogeneity, columns 7 to 10 the effects of our interaction terms. Column 10 includes country-pair fixed effects to control for the endogeneity of the trade policy variables.

The regulatory difference in logistics has negative and significant values in our regression. In addition, the disparity in the transportation sector has positive and significant effects on exports. The positive sign is explained by the small disparity in the transport sector between European Union member countries (the index ranging from 0.06213 to 0.25915 with an average of 0.14659, a lower than logistics index, see table A.3). The overall regulatory disparity index has significant negative effects. This result suggests that regulatory heterogeneity is indeed negatively associated with cross-border food trade. A 0.05 point lower regulatory heterogeneity is associated with a 10 percent rise on average in food exports across all sectors.²³

²¹We use the score index to compare it to each country's STRI score.

²²We consider the overall STRI and regulatory disparity index in the four service sectors for the analysis of our interaction terms.

²³ $[\text{Exp}(-0.05 * (-1.9580)) - 1] * 100 = 10.28$ percent. The calculation is based on the regression data described in Table

Moreover, regulatory differences have a less significant marginal impact on trade flows the higher the level of trade restrictiveness both in the exporting and the importing country.

Table 1.8: The effects of heterogeneity regulatory on cross-border exports of food commodities (all food products): PPML

Model	Sectoral Regulatory Heterogeneity Score			Overall Regulatory Heterogeneity Score			Overall Country STRI and Heterogeneity Score			Pair-FE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
<i>Heterogeneity score_{ijt,logistics}</i>	-5.9116*** (1.0388)	-5.8123*** (1.3934)	-5.2440*** (1.2148)							
<i>Heterogeneity score_{ijt,Financial-Business}</i>	-2.1577 (1.3699)	0.0433 (1.1906)	-0.4160 (1.0131)							
<i>Heterogeneity score_{ijt,Transports}</i>	7.4262*** (0.9063)	4.5802*** (1.5053)	4.5382*** (1.3335)							
<i>Heterogeneity score_{ijt,Distribution}</i>	-2.6660** (1.2635)	-0.0478 (1.2973)	-0.1760 (1.1358)							
<i>Overall Heterogeneity score_{ij,t}</i>				-0.7853 (1.4684)	-1.9970** (0.9403)	-1.9580** (0.7790)	-3.6875 (2.5580)	-10.5709*** (4.0161)	-10.5012*** (3.6055)	5.5081 (3.7381)
<i>Overall Heterogeneity score_{ij,t} *STRI_{i,t}</i>							1.7509 (6.3114)	24.4309* (12.7066)	24.7319** (10.1811)	3.5286 (9.8911)
<i>Overall Heterogeneity score_{ij,t} *STRI_{j,t}</i>							7.1538 (5.2705)	13.6079 (11.8198)	13.1989 (11.3372)	-28.1474* (14.7670)
<i>RTA_{ij,t}</i>	0.4871*** (0.1688)	0.2976** (0.1251)	0.4308*** (0.1169)	0.6589*** (0.1711)	0.3469*** (0.1204)	0.4748*** (0.1127)	0.5916*** (0.1767)	0.3624*** (0.1196)	0.4876*** (0.1116)	-0.1041 (0.0879)
<i>Ln(1 + tariff_{ji,t})</i>	-0.2104*** (0.0438)	-0.3201*** (0.0527)	-0.3496*** (0.0470)	-0.1444*** (0.0413)	-0.3055*** (0.0548)	-0.3335*** (0.0488)	-0.1609*** (0.0425)	-0.2592*** (0.0600)	-0.2875*** (0.0533)	-0.0137 (0.0127)
<i>Ln dist_{ij}</i>	-1.3052*** (0.1466)	-1.7233*** (0.1127)	-1.7478*** (0.1023)	-1.0835*** (0.1592)	-1.6728*** (0.1127)	-1.6967*** (0.1006)	-1.0834*** (0.1612)	-1.6838*** (0.1119)	-1.7086*** (0.1001)	
<i>lang_{ij}</i>	0.0362 (0.1256)	0.1300 (0.0983)	0.1800** (0.0857)	-0.0065 (0.1543)	0.1336 (0.1011)	0.1756** (0.0890)	0.0022 (0.1516)	0.1562 (0.1004)	0.1977** (0.0884)	
<i>border_{ij}</i>	0.8252*** (0.1355)	0.7224*** (0.0793)	0.7311*** (0.0751)	0.9329*** (0.1631)	0.7606*** (0.0850)	0.7735*** (0.0799)	0.9195*** (0.1600)	0.7523*** (0.0832)	0.7654*** (0.0786)	
Exporter-Importer Controls	Yes	No	No	Yes	No	No	Yes	No	No	No
Time-FE	Yes	No	No	Yes	No	No	Yes	No	No	No
Sector-FE	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	No
Exporter-time-FE	No	Yes	No	No	Yes	No	No	Yes	No	No
Importer-time-FE	No	Yes	No	No	Yes	No	No	Yes	No	No
Exporter-time-Sector-FE	No	No	Yes	No	No	Yes	No	No	Yes	Yes
Importer-time-Sector-FE	No	No	Yes	No	No	Yes	No	No	Yes	Yes
Country-pair-sector-FE	No	No	No	No	No	No	No	No	No	Yes
R ²	0.732	0.923	0.9374	0.666	0.919	0.9361	0.671	0.920	0.9365	0.9935
Observations	24867	24867	24763	24867	24867	24763	24867	24867	24763	23091
Chi-2			2196.98***			1848.69***			1925.97***	5.88

Notes: The dependent variable is nominal bilateral food product from i to j at to t in sector k as in equation (1.3). Regressions 3, 6, 9 10 are performed using the ppmlhdfc STATA command written by Correia, Guimarães, Zylkin (2019). Exporter-importer controls are the GDP of both countries. Standard errors are reported in parentheses and clustered by country-pair level. *, **, *** denote significance at the 10% 5% and 1% level respectively.

Interestingly, our interaction variables have positive and significant signs between the exporter's STRI and the regulatory heterogeneity index. The negative sign of the regulatory difference and the positive sign of our interaction term suggest that the negative effect of the regulatory difference on food exports decreases with exporter country restrictions. Indeed, the impacts of regulatory heterogeneity decrease if the exporter country is closed to service providers (Table 1.9).²⁴

The regulatory difference has significant effects on trade in services if both countries are open to service providers and less significant effects if they are completely closed (Nordås and Rouzet, 2016). In this case, the restrictions imposed by each country are still the main barrier to entry for service providers. In the food industry, the regulation of services in the exporter country is a barrier to trade. The services of the exporter country are key factors for production and export: if a country is closed to service providers, that will impact its export performance. This explains the positive and non-significant sign of the second interaction term. These results become non-significant when including country-pair fixed effects. The reason is that the annual change in regulatory disparity between country-pairs and specific STRIs is lower in many sectors (see Table 1.10).

Table 1.9: Change in bilateral trade from a 0.05 point change in STRI heterogeneity (%)

$STRI_i$	Change in bilateral trade (%)
0.05	37.07
0.1	33.06
0.15	28.79
0.2	24.25
0.25	19.41
0.3	14.28
0.35	8.81
0.4	2.99

Source: Author's calculation

²⁴The percentage change in exports from a 0.05 points reduction in the STRI heterogeneity index is : - $[\exp(0.05*(-10.5012 + 24.7316*STRI_i)) - 1]*100$. The calculation in Table 1.9 is based on the regression data described in Table 1.8 column 9. We consider the exporter's STRI because the coefficient of the importer's STRI is not significant.

Table 1.10: Annual average change in STRIs from 2014 to 2018

Time	<i>Regulatory Heterogeneity</i>		<i>STRI exporter</i>		<i>STRI importer</i>	
	Values	Change in points	Values	Change in points	Values	Change in points
2014	0.2291		0.2309		0.2334	
2015	0.2288	-0.0003	0.2329	0.002	0.2329	-0.0005
2016	0.2257	-0.0031	0.2332	0.0003	0.2332	0.0003
2017	0.221	-0.0047	0.2323	-0.0009	0.2323	-0.0009
2018	0.2213	0.0003	0.2313	-0.001	0.2322	-0.0001

Source: Author's calculation using OECD STRI database

1.8 Robustness check

Our main estimates of the gravity model suggest significant negative results of restrictions in logistics and transport sectors on food exports. A high STRI in the finance and other business sectors is associated with low food imports. In addition, restrictions in the distribution sector have positive effects on trade. We performed various robustness tests to assess the sensitivity of our results.

The first tests focus on the effects of individual importer and exporter country restrictions on bilateral food exports. We study the effects of country-specific restrictions on food trade. Adding the importer and exporter STRIs into our equation, we examine their effects on trade. Both indices have significant and negative effects on food trade (column 3 of Table A.4), but the STRI of the exporter country has much greater impacts than the importer country's STRI: A 0.05 point increase in the STRI leads to a decrease in food exports and imports respectively by 15.74 and 7.40 percent. The results are carefully considered because we did not consider the country sector time fixed effects to control for the omitted variables. If we compare these results with those of our terms of interactions we can see that the exporting country's restrictions have a higher significant negative impact on food trade (Nordås and Rouzet, 2016).²⁵ The same results are found when controlling for omitted variables.

The second test includes other control variables. We consider dummy variables that control for economic integration such as the EEA, and NAFTA.²⁶ We also consider economic integra-

²⁵These authors find that the STRI has more negative effects on the performance of services exports than imports.

²⁶We include dummy variables that represent the European Economic Area (Intra EEA) to control for the deeper integration in services, and North American Free Trade Agreement (NAFTA), which is a major trade agreement on commodities.

tion agreements (EIA) with provisions for harmonization of SPS and TBT standards.²⁷ We find the same effects observed above (see columns 4, 5, 6 and 7 of Table A.4).

The analysis of the sectoral bilateral STRI shows negative and significant impacts in the sectors of cargo-handling, freight forwarding and customs brokerage logistics. In the financial and other business sector, the banking and accounting sectors have limiting and significant effects on food trade. In transportation, the restrictions in road freight and sea are barriers to food trade. Overall, restrictions in logistics, financial, other business sectors and distribution sectors have more significant effects on food trade (Table A.5).

The last robustness tests attempt to study the performance of our results on the negative impacts of regulatory disparity on food exports. To evaluate these results, we consider the regulatory disparity between net food exporter and net food importer countries according to UNCTAD classification, and the regulatory disparity between OECD countries and emerging countries, which is still greater than the disparity between OECD countries (see Table A.3). The disparity between the ten countries with high and low value added of services to GDP according to World Development Indicators data and that between EEA and EU countries (lower restrictions) are evaluated. The results are presented in Table A.6. Overall, the disparities in logistics, finance, and other business sectors have negative effects, while transport has positive effects on exports. Disparities between net exporting and net importing countries and between OECD and emerging market countries do not have significant effects on the sectors considered, although the free movement of goods, services and people in the EU and EEA countries, the regulatory disparity in logistics, finance and other business sectors are barriers to trade in food products.

1.9 Conclusion

This study is an extension of previous studies on the impacts of services restrictions on international trade. However, it differs from earlier studies because we examine restrictions in the services sector on food trade, a topic not widely studied in the literature. Our analysis suggests that deregulation of the services sector and harmonization policy are highly beneficial for food trade.

²⁷The EIA database was compiled by Baier and Bergstrand (<http://www.nd.edu/~jbergstr/>). It provides detailed and useful information on EIAs and links to the legal text of the agreements.

Our paper, which investigates the impacts of service regulations on food trade, presents a tool for quantifying service restrictions and assesses these effects on trade flows. We start with a gravity analysis using panel data on pooled bilateral trade in food products between OECD countries from 2014 to 2018. To estimate restrictions in services, we use the Service Trade Restrictiveness Index and the Regulatory Heterogeneity Index of the OECD. Restrictions in logistics, transportation, financial, other business sectors, and distribution are considered in our study.

We found that the STRI in the logistics and transportation sector is negatively associated with food exports. Restrictions in the financial and other business sectors limit food imports. Moreover, restrictions in distribution have positive and significant effects on exports and imports. The most affected sectors are food, live animals and perishable products (milk, eggs, and meat). Regulatory disparity in the logistics sector is a barrier to trade, but disparity in the transport sector has positive and significant effects on food exports. By contrast, the overall disparity in the services sector has a significant negative impact on food trade. This impact decreases when the exporting country is closed to service providers.

The results appear robust to alternative specifications. Several different aspects were analyzed. First, we estimate the effects of country-specific STRIs on food trade. Second, other control variables are introduced in our estimates. The restrictions have greater negative effects on exports than on imports and confirm our findings that restrictions in logistics, distribution, finance and other business sectors have significant effects on trade flows. A sectoral analysis shows that restrictions in cargo-handling, freight forwarding, customs brokerage, banking, accounting, road freight and sea transport are barriers to food trade. The effects of regulatory disparity on exports are tested further. Regulatory disparity was analyzed between net exporting and net importing countries, the ten countries with high and lower services value added to GDP, between OECD and emerging countries, and EEA and EU member countries. The results show that regulatory disparities in logistics, finance, and other business sectors have significant negative effects, while regulatory disparity in transportation has positive effects.

Our study differs from the existing literature, but is limited by the data. Indeed, service restriction indices are time-invariant composite measures for some sectors, and the data are also short-run in order to capture the effects (2014-2018). Regulations are adjustment policies that

require time for firms or exporters to comply with them. Therefore, the data do not capture the effects on trade over the long run. However, we can improve our study by considering the Intra-EEA regulation of services in our study in order to take into account the effect on trade of preferential treatment subject to service providers in economic integration areas. It will be interesting to see the effects of the disaggregated STRI in the distribution sector on food trade. The effects of STRI may vary depending on the type of index used.

This study on the impacts of services restrictions on food products shows that services regulation has detrimental effects on export performance and import penetration in OECD countries. The novel conclusion is that regulatory cooperation in services between countries has become a relevant factor in global food trade. Regulatory harmonization in economic integration zones significantly boosts trade flows.

The effects of restrictive measures on cross-border investment: Evidence from OECD and emerging countries[†]

2.1 Introduction

Foreign direct investment (FDI) has become more and more important in economic growth and globalization in the last years. Indeed, FDI can increase productivity and change the comparative advantage of host countries. The establishment of multinational firms, capital accumulation, or delocalization can reduce unemployment, income inequality, poverty, improve technology transfer, and increase product variety through innovation (Hale and Xu, 2016; Dritsaki and Stiakakis, 2014). The empirical literature suggests a positive correlation between FDI and economic growth (Iamsiraroj and Doucouliagos, 2015). However, several factors determine the massive inflow of FDI into a country and its effectiveness in economic growth (Alfaro et al., 2004; Li and Liu, 2005; Batten and Vo, 2009; Desbordes and Vicard, 2009). A strong macroeconomic framework with competitive and effective policies is necessary and contributes to attracting more FDI into a country (tax rates, restrictions on financial transactions, legal framework, economic and political stability, etc.). Indeed, an investment environment that considers the local institutions, regulations and policies in which companies operate, stimulates economic growth by encouraging the firms to invest. In this case, the regulation has an impact on job creation and sustainability (World Bank, 2005). The positive link between FDI and growth is stronger in open economies with an educated workforce and developed financial markets (Bodman and Le, 2013). Moreover, some analyses have showed the positive link between FDI inflows and low economic policy uncertainty (Gulen and Ion, 2015).

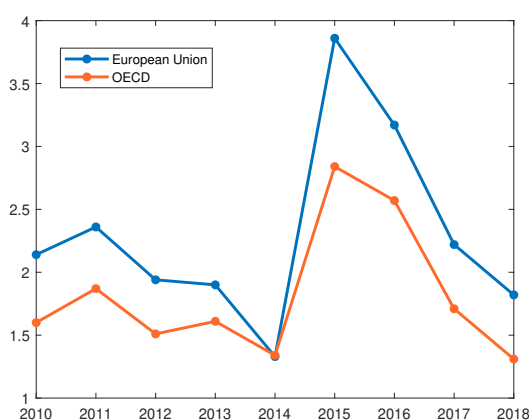
Studies showing the relationship between FDI and regulation suggested that the FDI sector is

[†]This chapter has been accepted for publication in the *The World Economy*, forthcoming.

far less liberalized than trade in goods and services (Ghosh et al., 2012). Although regional, bilateral, and multilateral trade and investment agreements have reduced formal barriers, restrictions are still significant in some countries and affect FDI. The regulatory framework plays a key role in FDI flows. Indeed, the regulation has a profound and durable impact on a firm's financial choices and is seen as a crucial driver of investment. To encourage FDI, the authorities must reduce the costs, minimize the risks associated with investment, and create an appropriate climate for the domestic economy. The regulation must be both optimal and competitive, protecting the investors from potential risks, promoting competition among the firms across borders, and protecting consumers from higher prices.

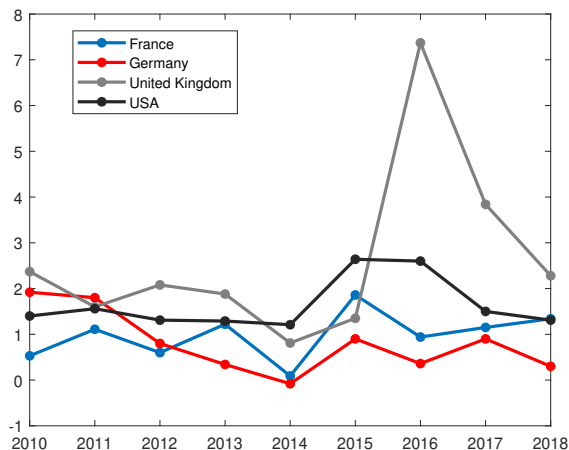
In 2018, inward FDI represented about 2% of GDP in the EU and 1.3% of GDP in OECD region (see Figure 2.1). But we note that between 2016 and 2018, foreign investments have dropped by around 3.2 to 2% of GDP in the EU and by almost 2.7 to 1.3% on average in the OECD area, which is contrary to the acceleration of GDP and trade growth. These trends are more significant in advanced countries than emerging countries (see Figures 2.2 and 2.3). In this year, some 55 economies introduced at least 112 measures affecting foreign investment. Two thirds of these measures sought to liberalise, promote and facilitate new investment (falling since 2016). Almost a third of these measures are new restrictions (increasing since 2016) (UNCTAD, 2019). How can we explain the decline in foreign investment? Is it a consequence of restrictive or sub-optimal policies? What is the real impact of restrictive measures on investment? Did the restrictions stimulate capital accumulation in the markets?

Figure 2.1: Inward FDI flows, % of GDP, 2010-2018



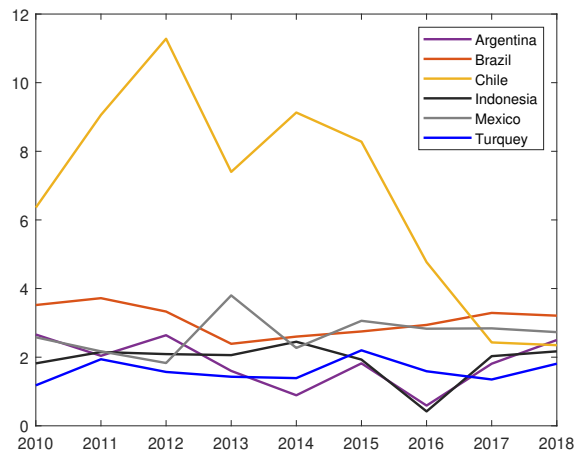
Source: OECD database

Figure 2.2: Inward FDI in advanced countries as % of GDP, 2010-2018



Source: OECD database

Figure 2.3: Inward FDI in emerging countries as % of GDP, 2010-2018



Source: OECD database

This paper examines the effects of global and sectoral restrictive measures on FDI among 49 advanced and emerging countries from 2010 to 2019. The existing empirical literature on the effects of restrictions on FDI has shown negative impacts of restrictive measures on FDI (Nicoletti et al., 2003; Ghosh et al., 2012). Some studies have underlined the restrictive effects of measures on cross-border M&A in the secondary sector and non-financial services (Gregori and Nardo, 2021). Others have highlighted the negative effects of these measures on cross-border M&A in the services sector (Mistura and Roulet, 2019). Mistura and Roulet (2019) investigate the impacts of restrictions on global inward FDI and cross-border M&A across 60 advanced and emerging countries from 1997 to 2016, and Gregori and Nardo (2021) analyze the effects on EU member countries from 2011 to 2018. Few studies have empirically measured the impact of sectoral restrictive measures on overall inward FDI between advanced and emerging countries.

Our paper contributes to the literature about the effects of restrictive measures on FDI in advanced and emerging countries. However, it is innovative in 3 aspects .

First, similar to Mistura and Roulet (2019), we estimate through an augmented gravity model the effects of restrictive measures on cross-border FDI in 49 developed and emerging countries from 2010 to 2019. We use the OECD FDI Regulatory Restrictiveness Index that captures barriers to FDI entry in 22 economic sectors across 69 countries. The index measures institutional

factors that could influence FDI, such as restrictions on equity or key personnel for foreign investors, limitations on the establishment of branches, and clauses on profit and capital repatriation. Moreover Mistura and Roulet (2019) investigate the effects of restrictions on global FDI across advanced and emerging countries in 2001 to 2012 and on M&A from 2001-2016. Our paper provides a more recent analysis of the effects of restrictions on global FDI among advanced and emerging countries from 2010 to 2019. It considers the latest international guidelines for compiling foreign direct investment (FDI) statistics.¹ Second, Mistura and Roulet (2019); Gregori and Nardo (2021) study the effects of different types of restrictive measures on FDI. Our model examines in more details the impact of global and sectoral restrictive measures on cross-border FDI. We consider FDI restrictions in the primary, secondary, and tertiary sectors, and further investigate the more disaggregated sectoral effects. The last contribution relates to the type of country considered. Contrary to Mistura and Roulet (2019), who analyze the effects of restrictions on FDI between OECD and non-OECD countries, we examine these effects at three levels: first, a study on FDI between advanced countries (intra-OECD), then among OECD countries and emerging countries (BRICS and some Latin American and Asian countries), and finally between OECD countries and middle-income countries (North African countries and South Africa).² Indeed, depending on type of economy, the impacts of sectoral measures are different. OECD countries have a more service-oriented economy, emerging countries have a manufacturing and primary sector-based economy and the economy of African countries depends on agriculture and natural resources.

Our results suggest that overall restrictive measure has negative and non-significant effects on cross-border FDI across OECD countries, while restrictions in the services sector are negatively and significantly associated with inward FDI. Indeed, an increase of 0.05 points in FDI restrictions in this sector decreases inward FDI by about 12.29%. Moreover, the overall restrictive measures and those in the primary, secondary and tertiary sectors have negative and significant effects on inward FDI among OECD and emerging countries. A 0.05 point increase in global and sector-specific restrictions is associated with a decrease in inward FDI by 15.24, 10.67, 15.77 and 13.07% respectively. The restrictions in the primary sector are a main obstacle to inward FDI in the big emerging countries. In addition, global and sectoral restrictions do

¹In 2014, many countries implemented the latest international guidelines for compiling foreign direct investment (FDI) statistics (OECD, 2015).

²The countries with FDI restrictive measures data available in our sample are North African countries and South Africa, see Table B.1.

not have a significant effect on FDI between advanced and African countries. The analysis of disaggregated sectoral restrictive measures shows that the restrictions in business and other financial services are negatively associated with intra-OECD FDI, while those in the banking and insurance sector have non-significant effects on inward FDI. This paper also shows the restrictive impact of services sector measures on intra-OECD FDI using the OECD's Services Trade Restrictiveness Index (STRI). Furthermore, the restrictive measures in the manufacturing sector have restrictive impacts on inward FDI in emerging countries, most pronounced in the BRICS countries, and those in the mining, quarrying, and oil extraction sector are barriers to inward FDI in African countries. Reforms to liberalize sectoral restrictions by country have positive effects on FDI, but deregulation of the services sector has beneficial effects on inward FDI from developed and emerging countries.

The remainder of this paper is structured as follows. The next section documents recent literature on the effects of FDI regulation on investment. In the second part, we describe our econometric model with data, sources, and the type of regression used. The third section presents and discusses the results and formulates policy recommendations.

2.2 Literature review

Empirical studies that examine the impact of restrictive measures on FDI use two main indices. Some authors study the effects of restrictions on FDI using the FDI Regulatory Restrictiveness Index of OECD and others the indexes of capital account restrictions based on IMF's AREAER database.³

Authors such as Nicoletti et al (2003), based on the original version of the index created by Golub (2003)⁴ and the OECD's PMR⁵, explore the effects of FDI restrictions and other policies on foreign direct investment in a panel of 28 OECD countries between 1980 and 2000. The paper uses a gravity model to control bilateral outward FDI flows and a dynamic panel model to explain total multilateral inward FDI stocks. Their results suggest that FDI restrictions could reduce bilateral outward FDI stocks by between 10% and 80% on average, depending on the

³Database on the exchange rates and trade regimes of all members of the International Monetary Fund (currently 189 countries) and three territories (Aruba, Hong Kong SAR, and Curaçao and Sint Maarten - formerly the Netherlands Antilles).

⁴The first to construct the aggregate index of FDI restrictions.

⁵Product Market Regulation index.

type of restriction. Inward FDI stocks are also impacted by FDI restrictions, but the results should be treated carefully due to the lack of variability of restrictions across OECD member countries. The analysis of Ghosh et al (2012) similar to the previous one shows the impact of restrictions on inward FDI stocks using panel data (1981-2004) for 23 OECD countries. Based on the FDI Restrictiveness Index of Golub (2003) and Koyama and Golub (2006) and a gravity model, they find significant negative effects of restrictions on inward FDI stocks. To determine the short- and long-run effects of the restrictions, they use an autoregressive distributed lag model. Their results show that the short-run elasticity estimated was between 0.06 and -0.14, and the long-run elasticity between -0.64 and -1.49.

The analysis of Ahrend and Goujard (2012) indicates that FDI restrictions may contribute to greater risks of financial crisis. Indeed, higher restrictions in OECD countries, measured by OECD indexes, and anti-competitive product market regulation have contributed to reduced financial stability. That is due to a rise of countries' debt over FDI or capital investment. By contrast, more stringent capital regulations for banks and more openness to foreign bank entry have reduced the vulnerability to financial contagion. Fournier (2015) examines the determinants of foreign direct investment (FDI) from 1998 to 2013, including FDI restrictions. Using gravity models and the recent version of the OECD FDI restrictiveness index, he finds a significant negative impact of restrictions on FDI stocks after controlling for various political and structural determinants of bilateral FDI.

Recent studies examining the impacts of restrictive measures on FDI through the OECD FDI Regulatory Restrictiveness Index are those by Mistura and Roulet (2019) and Gregori and Nardo (2021). They differ from those mentioned above because they examine the effects of restrictions on aggregate FDI, sectoral FDI, and M&A. They also examine the impact of different types of restrictions such as foreign equity limitations, screening or approval mechanisms, restrictions on the employment of foreigners as key personnel and operational restrictions. Mistura and Roulet (2019) find that reforms liberalising FDI restrictions by about 10 percent could increase bilateral FDI in stocks by 2.1 percent on average. The effects are greater for FDI in the services sector, but also in manufacturing sectors which are typically open to FDI. The effect of reducing foreign equity limitations is the strongest, and foreign investment screening policies significantly curb FDI, but to a much lower extent. Gregori and Nardo (2021) show that the presence of formal screening procedures does not negatively affect cross-border in-

vestment on average. Other restrictive policies, such as licensing requirements, quantitative limitations, restrictions to the market access and activity of foreign companies limit M&A flows. This is particularly relevant in the manufacturing and non-financial services industries, where M&A flows are negatively affected by restrictions on foreign personnel being employed in key positions, and restrictions on the establishment of branch offices, land acquisition, or profit and capital repatriations. Their results are also in line to the literature about the effects of regulation on trade in services. Indeed Van der Marel and Shepherd's (2013) examine the relationship between trade in services and regulation. They find a negative relationship between regulatory restrictiveness and trade flows, with the effects varying across sectors. Nordås and Rouzet (2017) confirm this result by explicitly excluding FDI.⁶ In their gravity model relating trade in services with regulatory restrictions, tighter restrictions decrease trade, with the exports of services more impacted than imports.

Contrary to the above studies, Binici, Hutchison and Schindler (2009) apply an index of capital restrictions based on IMF's AREAER information, by asset class and covering 74 countries over the period 1995-2005. They study the effects of FDI and equity portfolio investment restrictions on total inward and outward FDI and equity portfolio investment. The results suggest that restrictions control capital outflows, not inflows. The study of Arbatli (2011) similar to the previous one, uses capital account restriction indices based on IMF's AREAER database. Through a binary index of FDI restrictions, he investigates the determinants of FDI flows into emerging economies. The author creates two binary indicators of FDI restrictions: one that assesses the existence of any restrictions on FDI inflows; and one that captures restrictions on the liquidation of direct investment. He uses a dynamic panel model approach to model FDI flows and data for 46 countries over 20 years. The results suggest that FDI capital restrictions have a significant negative effect on inward FDI, but no significant effect was found for restrictions on the liquidation of investment.

2.3 Theoretical gravity model for FDI

Gravity model, is increasingly used when investigating determinants of FDI flows.⁷ Head and Ries (2008) provide theoretical micro-foundations for a gravitational model of FDI and

⁶They consider three modes of service supply (cross-border supply, consumption abroad and movement of people).

⁷Wei (2000) or Bénassy-Quéré et al. (2007).

motivate its application for modelling bilateral FDI as well as trade flows.

The framework used in this paper is based on recent advances in the literature on gravitational models (see Yotov et al., 2016). In particular, we apply the gravity modeling approach for FDI developed by Anderson et al (2016, 2017). Indeed, their model shows how trade and FDI are linked and how they respond to natural or man-made barriers to trade and investment.

In particular, Anderson et al (2016, 2017) model focuses on the interpretation of FDI based on technological capital or knowledge capital. A given stock of technological capital (patents, plans, management skills, etc.) can be used simultaneously in more than one country. The value of knowledge capital increases when it can be "leased" to other countries as FDI. Since knowledge capital flows are largely intangible and therefore difficult to measure, bilateral FDI stock will be used as a proxy indicator of knowledge capital flows between two countries.

FDI from country i to country j is as follows: FDI_{ij}^{stock} . It is positively influenced by the size of source country (E_i), as large economies tend to invest more in technological capital. The stock of bilateral FDI is also positively influenced by the size of destination country (Y_j), as large economies can in principle absorb more foreign technology. If the size of the aggregate stock of technological capital in country i is denoted by M_i , the ratio $\frac{Y_j}{M_i}$ can be considered as a gross measure of the potential absorptive capacity of country j for FDI-related technological capital from country i . FDI flows are impeded by obstacles or frictions. For FDI, the relative openness of country j to foreign technologies can be represented by w_{ij} , which has values from 0 to 1. If $w_{ij} = 1$, country j is fully open to the entry of technological capital from country i , while in the case of $w_{ij} = 0$, no technological capital from country i is allowed. All these factors are the main determinants of the bilateral stock of FDI.⁸ The general formulation is as follows:

$$FDI_{ij}^{stock} = w_{ij}^{\eta} \frac{\alpha E_i}{P_i} \frac{Y_j}{M_j} \quad (2.1)$$

With E_i measures the size of country i as a total expenditure, including expenditures for the development of technological capital; Y_j is a measure of the size of host country j . The parameter η is the elasticity of FDI revenue flows with respect to the measure of openness. More openness in country j will lead to more frequent use of the technology stock, which will lead to an increase of FDI revenues. The other elements of equation (2.1) come from the

⁸Time indices are omitted in this representation.

structural gravity system for trade, in which the FDI determinants are integrated. α groups a set of fixed parameters from the theoretical model.⁹ Finally, P_i is the inward multilateral resistance term of the gravity trade model. They aggregate the bilateral trade costs of country i with all other countries:

$$P_i = \left[\sum_{j=1}^N \left(\frac{t_{ji}}{\Pi_j} \right)^{1-\sigma} \frac{Y_j}{Y} \right]^{\frac{1}{1-\sigma}} \quad (2.2)$$

With t_{ji} represents the bilateral trade-cost frictions (bilateral distance, having different languages, common border..) that increase bilateral trade cost. $Y = \sum Y_j$ is world production or world GDP, used to normalize the size of destination country (Y_j), and σ is the elasticity of substitution from CES functions used to aggregate multilateral resistance (MR) terms.¹⁰

World trade is a fully integrated system, equation (2.2) also contains the term Π_j , which represents the outward multilateral trade resistances of country j . It aggregates the bilateral trade costs of country j with respect to all other countries. The gravity system of the FDI becomes:

$$\Pi_j = \left[\sum_{i=1}^N \left(\frac{t_{ji}}{\Pi_i} \right)^{1-\sigma} \frac{E_i}{Y} \right]^{\frac{1}{1-\sigma}} \quad (2.3)$$

The intuition for understanding the relation of equation (2.3) with bilateral FDI is that higher relative trade costs in host country j increase its domestic prices and thus lower the country's real potential for absorbing foreign technology capital (FDI).

The first authors who estimated bilateral FDI using a gravity model are Bénassy-Quéré et al. (2005). They study the impacts of FDI determinants on horizontal FDI. In their model, bilateral FDI stocks depend on both economies' GDP, the determinants of supply and demand, and the distance between capital. However, recent theoretical developments have provided other foundations for the application of a gravity model to other FDI models (Kleinert and Toubal, 2010; Bergstrand and Egger, 2007; Head and Ries, 2008; De Sousa et al., 2012; Heid and Larch, 2016 and Nordås and Rouzet, 2017).¹¹ Bergstrand and Egger (2007) implement a

⁹These include parameters such as the depreciation rate, the utility function discount factor and other parameters that are used in the underlying theoretical model (see Anderson et al., 2016, 2017).

¹⁰With $\sigma > 1$, the elasticity of substitution shows that all countries have a preference for a variety of products and technological capital by origin country.

¹¹The studies combine both horizontal and vertical FDI.

gravity model of FDI by including several aspects of FDI (foreign direct investment (FDI), foreign affiliate sales (FAS) and multinational companies (MNEs). However, Head and Ries (2008) develop a gravity model of FDI by considering the M&A process, in which the holding company tries to control the assets abroad.

2.4 Model and estimation issues

In our empirical analysis, we examine the impacts of restrictions on FDI stocks between OECD and emerging countries. Using the model of Anderson and Van Wincoop (2003); Anderson et al (2016, 2017), our baseline regression equation is the following:

$$FDI_{ij,t} = \exp[\beta_0 + \beta_1 \ln(FDI_{ij,t-1}) + \beta_2 FDI RI_{j,t-1}^s + \beta_3 t_{ij,t-1} + \beta_4 \ln(GDP_{i,t-1}) + \beta_5 \ln(GDP_{j,t-1}) + \beta_6 X_{j,t-1} + \alpha_i + \phi_j + \gamma_t + \varepsilon_{ij,t}] \quad (2.4)$$

With $FDI_{ij,t}$ represents FDI positions (stocks) from country i (the reporting or source country) to country j (the partner or host country) in period t (2010-2019) = $\frac{FDI_{ij,t}}{GDP_{deflator(ij,t)}}$. FDI are calculated by dividing FDI stocks (in U.S. dollars) by the average of the source and host country GDP deflators to remove inflation. $FDI_{ij,t-1}$ is one-year lagged dependent variable (Egger and Merlo, 2007).¹² Following Mistura and Roulet (2019), all explanatory variables are lagged by one year to reduce potential endogeneity issues. $FDI RI_{j,t-1}^s$ is our interest variable (FDI Regulatory Restrictiveness Index), i.e. the restrictive measures on FDI implemented in the destination country j at the time t-1 in the sector s (s= primary, secondary and tertiary sectors). It is measured by the OECD FDI restrictiveness index. $t_{ij,t-1}$ includes time-invariant bilateral control variables, i.e. bilateral distance, common language, common border, colonial links (Blonigen and Piger, 2014)¹³ and time varying variables such as regional trade agreements (RTA), bilateral investment treaties (BIT) and human capital dissimilarity ($HCD_{ij,t}$). According to Ethier and Markusen (1996), the difference in factor endowments can affect inward FDI.¹⁴ We include standard gravity variables, specifically the GDP of both the origin

¹²They argue that ignoring the dynamic nature of FDI could lead to an overestimation of the effect of bilateral factors.

¹³They identify as main enabling factors for inward FDI the traditional gravity variables such as cultural distance, difference in labor endowment, and the presence of trade agreements.

¹⁴Golub et al. (2003) define human capital dissimilarity as the difference in absolute value between the human capital index in the destination country and that in the source country $HCD_{ij,t} = | \ln(education_{jt} - \ln(education_{it}) |$.

country and the destination country. X_{jt} covers destination country specific characteristics such as regulatory quality (Bénassy-Quéré et al., 2007) and FDI determinants in destination country such as trade openness¹⁵, productivity, labour freedom index (Nordin et al., 2019), tax burden (Djankov, Ganser, McLiesh, Ramalho, and Shleifer, 2010).¹⁶ The variables used are detailed in Table B.2. α_i and ϕ_j represent source-host country fixed effect (dummy variables that control the inward and outward multilateral resistance terms). γ_t is a time fixed effect (capturing the global macroeconomic cycle) and ε_{ijt} is a error term. Standard errors are clustered by country pairs to control for potential heteroskedasticity and to limit the potential effect of persistence over time of FDI stock levels in each pair of countries, see Fournier (2015). β_2 is the coefficient of interest; according to the literature it is negative (Ghosh et al., 2012; Fournier, 2015; Mistura and Roulet, 2019).

Some values of our dependent variable are zero and the estimation using OLS leads to a bias (zero FDI is associated with high bilateral fixed costs). To avoid biased estimation results, we use the Pseudo-Maximum Likelihood estimator (PPML) suggested by Santos Silva and Tenreyro (2006) as in Chapter 1. We include in the estimation fixed effects by origin country to control for unobservable multilateral resistance terms (Olivero and Yotov, 2012).¹⁷

2.5 Data description

To analyse the effects of restrictive measures on FDI stocks between OECD and emerging countries, we use panel data across 49 countries from 2010 to 2019. Indeed, we consider OECD countries because inward and outward FDI account for a large share of GDP and we include emerging countries due to the high level of restrictions in FDI (see Figure 2.4). Annual data from 2010-2019 to explain the decline in inward FDI since 2016, and to consider the new FDI statistics introduced in 2014. Our dependent variable is aggregate bilateral FDI stock. The data are collected on OECD Foreign Direct Investment Statistics.¹⁸ The data cover a range of advanced and emerging countries in terms of origin and destination. However, we use

¹⁵Chakrabarti (2001) finds that a country's degree of openness to international trade is a relevant determinant of the FDI decision, because most investment projects concern the tradable sector.

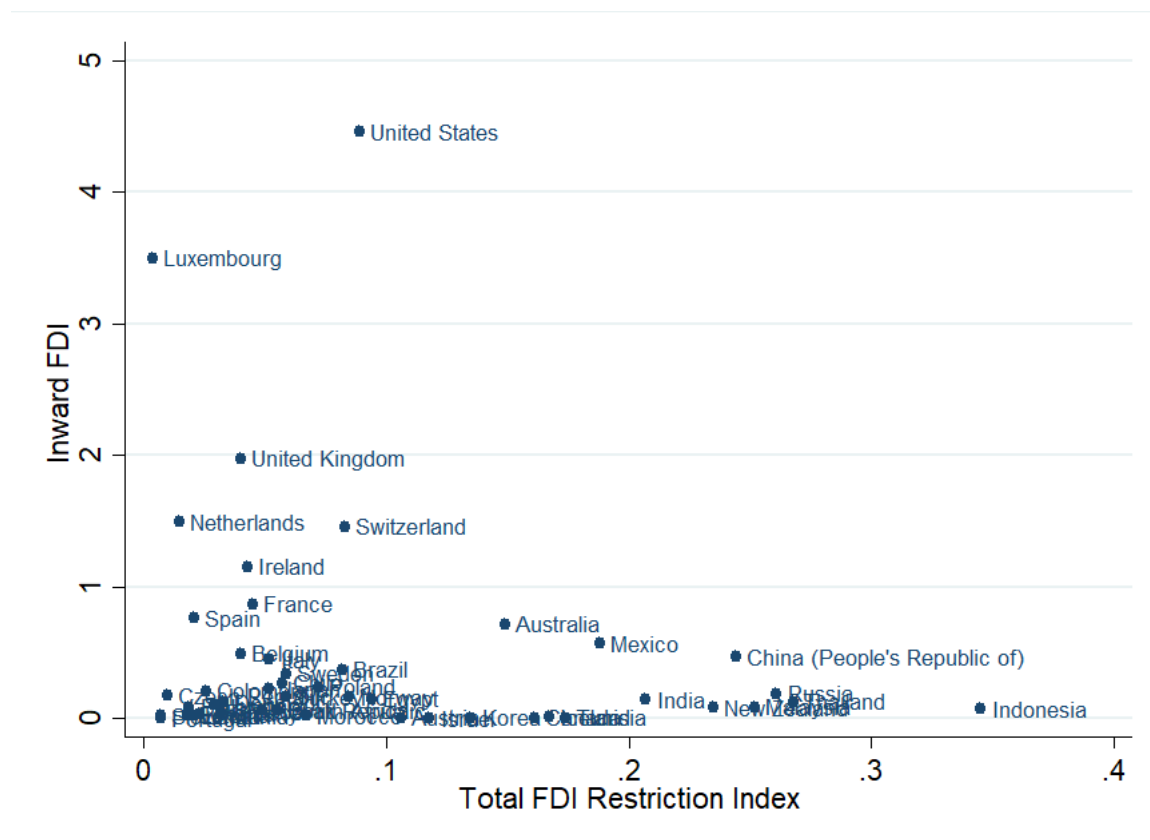
¹⁶They estimate, using cross-sectional survey data for 85 developed and developing countries, that corporate taxes always have a negative and significant effect on FDI inflows.

¹⁷We also estimated the model using destination country's dummies, but the model presents convergence issues (Santos Silva and Tenreyro, 2011).

¹⁸Data can be accessed at: https://stats.oecd.org/Index.aspx?DataSetCode=FDI_POS_CTRY.

the latest version set up by the OECD.¹⁹ This database highlights bilateral FDI between OECD member and non-member countries and runs from 2005 to 2019. It also highlights sectoral FDI (primary, manufacturing and service sectors).²⁰ Missing data (or non-reported, suppressed) and negative FDI are replaced by 0 in our case, to have a balanced panel (Kox and Rojas, 2019). Negative FDI positions largely result when the loans from the affiliate to its parent exceed the loans and equity capital given by the parent to the affiliate. This is most likely to occur when FDI statistics are presented by partner country. In this case, negative FDI stocks do not represent disinvestment. Disinvestment occurs in the case of FDI financial transactions when the direct investor sells its interest in a direct investment enterprise to a third party or back to the direct investment enterprise.

Figure 2.4: Correlation between FDI and restrictive measures, 2019



Source: OECD database

¹⁹Benchmark Definition 4th Edition (BMD4).

²⁰Sector-specific FDI data are not bilateral so the sectoral analysis will be conducted with the sectoral FDI restriction index.

Our interest variable captures the level of restrictiveness in FDI. We use FDI Regulatory Restrictiveness Index of OECD. Indeed, this variable measures the restrictiveness of the policies implemented in the FDI sector in 70 countries (36 OECD countries and 34 non-OECD countries). It gauges the restrictiveness of a country's FDI rules by looking at the four main types of restrictions on FDI:

- Foreign equity limitations.
- Screening or approval mechanisms.
- Restrictions on the employment of foreigners as key personnel.
- Operational restrictions, e.g. restrictions on branching and on capital repatriation or on land ownership.

The restrictions are also quantified in three sectors of activity: primary, secondary and tertiary. Restrictions are evaluated on a 0 (open) to 1 (closed) scale. Data are available for 1997, 2003 and 2006 and uninterrupted annual data for the period 2010-2019. Data collected from OECD FDI Regulatory Restrictiveness Index database. In addition, bilateral resistance variables such as the bilateral distance between the two capitals and binary variables (common border, language and colonial links) come from CEPII (Centre d' Etudes Prospectives et d' Informations Internationales) database. Binary variables such as regional trade agreements are obtained from the WTO (Regional Trade Agreements Information System, RTA-IS) and information on the signing and ratification of bilateral investment treaties is taken from UNCTAD's International Investment Agreements database. We consider the specific characteristics of the destination country that affect inward FDI such as regulatory quality (data available on Worldwide Governance Indicators). It refers to perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. The indicator is estimated yearly at the country level, in units of a standard normal distribution, ranging from approximately -2.5 to 2.5.

FDI determinants in destination countries such as tax burden and labour freedom index are collected on The Heritage Foundation database.²¹ Tax burden is a composite measure that reflects marginal tax rates on both personal and corporate income and the overall level of

²¹<https://www.heritage.org/index>.

taxation (including direct and indirect taxes) imposed by all levels of government as a percentage of gross domestic product (GDP). The labor freedom component is a quantitative measure that considers various aspects of the legal and regulatory framework of a country's labor market, including regulations concerning minimum wages, laws inhibiting layoffs, severance requirements, and measurable regulatory restraints on hiring and hours worked, plus the labor force participation rate as an indicative measure of employment opportunities in the labor market. These two indices are graded on a scale of 0 (less flexible) to 100 (more open or flexible). Productivity are collected on OECD database.²² Human capital index is taken from Penn World Table database of Groningen Growth and Development Centre.²³ Trade openness, GDP of exporting and importing countries are extracted from the World Bank database (World Development Indicators)

2.6 FDI gravity results and discussion

This section presents and analyzes the empirical results. We estimate the effects of restrictive measures on FDI stocks between OECD, emerging and Africa countries from 2010 to 2019. Tables 2.4, 2.5 and 2.6 present the baseline gravity model results for cross-border FDI using the OECD FDI restrictiveness index. Table 2.4 presents the results of restrictions on bilateral FDI among advanced countries (intra-OECD) and Tables 2.5 and 2.6 respectively the results on cross-border FDI among advanced and big emerging countries and between OECD and middle-income emerging countries (African).²⁴ In order to determine whether the effects of FDI restrictions can be expected to differ for developed and developing economies, we include a dummy variable equals 1 if the destination country is an OECD member in year t and an interaction term with the variable of interest capturing their level of FDI restrictiveness (results presented in Tables 2.5 and 2.6). We confirmed the validity of our results using a series of robustness tests presented in Tables B.5 to B.10. We apply the PPML estimator to control for the zero FDI and heteroskedasticity issues, we also include country fixed effects to control for structural multilateral resistance. It controls for unobserved heterogeneity, but does not entirely resolve the "gold medal mistake" (Baldwin and Taglioni, 2006), because we need to

²²It measured by GDP per hour worked (U.S dollars).

²³This index refers to the number of years of schooling and return on education.

²⁴The estimated coefficients from regressions pooling wealthy and poor economies may fail to capture the true relationship between FDI and the explanatory variable of interest (Blonigen and Wang's, 2004).

include time-varying country fixed effects, which is not possible in our analysis because it significantly reduces the model's degrees of freedom (Raphael and François, 2020). Therefore, to better capture multilateral resistance and produce unbiased estimates, we include country and time fixed effects separately. In order to see the impacts of our fixed effects, we include in our first estimates all fixed effects (country and time) and secondly only the country fixed effects. Due to the high multicollinearity between the primary, secondary and tertiary sectors (Table B.4), we include only one of the three sector-specific indicators in the estimations.

2.6.1 Baseline results

In terms of variables of main interest - the FDI restrictiveness indices - we find that global FDI restrictions have a negative and non-significant effect on intra-OECD FDI (Columns 1 and 2 of Table 2.4). The reason is that the sectoral FDI regulation index is larger than the global index (see Figure 2.5). Moreover, these restrictions represent a barrier to cross-border FDI among OECD countries and the big emerging countries (Columns 1 and 2 of Table 2.5). The results are robust without time fixed effects. The introduction of reforms leading to a 0.05 point reduction in level of FDI restrictiveness could increase bilateral FDI inward stocks by around 15.24 percent on average (column 1).²⁵ The interaction between our dummy variable and the restrictive measures does not have a significant effect on FDI. The combined negative and significant effect of global restrictive measures and non-significant effect of our interaction term suggests that the negative effects of restrictions on FDI tend to be more accentuated for emerging economies.²⁶ This result confirms the findings of Mistura and Roulet (2019). Further, global restrictive measures do not significantly affect cross-border FDI between OECD and African countries (Table 2.6).²⁷

The sectoral analysis of FDI restrictive measures shows significant negative effects of restrictions in the services sector on intra-OECD FDI. The effect of a 0.05 point reduction in FDI restrictions in services is associated with a 12.29 percent increase in inward FDI (column 7 of Table 2.4). This is explained by the fact that services are the largest sector for inward FDI in the OECD area and also one of the most restrictive compared to other sectors (see Table 2.1 and Figure 2.5). Indeed, the manufacturing sector, excluding defense and military goods,

²⁵As in Chapter 1, the percentage change in inward FDI from a 0.05 point reduction in the FDI restrictiveness index is calculated as follows: $[\exp(-0.05 \cdot \text{coefficient}) - 1] \cdot 100$.

²⁶The reason is that global and sectoral restrictions, especially in services, are very high in emerging countries.

²⁷We have a limited sample of African countries, which could explain these results.

is the most open sector where countries generally allow foreign investment. In the primary sector, the location-specific and licensing-heavy nature of some of such investments (e.g., extractive industries) may offer relatively few alternatives for foreign investors. The existence of numerous taxes and royalties where economic rents are potentially high, as in the extractive industries, to capture a part of such rents for their nationals limits investment in this sector (Mistura and Roulet, 2019).

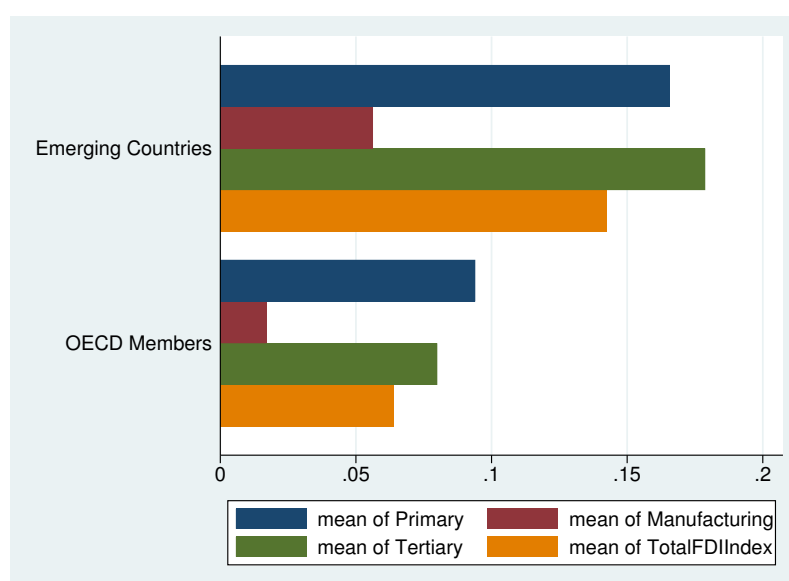
Table 2.1: OECD outward and inward FDI stocks by sector (% of total FDI)

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Years	2016		2017		2018		2019	
	Inward	Outward	Inward	Outward	Inward	Outward	Inward	Outward
Agriculture, forestry, fishing and mining	0.73	0.29	0.82	0.3	0.79	1.1	1.08	2.14
Manufacturing sector	23.04	21.99	23.98	22.71	22.87	23.44	23.07	20.6
Service sector	63.48	60.46	62.44	61.75	64.22	61.23	62.47	62.38

Source: Author's calculation based on OECD FDI data

Figure 2.5: OECD and Emerging countries FDI Regulatory Restrictiveness Index in 2019



Source: OECD FDI Regulatory Restrictiveness Index database

The study on FDI between advanced and large emerging countries suggests significant negative effects of restrictive measures in all three sectors (columns 3 to 8 of Table 2.5). A decrease of restrictions in the primary, secondary, and tertiary sectors by 0.05 points leads to an increase in inward FDI respectively by 10.67, 15.77 and 13.07 percent (columns 3, 5 and 7). The

effects are most pronounced in the secondary sector. Indeed, the greenfield investments and cross-border M&As in the world are significant in the manufacturing sector. In 2019, cross-border M&A sales in manufacturing are valued at \$243 billion, compared to \$227 billion in services and \$37 billion in the primary sector. The greenfield investments in the manufacturing sector are estimated at \$402 billion, compared to \$422 billion in services and \$21 billion in the primary sector (UNCTAD, 2021). The top industries in value terms are energy and gas supply, information and communication, electronics and electrical equipment, food, beverages and tobacco and pharmaceuticals. Interestingly, these restrictions have a greater impact on inward FDI in emerging countries than in advanced countries. This is particularly relevant when considering restrictions in the primary sector (columns 3 and 4). However, restrictive measures in all three sectors do not significantly affect FDI between advanced and African countries (columns 3 to 8 of Table 2.6).

The negative impacts of restrictive measures in FDI are due to high entry costs in the different sectors. In addition to acting as a barrier to entry, this result may also underscore a potential signaling effect of restrictions about the difficulties in doing business as a foreign investor, including outside of the restricted sectors. Services are the sectors that receive the most FDI and thus are the most affected by these restrictions.

In the different specifications, we also find the following effects: the standard gravity model variables such as distance, common language and colonial links have the expected signs and magnitudes and are statistically significant. Indeed, distance has negative and significant effects on cross-border FDI inflows among advanced and emerging countries as in the theory (Bénassy-Quéré et al., 2005; Basile et al., 2008). Binary variables such as common language and colonial links have positive and more significant effects on FDI between OECD and emerging countries. Moreover, the common border has negative and significant impacts on FDI inflows, which is contrary to the theory. This negative and significant sign is due to the substitutability between trade and FDI, especially between countries that share the same border (Gregori and Nardo, 2021).²⁹ This can be explained by the European Monetary Union (Brouwer et al., 2008, Martínez-San Román et al., 2016) and the single currency (Camarero et al., 2018; Alfieri, 2021). Regional trade agreements (RTAs) have significant positive effects on cross-border FDI. The impacts tend to be more meaningful between OECD and emerging countries. Our results support the idea developed by Carr et al. (2001) and Jang (2011). Bilateral investment treaties

²⁹There is also a complementarity between trade and FDI.

(BITs) have negative and significant effects on cross-border FDI, more pronounced effects on FDI across OECD and emerging countries. The BIT has different characteristics than the RTA, it protects the investor against risks in the market receiving the FDI. It therefore establishes transparency on the host country (Bergstrand and Egger, 2013). These agreements among advanced countries and emerging or developing countries (North-South investment) have much greater effects than North-North agreements (Kox and Rojas, 2019). BITs affect negatively FDI inflows when the political risk in a country is high whereas the opposite occurs when the risk level is low (Tobin and Rose-Ackerman, 2005).³⁰ This variable has negative and significant effects if the quality of institutions is bad.

If we consider the determinants and explanatory factors of FDI, the regulatory quality variable is positively related to cross-border FDI, highlighting the proactive role that public administration can exert to stimulate foreign investment (Gregori and Nardo, 2021). Trade openness attracts investment because of a complementarity between FDI and trade (Belke and Clemens, 2018). The dynamism of the destination economy has positive and significant impacts on FDI. These results confirm that the size of the destination country's market boosts cross-border investments by creating additional market shares, economies of scale, or reducing production costs for foreign investors (Eicher et al., 2012). Likewise, the dynamism of investing country is positively related to cross-border flows (Gregori and Nardo, 2021). The productivity measured by the GDP per hour employed is positively associated with FDI. Like the GDP of the destination country, productivity in the destination economy creates economies of scale and reduces production costs, which attracts cross-border FDI. The difference in relative human capital endowment has a negative and non-significant effect. As Gregori and Nardo (2021), the tax indicator does not have a significant effect on FDI flows, explained by the predominance of market factors over institutional aspects in driving cross-border investments (Gherghina, Simionescu and Hudea, 2019). Labor market flexibility attracts cross-border FDI. Indeed, labor market standards and regulations or any limitation placed on employment lead to labor market rigidity, which imposes costs on firms (Nordin et al., 2019).³¹

³⁰They find negative and more significant effects of BITs on cross-border FDI among advanced and emerging countries (where the political risk is higher).

³¹Their study argues that the growth-effect of FDI is possibly influenced by the flexibility of the labor market in the host country.

2.6.2 Robustness check

In this section, we performed several robustness tests to confirm our baseline results. First, we split our sample in two periods (2010-2014) and (2015-2019) and examine the different effects of restrictive measures on FDI between advanced and emerging countries including African countries. This test highlights two trends: the effects of the policy on international guidelines for the compilation of foreign direct investment (FDI) statistics implemented in many countries in 2014 and the impacts of the 2008-2009 financial crisis that led to a stagnation of FDI.³² We consider the different trends between 2010-2014 (effect of the crisis) and 2015-2019 (effect of the new policy for the compilation of FDI statistics). The results are presented in Table B.5 and Table B.6 and show more significant effects from 2015 to 2019 due to the financial crisis effects and confirm our results found above. However, during this period, global restrictive measures and those in the secondary sector are negatively and significantly associated with FDI across OECD countries. The effects in the secondary sector refer to the existing literature on the effects of restrictions in services on the performance of manufacturing firms (Ariu et al., 2019; Ariu et al., 2020; Amara, 2021). Indeed, restrictions on FDI in services have an impact on the productivity of manufacturing firms (increased costs of sourcing services) as they increasingly use services as an important input of manufacturing value added.

Interestingly, restrictive measures in the secondary sector boost FDI between OECD and African countries (2010 to 2014), with greater effects on inward FDI for African countries (Table B.5). The reason is that the index in this sector measures FDI restrictions in the food, chemical, metal, and electronics industries. Contrary to OECD countries where these sectors are developed with more competition, they are still nascent in North and South Africa with lower competition. An increase in restrictions in this sector leads to a rise in economic rents from FDI (Rouzet and Spinelli, 2016).

The second test investigates the effects of restrictive measures firstly on FDI between advanced countries and the BRICS countries³³, considered as large emerging countries, and finally between the OECD and the non-BRICS emerging countries in our sample. This test shows whether the effects are different depending on emerging countries' economic weight. The results presented in the Table B.7 show that the global restrictions and those in the three

³²Gregori and Nardo (2021) observed a stagnation of inward M&As in EU countries during 2011-14.

³³Brazil, Russia, India, China and South Africa.

sectors have negative and more significant impacts on the BRICS than on the other emerging countries.

The third test analyzes the robustness of the negative effects of restrictive measures in the service sector on inward FDI between OECD countries. We use the OECD's Services Trade Restrictiveness Index (STRI) as an alternative index to measure restrictions in the services sector.³⁴ The two indicators (STRI and FDI RI) are very similar in that they capture the restrictions affecting trade in services. Both indexes include in the overall measure the control on foreign entry perceived as very restrictive.³⁵ The basic difference between the two indexes is that for the STRI, information was collected by looking into each country's laws and regulations currently in force and identifying relevant restrictions, while the OECD FDI RI does not take into account the actual implementation of legal restrictions. It is based on statutory measures as reflected in official OECD instruments or identified in OECD Investment Policy Reviews and yearly monitoring reports. Therefore, the OECD STRI is broadly defined, capturing restrictions on any of the channels of international services trade, not just FDI (mode 3 "commercial presence" defined by the WTO). Our results presented in Table B.8 show negative and significant effects of both indicators on inward FDI in OECD countries.³⁶ This test confirms the negative effect of restrictive measures in the services sector on inward FDI among OECD countries (Jungmittag and Marschinski, 2020).³⁷

OECD inward and outward FDI in the services sector are the highest in comparison to the other two sectors (accounts for almost 60% of total FDI, see Table 2.1) and considering Table 2.2, foreign investments in the financial sector are the most significant of cross-border FDI in services. We then look at the effects of restrictions in the financial services sector on intra-OECD FDI. Using the two indexes in financial services, we find that the restrictions in this sector are negatively and non-significantly correlated with inward FDI (columns 3 and 4 of table B.8). Contrary to the financial sector, restrictive measures in the business sector have significant negative effects on intra-OECD FDI (columns 5 and 6).³⁸ A decline of the index by

³⁴The STRI information was outlined in Chapter 1, We use the measure of restrictions on foreign entry in the services sector.

³⁵Foreign equity limitations in FDI RI.

³⁶We considered the sample from 2014 to 2019 to compare the results between the two indexes because the STRI index ranges from 2014 to 2020.

³⁷They find that services trade restrictions (STRI) represent a significant barrier to bilateral greenfield FDI between 42 destination countries and 41 source countries from 2014 to 2018.

³⁸The business sector encompasses legal services, audit, accountancy, architectural and engineering. This sector is very restrictive due to high entry costs such as expertise, qualifications and nationality requirements.

0.05 point in this sector is associated with an increase in inward FDI by 7 percent (column 5). The analysis of the disaggregated financial sector restrictions shows significant negative effects in the other finance sectors and non-significant effects in the banking and insurance sector. A 0.05 point decrease in other finance sectors restrictions leads to a rise in OECD FDI by 6.22 percent.³⁹

Table 2.2: OECD outward and inward FDI by service sector (% of service FDI)

	Years	2015	2016	2017	2018	2019
<i>Financial and insurance activities</i>	Inward	60.57	62.2	62.04	55.07	59.57
	Outward	65.44	65.71	66.87	65.19	68.25
<i>Wholesale and retail trade repair of motor vehicles and motorcycles</i>	Inward	11.89	11.49	13.79	12.57	13.6
	Outward	8.7	8.94	8.56	9.03	7.83
<i>Transportation and storage</i>	Inward	2.25	2.38	2.56	2.98	2.59
	Outward	1.58	1.52	1.59	1.88	1.77

Source: Author's calculation based on OECD FDI data

The two tests below estimate the effects of restrictive measures on FDI between OECD and emerging countries by type of economy. The big emerging countries have economies more oriented to the manufacturing and agricultural sectors than the North and South African countries where the main economic activity is agriculture and natural resources (see Table 2.3). In the first part, we study the effects of restrictions in the agricultural and manufacturing sectors on FDI between OECD countries and large emerging economies (results reported in Table B.9) and the second the effects of restrictions in the agricultural and natural resources sectors (mining, oil and gas, etc.) on FDI among OECD and African countries (Table B.10).

³⁹The other finance sectors cover other financial services activities whose primarily concerned with distributing funds other than by making loans: factoring activities - writing of swaps, options and other hedging arrangements, venture capital companies, investment clubs etc.

Table 2.3: Exports of primary and manufacturing goods (millions of US dollars) from 2015-2019

Countries	Years	<i>Primary commodities precious stones and non-monetary gold</i>	<i>Manufactured goods</i>
Africa	2015	122	2,77E+04
Emerging	2015	1,32E+06	9,07E+05
Africa	2016	114	2,77E+04
Emerging	2016	1,26E+06	8,46E+05
Africa	2017	141	2,91E+04
Emerging	2017	1,48E+06	9,23E+05
Africa	2018	158	3,19E+04
Emerging	2018	1,60E+06	9,89E+05
Africa	2019	150	2,93E+04
Emerging	2019	1,49E+06	9,83E+05

Notes: Africa includes North and South African countries. Emerging countries include Central and South Asia, Eastern and South-Eastern Asia and Latin America.

Source: Author's calculation based on UNCTAD data

The results suggest that FDI restrictions in the manufacturing sector have significant negative effects on FDI between advanced and emerging countries, the effect being more pronounced if the destination country is a BRICS country. In addition, restrictive measures in the mining, quarrying, and oil extraction sector have significant negative effects on FDI between advanced and African countries, with higher effects for African countries.

These results underscore the implementation by the governments of attractive sectoral regulation of FDI. The effects of the measures vary according to the type of economy, but unanimously, liberalization of the services sector has more beneficial effects on inward FDI in all countries in order to boost the performance of manufacturing industries. The advanced countries must reduce the restrictions in the service sector which considerably hamper the FDI inflow. The restrictions in all three sectors are deterring inward FDI between OECD countries and emerging countries. Further, restrictions in the primary sector (agriculture and natural resources) and manufacturing are key barriers to inward FDI in emerging countries. The big emerging countries (BRICS) in addition to the services sector should deregulate the primary and manufacturing sector which plays a vital role in economic activity, and for African countries, reforms to liberalize the natural resources sector would boost inward investment. Governments also need to regulate FDI taking into account the restrictions of other countries, because regulations will affect FDI differently depending on the destination country.

2.7 Conclusion

This paper, which investigates the effects of restrictive measures on FDI, contributes to the literature on the impact of restrictions on FDI, but differs from recent studies because it examines the sectoral effects of FDI restrictions on cross-border FDI between advanced and emerging countries.

Using a gravity model we examined the effects of global and sectoral restrictive measures on FDI among OECD countries, between advanced and large emerging countries and finally between advanced and African countries from 2010 to 2019. Our results suggest that global restrictive measures do not significantly affect cross-border FDI in OECD countries, while restrictions in the service sector have negative and significant effects on FDI. Moreover, the overall restrictive measures and those in the primary, secondary and tertiary sector negatively impact inward FDI among OECD and big emerging countries. The restrictions in the primary sector are a main obstacle to inward FDI in big emerging countries. In addition, global and sectoral restrictions do not have a significant effect on FDI between advanced and African countries.

The results are robust to the baseline results. Several tests are performed. First, we estimated the effects of global and sectoral restrictions between advanced and emerging countries in the period 2010 to 2014 and 2015 to 2019. The results confirmed our baseline results and showed more significant effects in the period 2015 to 2019. The second test examined the impacts of restrictive measures on the BRICS and on emerging countries excluding the BRICS, the results are more significant on the BRICS than on other emerging countries. The third test assessed the robustness of the restrictive effects of measures in services on intra-OECD FDI using the STRI. The results show negative and significant effects of restrictions in services and non-significant effects in the global financial sector on intra-OECD FDI. Restrictive measures in the business sector have significant negative impacts on intra-OECD FDI. We also estimate the effects of disaggregated financial services restrictions on intra-OECD FDI. The results indicate that restrictions in other finance services are negatively associated with cross-border FDI in OECD countries. The last two tests showed that restrictive measures in the manufacturing sector have restrictive impacts on inward FDI in emerging economies, particularly in the BRICS, and that restrictions in the mining, quarrying, and oil extraction sector are an obstacle to inward FDI in African countries.

We could improve our study by considering financial FDI such as M&A. However, there are some important limitations, mainly related to the data. First, FDI restrictions have some limitations, notably that they are time-invariant for some sectors. Second, it would be really interesting to also examine the effects of these restrictive measures on domestic investment in future research.

This paper highlighted the detrimental impact of restrictive measures on cross-border FDI. It showed the negative impacts of sectoral restrictions depending on the type of economy receiving the FDI. From this study, we conclude that the drop of inward FDI in OECD countries since 2016 is due to a rise of restrictive and protectionist policies in order to protect local firms, the exit of the United Kingdom from the EU (Brexit). It is also the result of Donald Trump's tax cuts since 2017. This measure led to repatriation of profits into United States. This decrease is probably due to the trade war between China and United States, which has a considerable effect on production and investment in global value chains.

2.8 Appendix: Baseline results

Table 2.4: The impacts of restrictive measures on FDI stocks: Intra-OECD countries

Specification Dependant variable Years	PPML Estimate							
	Global FDI RI		Sectoral FDI RI					
			Primary		Secondary		Tertiary	
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$FDI RI Global_{j,t-1}$	-1.4577 (1.2565)	-1.5775 (1.2897)						
$FDI RI Primary_{j,t-1}$			0.4801 (0.5756)	0.5091 (0.5922)				
$FDI RI Secondary_{j,t-1}$					-1.5998 (1.2417)	-1.7959 (1.2573)		
$FDI RI Tertiary_{j,t-1}$							-2.3188** (1.0835)	-2.5034** (1.1179)
$Ln FDI_{ij,t-1}$	0.7409*** (0.0642)	0.6660*** (0.0627)	0.7410*** (0.0643)	0.6648*** (0.0624)	0.7398*** (0.0645)	0.6648*** (0.0629)	0.7363*** (0.0641)	0.6628*** (0.0625)
$Ln distance_{ij,t-1}$	-0.6828*** (0.1065)	-0.7486*** (0.1110)	-0.7330*** (0.1125)	-0.8060*** (0.1155)	-0.7003*** (0.1101)	-0.7672*** (0.1147)	-0.6650*** (0.1118)	-0.7278*** (0.1179)
$Common border_{ij,t-1}$	-0.2408** (0.1096)	-0.2492** (0.1138)	-0.2804** (0.1118)	-0.2916** (0.1167)	-0.2459** (0.1080)	-0.2539** (0.1122)	-0.2119** (0.1070)	-0.2182** (0.1110)
$Common lang_{ij,t-1}$	0.1198 (0.1004)	0.1324 (0.1060)	0.0915 (0.1049)	0.1010 (0.1112)	0.1186 (0.1026)	0.1319 (0.1083)	0.1372 (0.0980)	0.1508 (0.1031)
$Colonial links_{ij,t-1}$	0.2322** (0.1159)	0.2398** (0.1181)	0.2376** (0.1180)	0.2454** (0.1204)	0.2293** (0.1154)	0.2361** (0.1174)	0.2075* (0.1141)	0.2131* (0.1162)
$RTA_{ij,t-1}$	0.2427** (0.1136)	0.1999 (0.1238)	0.1997* (0.1098)	0.1490 (0.1175)	0.2347** (0.1155)	0.1921 (0.1258)	0.2678** (0.1229)	0.2287* (0.1346)
$BIT_{ij,t-1}$	-0.1987 (0.1425)	-0.2181 (0.1500)	-0.1561 (0.1298)	-0.1712 (0.1364)	-0.2021 (0.1396)	-0.2244 (0.1469)	-0.2715* (0.1533)	-0.2968* (0.1614)
$Ln GDP_{i,t-1}$	-0.2783 (0.1864)	0.2175*** (0.0255)	-0.2764 (0.1872)	0.2175*** (0.0255)	-0.2778 (0.1869)	0.2171*** (0.0254)	-0.2797 (0.1865)	0.2172*** (0.0255)
$Ln GDP_{j,t-1}$	1.5614*** (0.1427)	1.6049*** (0.1455)	1.5618*** (0.1489)	1.6064*** (0.1522)	1.5452*** (0.1406)	1.5853*** (0.1434)	1.5315*** (0.1407)	1.5716*** (0.1429)
$Trade openness_{j,t-1}$	0.9049*** (0.1001)	0.9315*** (0.1011)	0.9404*** (0.1008)	0.9704*** (0.1029)	0.9143*** (0.1013)	0.9403*** (0.1029)	0.8830*** (0.0999)	0.9067*** (0.1007)
$Regulatory quality_{j,t-1}$	0.1206*** (0.0442)	0.1755*** (0.0425)	0.1153*** (0.0443)	0.1700*** (0.0425)	0.1248*** (0.0443)	0.1798*** (0.0426)	0.1220*** (0.0434)	0.1770*** (0.0416)
$Ln productivity_{j,t-1}$	0.8190* (0.4410)	0.6613 (0.4474)	0.8967** (0.3917)	0.7373* (0.3986)	0.8190* (0.4290)	0.6605 (0.4360)	0.6804 (0.4529)	0.5220 (0.4586)
$Ln tax burden_{j,t-1}$	0.1611 (0.6004)	0.0588 (0.6089)	-0.0651 (0.6268)	-0.1839 (0.6360)	0.0521 (0.6178)	-0.0548 (0.6255)	0.3485 (0.5897)	0.2633 (0.5996)
$HCD_{ij,t-1}$	-0.0398 (1.1792)	0.2990 (1.2344)	-0.0491 (1.1885)	0.2798 (1.2520)	-0.1181 (1.1749)	0.2037 (1.2316)	-0.1558 (1.1968)	0.1665 (1.2514)
$Ln labor freedom_{j,t-1}$	1.7763*** (0.4482)	1.9088*** (0.4627)	1.6486*** (0.4310)	1.7742*** (0.4467)	1.7963*** (0.4472)	1.9325*** (0.4606)	1.8512*** (0.4502)	1.9828*** (0.4640)
Time-FE	Yes	No	Yes	No	Yes	No	Yes	No
Country-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.8371	0.8330	0.8369	0.8328	0.8371	0.8330	0.8378	0.8339
Observations	12391	12391	12391	12391	12391	12391	12391	12391

Notes: The dependent variable is bilateral FDI stocks. Columns (1) and (2) represent the results of the impact of global FDI restrictiveness index on cross-border investment and (3) to (8) the results of sector-specific restrictiveness of FDI. Standard errors are reported in parentheses and clustered by country-pair level. *, **, *** denote significance at the 10% 5% and 1% level respectively.

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Table 2.5: The impacts of restrictive measures on FDI stocks: OECD vs. Emerging countries

Specification Dependant variable Years	PPML Estimate							
	Global FDI RI		Sectoral FDI RI					
			Primary		Secondary		Tertiary	
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>FDI RI Global_{j,t-1}</i>	-2.8372*** (0.8605)	-2.7090*** (0.8676)						
<i>FDI RI Primary_{j,t-1}</i>			-2.0281*** (0.7121)	-2.1037*** (0.7126)				
<i>FDI RI Secondary_{j,t-1}</i>					-2.9298** (1.1595)	-2.5940** (1.1635)		
<i>FDI RI Tertiary_{j,t-1}</i>							-2.4579*** (0.7285)	-2.3285*** (0.7253)
<i>OECD dum_j * FDI RI Global_{j,t-1}</i>	1.8073 (1.9091)	1.0522 (1.6975)						
<i>OECD dum_j * FDI RI Primary_{j,t-1}</i>			2.9714*** (0.9868)	2.8354*** (0.9619)				
<i>OECD dum_j * FDI RI Secondary_{j,t-1}</i>					1.4257 (1.9882)	0.4349 (1.9221)		
<i>OECD dum_j * FDI RI Tertiary_{j,t-1}</i>							0.2982 (1.7310)	-0.2638 (1.5068)
<i>OECD dum_j</i>	1.6942*** (0.5514)	0.2383 (0.2899)	1.5349*** (0.5476)	-0.0551 (0.2592)	2.0036*** (0.6000)	0.4249* (0.2227)	1.6686*** (0.5323)	0.3481 (0.3008)
<i>Ln FDI_{ij,t-1}</i>	0.1037** (0.0482)	0.2169*** (0.0449)	0.1026** (0.0490)	0.2153*** (0.0459)	0.1070** (0.0480)	0.2199*** (0.0449)	0.1032** (0.0466)	0.2155*** (0.0436)
<i>Ln distance_{ij,t-1}</i>	-1.1267*** (0.1373)	-1.0958*** (0.1336)	-1.1832*** (0.1430)	-1.1587*** (0.1381)	-1.1335*** (0.1393)	-1.1114*** (0.1349)	-1.1049*** (0.1404)	-1.0739*** (0.1362)
<i>Common border_{ij,t-1}</i>	-0.4442*** (0.1512)	-0.4240*** (0.1497)	-0.4733*** (0.1526)	-0.4674*** (0.1543)	-0.4400*** (0.1494)	-0.4242*** (0.1478)	-0.4130*** (0.1482)	-0.3917*** (0.1465)
<i>Common lang_{ij,t-1}</i>	0.2863* (0.1499)	0.3148** (0.1485)	0.2537* (0.1538)	0.2767* (0.1535)	0.2883* (0.1510)	0.3176** (0.1488)	0.3079** (0.1452)	0.3332** (0.1440)
<i>Colonial links_{ij,t-1}</i>	0.3773** (0.1575)	0.3702** (0.1551)	0.3724** (0.1588)	0.3726** (0.1596)	0.3730** (0.1550)	0.3640** (0.1524)	0.3535** (0.1553)	0.3450** (0.1516)
<i>BIT_{ij,t-1}</i>	-0.3391* (0.1782)	-0.3866** (0.1730)	-0.3312** (0.1688)	-0.3581** (0.1677)	-0.3560** (0.1741)	-0.4056** (0.1698)	-0.4001** (0.1864)	-0.4456** (0.1785)
<i>RTA_{ij,t-1}</i>	0.3363** (0.1447)	0.3709*** (0.1398)	0.2911** (0.1433)	0.3216** (0.1359)	0.3343** (0.1491)	0.3641** (0.1438)	0.3576** (0.1527)	0.3910*** (0.1477)
<i>Ln GDP_{i,t-1}</i>	-0.1195* (0.0702)	0.2004*** (0.0300)	-0.1292* (0.0669)	0.2039*** (0.0305)	-0.1278* (0.0689)	0.1951*** (0.0289)	-0.1003 (0.0689)	0.1997*** (0.0300)
<i>Ln GDP_{j,t-1}</i>	2.4201*** (0.1279)	2.4362*** (0.1315)	2.3949*** (0.1319)	2.4413*** (0.1336)	2.3809*** (0.1268)	2.3937*** (0.1278)	2.3738*** (0.1267)	2.3840*** (0.1287)
<i>Trade openness_{j,t-1}</i>	1.4140*** (0.1158)	1.4634*** (0.1156)	1.4541*** (0.1152)	1.5245*** (0.1150)	1.3993*** (0.1149)	1.4574*** (0.1128)	1.3697*** (0.1154)	1.4159*** (0.1139)
<i>Regulatory quality_{j,t-1}</i>	0.1654** (0.0650)	0.1847*** (0.0632)	0.1719*** (0.0638)	0.1920*** (0.0624)	0.1715*** (0.0649)	0.1955*** (0.0635)	0.1606** (0.0644)	0.1750*** (0.0624)
<i>Ln productivity_{j,t-1}</i>	0.7602*** (0.1843)	0.2163*** (0.0730)	0.7376*** (0.1731)	0.1715** (0.0673)	0.7752*** (0.2013)	0.1973*** (0.0724)	0.7316*** (0.1807)	0.2356*** (0.0749)
<i>Ln tax burden_{j,t-1}</i>	-0.1956 (0.6736)	-0.3006 (0.6583)	-0.4863 (0.7052)	-0.6821 (0.6814)	-0.2571 (0.6988)	-0.4280 (0.6728)	0.0994 (0.6739)	0.0189 (0.6609)
<i>HCD_{ij,t-1}</i>	-0.4566 (1.1578)	-1.0753 (1.1411)	-0.4359 (1.1496)	-1.0308 (1.1393)	-0.7512 (1.1487)	-1.4080 (1.1218)	-0.5248 (1.1549)	-1.1206 (1.1448)
<i>Ln labor freedom_{j,t-1}</i>	2.4041*** (0.5323)	2.3610*** (0.5189)	2.3065*** (0.5141)	2.2481*** (0.5001)	2.4131*** (0.5344)	2.3772*** (0.5196)	2.4688*** (0.5368)	2.4125*** (0.5224)
Time-FE	Yes	No	Yes	No	Yes	No	Yes	No
Country-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.7993	0.7877	0.7992	0.7874	0.7989	0.7874	0.8002	0.7889
Observations	19449	19449	19449	19449	19449	19449	19449	19449

Notes: The dependent variable is bilateral FDI stocks. Columns (1) and (2) represent the results of the impact of global FDI restrictiveness index on cross-border investment and (3) to (8) the results of sector-specific restrictiveness of FDI. Standard errors are reported in parentheses and clustered by country-pair level. *, **, *** denote significance at the 10% 5% and 1% level respectively.

Table 2.6: The Impacts of Restrictive Measures on FDI Stocks: OECD vs. African countries

Specification Dependant variable Years	PPML Estimate							
	Global FDI RI		Sectoral FDI RI					
	(1)	(2)	Primary		Secondary		Tertiary	
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>FDI RI Global</i> _{j,t-1}	-1.6162 (3.7637)	-0.9225 (3.5504)						
<i>FDI RI Primary</i> _{j,t-1}			-1.7933 (2.7210)	-1.4645 (2.6931)				
<i>FDI RI Secondary</i> _{j,t-1}					7.5160 (6.5403)	6.7006 (6.5831)		
<i>FDI RI Tertiary</i> _{j,t-1}							-2.1809 (3.2296)	-1.4656 (2.9692)
<i>OECD dum_j * FDI RI Global</i> _{j,t-1}	-0.0712 (4.4800)	-0.7046 (4.2073)						
<i>OECD dum_j * FDI RI Primary</i> _{j,t-1}			2.7402 (2.8935)	2.4152 (2.8643)				
<i>OECD dum_j * FDI RI Secondary</i> _{j,t-1}					-9.8175 (6.8840)	-9.1310 (6.9126)		
<i>OECD dum_j * FDI RI Tertiary</i> _{j,t-1}							-0.7473 (3.8747)	-1.2855 (3.5207)
<i>OECD dum_j</i>	1.9968* (1.1026)	1.1963** (0.5064)	1.8211* (1.0318)	1.0080** (0.4575)	2.2279** (1.1136)	1.3780*** (0.5073)	1.8155* (0.9783)	1.2257** (0.5345)
<i>Ln FDI</i> _{ij,t-1}	0.0983** (0.0489)	0.1970*** (0.0460)	0.0975* (0.0501)	0.1959*** (0.0471)	0.0987** (0.0484)	0.1965*** (0.0456)	0.0976** (0.0471)	0.1973*** (0.0445)
<i>Ln distance</i> _{ij,t-1}	-1.0968*** (0.1550)	-1.0735*** (0.1492)	-1.1746*** (0.1611)	-1.1498*** (0.1557)	-1.1073*** (0.1578)	-1.0828*** (0.1510)	-1.0706*** (0.1607)	-1.0439*** (0.1530)
<i>Common border</i> _{ij,t-1}	-0.4014** (0.1602)	-0.3946** (0.1593)	-0.4484*** (0.1631)	-0.4416*** (0.1636)	-0.4025** (0.1580)	-0.3938** (0.1571)	-0.3609** (0.1562)	-0.3534** (0.1557)
<i>Common lang</i> _{ij,t-1}	0.2564* (0.1530)	0.2730* (0.1535)	0.2143 (0.1590)	0.2302 (0.1591)	0.2646* (0.1539)	0.2834* (0.1533)	0.2771* (0.1477)	0.2911** (0.1484)
<i>Colonial links</i> _{ij,t-1}	0.3816** (0.1581)	0.3795** (0.1585)	0.3776** (0.1604)	0.3767** (0.1622)	0.3741** (0.1555)	0.3704** (0.1550)	0.3540** (0.1552)	0.3544** (0.1549)
<i>BIT</i> _{ij,t-1}	-0.3486* (0.2064)	-0.3623* (0.2012)	-0.3073 (0.1903)	-0.3237* (0.1890)	-0.3727* (0.2000)	-0.3898** (0.1960)	-0.4400** (0.2196)	-0.4437** (0.2120)
<i>RTA</i> _{ij,t-1}	0.3800** (0.1650)	0.4031** (0.1568)	0.3066** (0.1560)	0.3327** (0.1485)	0.3851** (0.1688)	0.4108** (0.1618)	0.4156** (0.1792)	0.4374*** (0.1693)
<i>Ln GDP</i> _{i,t-1}	0.1099 (0.1160)	0.2211*** (0.0310)	0.1096 (0.1060)	0.2211*** (0.0309)	0.1102 (0.1091)	0.2213*** (0.0309)	0.1319 (0.1111)	0.2206*** (0.0308)
<i>Ln GDP</i> _{j,t-1}	2.4123*** (0.1469)	2.4428*** (0.1431)	2.4029*** (0.1544)	2.4308*** (0.1466)	2.3865*** (0.1451)	2.4128*** (0.1411)	2.3537*** (0.1440)	2.3794*** (0.1418)
<i>Trade openness</i> _{j,t-1}	1.4150*** (0.1235)	1.4650*** (0.1161)	1.4696*** (0.1237)	1.5170*** (0.1128)	1.4214*** (0.1229)	1.4672*** (0.1128)	1.3665*** (0.1221)	1.4114*** (0.1159)
<i>Regulatory quality</i> _{j,t-1}	0.1628** (0.0675)	0.1623** (0.0645)	0.1593** (0.0663)	0.1601** (0.0633)	0.1760*** (0.0675)	0.1746*** (0.0649)	0.1608** (0.0664)	0.1563** (0.0634)
<i>Ln productivity</i> _{j,t-1}	0.8370** (0.3921)	0.5537*** (0.1551)	0.8586** (0.3456)	0.5842*** (0.1444)	0.8153** (0.3668)	0.5379*** (0.1515)	0.7563** (0.3673)	0.5367*** (0.1614)
<i>Ln tax burden</i> _{j,t-1}	-0.0404 (0.7608)	-0.0989 (0.7090)	-0.3721 (0.7968)	-0.4222 (0.7418)	-0.1807 (0.7773)	-0.2216 (0.7242)	0.2596 (0.7521)	0.2073 (0.7089)
<i>HCD</i> _{ij,t-1}	-0.1014 (1.5285)	-0.5337 (1.5348)	-0.1689 (1.5313)	-0.6342 (1.5437)	-0.2021 (1.5239)	-0.6500 (1.5281)	-0.1914 (1.5324)	-0.6324 (1.5434)
<i>Ln labor freedom</i> _{j,t-1}	2.6334*** (0.5807)	2.5221*** (0.5548)	2.4726*** (0.5549)	2.3632*** (0.5301)	2.6698*** (0.5769)	2.5734*** (0.5535)	2.7264*** (0.5837)	2.5983*** (0.5584)
Time-FE	Yes	No	Yes	No	Yes	No	Yes	No
Country-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.8039	0.7955	0.8040	0.7956	0.8043	0.7959	0.8051	0.7966
Observations	15213	15213	15213	15213	15213	15213	15213	15213

Notes: The dependent variable is bilateral FDI stocks. (1) and (2) represent the results of the impact of global FDI restrictiveness index on cross-border investment and (3) to (8) the results of sector-specific restrictiveness of FDI. Standard errors are reported in parentheses and clustered by country- pair level. *, **, *** denote significance at the 10% 5% and 1% level respectively.

Modeling the impact of non-tariff barriers in services on intra-African trade: Global Trade Analysis Project model

3.1 Introduction

On the 7th of July 2019, Nigeria became 53rd signatory to African Continental Free Trade Agreement (AfCFTA) in Niamey, Niger republic.¹ The AfCFTA major objectives are to establish a single continental market for goods and services including the unhindered movement of business persons and investments which will ultimately open the way for the creation of the Customs Union (CU) in Africa. Once the AfCFTA (full tariff elimination) is effective, it could generate welfare gains of \$16.1 billion, at the cost of \$4.1 billion in trade revenue losses (or 9.1% of current tariff revenues). GDP and employment are expected to grow by 0.97% and 1.17%, respectively in long-term. Intra-African trade growth is estimated at 33% and the continent's trade deficit is expected to drop by 50.9% (Saygili, Peters, and Knebel, 2018). This agreement will help stimulate intra-African trade, which remains highly fragmented and less competitive on a global scale. As a major fallout of this agreement, the issue of tariff reduction and possible elimination of tariff on goods and services have taken the center stage. However, the issues surrounding Non-Tariff Barriers (NTBs) have not been given a deserved attention, especially its effects on components of trade in services among African countries. Studies have identified the importance of trade in service for merchandise trade, economic performance and trade diversification (Hoekman, 2017). Consequently, policies and efforts to promote intra-African merchandise trade with reduction in tariff and NTBs under AfCFTA should not just be extended to trade in service on paper but through active implementation.

NTBs are categorized as restrictive or legitimate. NTBs that aim to protect consumers against

¹To date, 54 countries have signed the agreement, Eritrea has not signed and 34 countries including South Africa and Nigeria have both signed and approved ratification of the agreement, see Figure C.5.

poor quality or to protect the environment are legitimate, non-restrictive, but must be justified by the government according to the WTO's SPS and TBT agreements. Moreover, unjustified, discriminatory measures for the purpose of trade protection are trade restrictive measures. NTBs have been identified as a major contributor to high cost of intra-African trade. In this regard, Hamilton (2018) described NTBs as the main obstacles to trade between African countries. According to Vanzetti, Peters and Knebel (2017), African countries could gain \$20 billion each year by eliminating NTBs at the continental level and this is much more than \$3.6 billion that could benefit by eliminating tariffs. This simply suggests that competitiveness of African countries lie in addressing the NTBs prevalent in the continent. This will go a long way positioning them for both African and global relevance. In this same report, the distribution of welfare gains across African countries associated with the elimination of NTBs is positive all over the continent. This is a sharp contrast to the elimination of tariff in the continent that will lead to welfare loss for some countries in the continent. This clearly underscores the imperativeness of NTBs elimination for a successful.

Just like trade in goods, trade in services also encounters NTBs in forms of national regulations. The impact of these regulations sometimes cut across supplier, personnel and equipment and usually with significant cost implication (Kox and Nordås, 2007). The prevalence and stringency of these regulations are not considered as the major hindrance but their heterogeneity between origin and destination markets (Kox and Nordås, 2007). Based on Trade Cost Index data², trade costs for services are higher than for agricultural products. The trade costs for manufactured goods are the lowest. This emphasis the need to go beyond identification of regulations that impact on trade in service but working towards harmonization of national regulations across African countries as a major way to improving intra-African trade in service.

African trade analysis shows a very concentrated trade in free trade areas. Indeed, intra-African trade is much more significant between member countries of the same regional economic community (free trade agreement or customs union). Eight Regional Economic Community areas (REC) exist in Africa, and inter-community trade is very poorly developed. Ntara

²As mentioned in the general introduction, the WTO Trade Cost Index illustrates the evolution of trade costs over time, the incidence of trade costs across economies and sectors (Economy-Sector), for different household income groups, by gender, firms size and skill groups (Economic Agents) as well as identify the main factors determining trade costs (Determinants). Data can be accessed at: <http://tradecosts.wto.org/>. For more information, see Egger, Larch, Nigai and Yotov (2021).

(2016) shows that the main economic and trading blocks in Africa are the Economic Organization of West African States (ECOWAS),³ the Common Market for Eastern and Southern Africa (COMESA),⁴ the Southern African Development Community (SADC),⁵ and the Community of Sahel and Sahara States (CENSAD).⁶ Other regional trading blocks are the East African Community (EAC), the Economic Community of Central African States (ECCAS), the Intergovernmental Authority on Development (IGAD) and the Arab Maghreb Union (AMU).

According to the Africa Regional Integration Index report of 2016, among the eight regional trading blocks in Africa, SADC and ECOWAS have higher than average REC (Regional Economic Communities) scores on regional integration overall. SADC has higher than average REC scores across the dimensions of regional infrastructure, free movement of people and financial and macroeconomic integration. ECOWAS has higher than average REC scores across the dimensions of free movement of people and financial and macroeconomic integration (see Table 3.1). Moreover, intra-regional trade is more significant than inter-regional trade. Trade between ECOWAS and SADC member countries accounts for more than 50% of intra-African trade. However, bilateral trade between these two trading blocs is about 30% and 4% of intra-African trade (see Table 3.2).

Table 3.1: Africa regional integration: average scores in the five dimensions

REC (Regional Economic Communities)	Trade integration	Regional infrastructure	Productive integration	Integration movement of people	Free Financial and macroeconomic integration	Average REC scores
CEN-SAD	0.353	0.251	0.247	0.479	0.524	0.3708
COMESA	0.572	0.439	0.452	0.268	0.343	0.4148
EAC	0.780	0.496	0.553	0.715	0.156	0.54
ECCAS	0.526	0.451	0.293	0.400	0.599	0.4538
ECOWAS	0.442	0.426	0.265	0.800	0.611	0.5088
IGAD	0.505	0.630	0.434	0.454	0.221	0.4488
SADC	0.508	0.502	0.350	0.530	0.397	0.4574
UMA	0.631	0.491	0.481	0.493	0.199	0.459
Average of eight RECs	0.540	0.461	0.384	0.517	0.381	

Source: Africa Regional Integration Index Report (2016). Scores range from 0 (low) to 1 (high)

³It is composed of Western Africa nations.

⁴It groups Central and Eastern African states.

⁵It brings together Southern African countries.

⁶Composed of Northern, Central and Western African states.

Table 3.2: Intra and inter-regional trade in percent of total African trade (all products)

RECs	<i>Intra-ECOWAS trade</i> (% of total Africa trade)			<i>Trade with SADC</i> (% of total Africa trade)		
	2017	2018	2019	2017	2018	2019
ECOWAS	60	51	52	28	40	40
	<i>Intra- SADC trade</i> (% of Total Africa trade)			<i>Trade with ECOWAS</i> (% of total Africa trade)		
	2017	2018	2019	2017	2018	2019
SADC	87	86	87	4.4	4.2	4

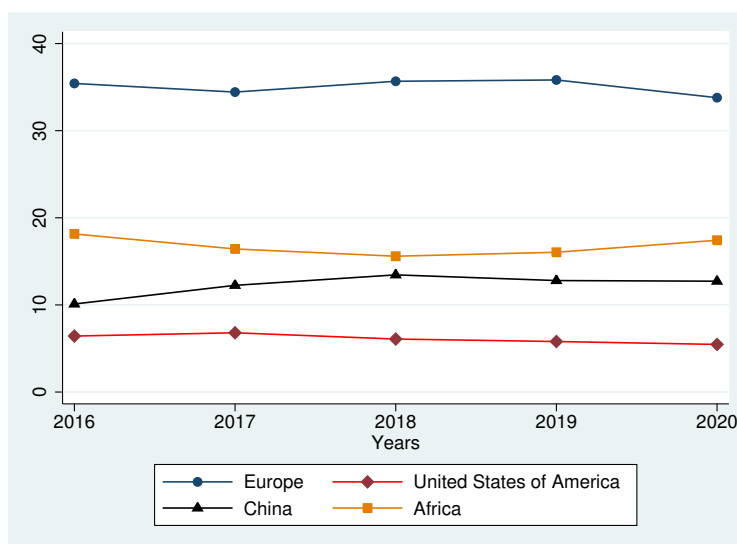
Source: Data extracted and compiled by the author's from the UNCTAD database

This is explained by trade cost factors such as distance, various languages, restrictive customs procedures, high tariffs and barriers to entry into services. Therefore, the African Continental Free Trade Area can provide a platform of dialogue and negotiation among the eight regional economic communities in order to boost inter-regional trade. Indeed, the goal of the AfCFTA is to progressively reduce tariff, non-tariff barriers and trade facilitation bottlenecks. The objective is to create a liberalized market for goods and services through successive rounds of negotiations. The agreement foresaw in 2021 a 90% reduction of tariff lines and a 50% reduction of NTBs in the goods and services sector with measures to facilitate trade through the implementation of the WTO Trade Facilitation Agreement (TFA). In 2025 an additional 7% reduction in tariffs. In order to boost intra-African trade, this agreement should stimulate trade among regional trading blocs in Africa.

The goal of this paper is to assess the effect of AfCFTA (removal of import tariffs, non-tariff barriers in the goods and services sector) on intra-African trade. In line with the AfCFTA modalities, the paper examines the effects of a tariff elimination on 90% of tariff lines on goods and a reduction on 50% of non-tariff barriers on goods and services on a most favored nation (MFN) basis. We do not consider the effects of measures that facilitate trade through implementation of a Trade Facilitation Agreement (TFA). We consider the service sector to critically analyze its impacts and to formulate policy suggestions and recommendations. Indeed, services accounted for 23% of world trade in 2018 and represent an important part of economic activity and production in Africa (UNCTAD, 2019b). Finally, services are the most protected sectors compared to the agricultural and manufacturing sectors, which are more liberalized (WTO, 2019).

Several studies have examined the impact of trade liberalization (reduction of tariffs and non-tariff barriers) on the performance of the agricultural sector in African trading blocks (Nin-Pratt and Diao, 2014; Elbushra et al., 2011). Others have assessed the impact of AfCFTA on GDP and total intra-African trade (AfDB, 2019; Abrego et al., 2019). Some studies have investigated the effects of services liberalization on the economic growth in African (Tekin, 2012; Maune, 2019). Few studies have examined the impact of AfCFTA on export performance by considering the services sector. Our study contributes to the existing literature on the quantitative impacts of the African Continental Free Trade Area in three ways.

Figure 3.1: African goods exports by trading partners (% of total African exports), 2016-2020



Source: UNCTAD

First, we study the impact of services trade liberalization on intra-African trade in goods and on trade between Africa and its trading partners (Europe, China and the United States).⁷ While the papers that have assessed the effects of AfCFTA on intra-African trade have focused on liberalisation of goods trade, our study examines the effects of NTBs reduction in services on bilateral trade in goods. We consider the agriculture, manufacturing, agri-food, natural resources, wood and textile sectors as the most important for African economies. We also highlight the contribution of services to economic growth and income in African countries. Second, for modeling restrictions in services, we use the tariff equivalents (AVEs) of entry

⁷China, Europe and the United States are the main trading partners of Africa because they account for almost 60% of total African exports (see Graph 3.1).

barriers established by Jafari and Tarr (2017). They estimate the AVEs of restrictions on 11 services sectors in 103 countries including African countries. These AVEs are more sectoral with a range of countries than the ones established by Benz and Jaax (2020) which covers 5 sectors in 46 countries (OECD and emerging countries). Third, in order to evaluate the effects of services sector liberalisation on intra-African trade, we use the latest version of the GTAP model (v10) with 2014 as the reference year.⁸ Indeed, the GTAP database is a consistent representation of the world economy for a pre-determined reference year. Underlying the database there are several data sources, including among others: national input-output (I-O) tables, trade, macroeconomic, energy and protection data. The GTAP 10 database describes the world economy for 4 reference years (2004, 2007, 2011, and 2014) and distinguishes 65 sectors, up from 57 in the previous release (GTAP v9), in each of the 141 countries/regions. The 121 countries in the database account for 98% of world GDP and 92% of world population. For each country/region, the database reports production, intermediate and final uses, international trade and transport margins, and taxes/subsidies. This database underlies most, if not all, applied global general equilibrium models.

Our study suggests that reducing tariff lines by 90% and NTBs by 50% in the agricultural and manufacturing sectors is associated with a rise in African GDP by 0.22% and 0.95% respectively in the short and long run. Regional income decreases by 0.1% and increases by 0.52% in the short and long term, respectively. The services liberalisation increases the GDP by 0.47% and 1.07% and a drop in regional income by 0.74% and 0.39% respectively in the short and long term. Reducing NTBs in services increases African GDP by about \$20.68 billion on average in the long run.

The analysis of trade in goods shows that the reduction of services trade barriers contributes to the growth of intra-African exports of agricultural products, manufactures, processed foods, and fossil fuels by 18.39%, 63.86%, 36.79% and 22.13% respectively in the long run. We also find an increase in exports of energy-intensive products, wood and paper products, and textiles and apparel by about 37.25%, 37.67%, and 122.79% respectively. Services liberalization increases intra-African exports of agricultural goods by 1.62% (nearly \$69.97 million), manufacturing goods by 16.37% (nearly \$827.3 million), processed foods by 3.45% (almost \$116.93 million), and fuel products by 4.92% (about \$290.52 million). Energy-intensive products also

⁸GTAP (Global Trade Analysis Project) is a global network of researchers and policy makers conducting quantitative analysis of international policy issues.

increased by 8.02% (approximately \$515.23 million), wood and paper products by 5.49% (approximately \$32.26 million) and textiles and apparel by 13.73% (around \$126.26 million). The reduction of entry barriers to service providers is contributing to an increase of African exports to its trading partners (Europe, China and the United States) and the AfCFTA leads to a long-term trade creation and diversion. The welfare gains from this trade agreement are positive with the exception of Benin and Mauritius.

The remainder of this paper is structured as follows. In the first part, we review the literature on the effects of AfCFTA on intra-Africa trade. Second, we would describe the weight of non-tariff barriers and service sector in Africa trade. The third part highlights our GTAP model with data, sources, types of methodology and scenarios used. The last section presents our different results, the discussion and policy recommendations.

3.2 Literature review

The existing literature on the quantitative impacts of the African Continental Free Trade Agreement (AfCFTA) has mainly focused on the effects of the reduction of tariffs and non-tariff barriers (NTBs), as well as trade facilitation measures, also on the African welfare. Among those studies of impact, the computable general equilibrium approach through the Global Trade Analysis (GTAP) model is the widely used. Moreover, some analyses also use the TASTE model (Tariff Analytical and Simulation Tool for Economists) to investigate the impacts of cuts in tariff lines. Other authors apply the MIRAGE-e CGE (Computable General Equilibrium) model with GTAP data to examine the impacts of tariffs, NTBs, and trade cost reduction.

3.2.1 Removal of tariffs on intra-AfCFTA trade

The authors who analyzed the effects of tariff reduction on intra-African trade are Mevel and Karingi (2012). They use a MIRAGE (Modeling International Relations in Applied General Equilibrium) CGE model with GTAP data (v7, 2004 being the base year). They assume an removal of all tariff barriers on goods within the African continent and see the effects relative to the baseline scenario in 2017. They find that the establishment of a Continental Free Trade Area (CFTA) would boost Africa's exports to the world, relative to the baseline scenario in 2022 by 4.0% (or \$25.3 billion) an increase in GDP of almost 0.2%. At the sectoral level, it is in

agriculture and food that African exports would rise the most with the adoption of the agreement, with +9.4% (or \$5.0 billion), as compared to the reference scenario in 2022. Moreover, the establishment of a CFTA would result in a significant rise in intra-African trade, increasing by 52.3% (\$34.6 billion). Most of the increase is in manufacturing products (\$27.9 billion) with most of the rest in agriculture.

The study by Jensen and Sandrey (2015), which is very similar to the previous one, first examines the effects of the full elimination of tariffs (all intra-African tariffs going to zero) applied to goods on intra-African trade in 2025. It uses a GTAP model similar to the MIRAGE model⁹ but with 2011 as the base year for its simulation (GTAP v9). They find that total African exports increase by nearly 3.11% in 2025, with intra-African trade increasing by about 4.3%. GDP grows by nearly 0.70%.

Saygili, Peters, and Knebel (2018) also investigate the impact of tariff reductions on intra-African trade following the African Free Trade Agreement (AFTA). As before, they use a GTAP model and analyze the impacts across two scenarios in long run, which differs from the studies above. The first is the full elimination of tariffs on goods in the FTA. They found that GDP increased by almost 0.97%, intra-African trade rose by 33%, and Africa's total trade deficit was cut in half. Also, the vast majority of individual countries gained from the FTA. The second scenario assumes the elimination of tariffs on all product categories, exempting certain sensitive products from liberalization. They assumed that the exempted products currently exhibit relatively high tariffs and significant imports. Their simulations showed lower GDP growth than the first scenario (0.82%). Intra-African trade would increase by 24%, but Africa's overall trade deficit only shrinks by 3.8%. However, the simulations showed that more countries experience welfare losses if sectors with high current tariff revenues are permanently excluded from liberalization. Vanzetti, Peters, and Knebel (2018) study the quantitative impacts of AfCFTA from tariff reduction through 2 shocks: (1) full tariff elimination; (2) tariff elimination with exemptions for 5% of sensitive products. The results on intra-African trade show an increase in intra-African exports of about 1 and 0.4% respectively under scenarios 1 and 2.

By using a GTAP (v10) model, the African Development Bank in their study (AfDB, 2019) showed that the removal of bilateral tariffs led to an increase in African intraregional trade by

⁹The only difference is the sectoral aggregation.

14.6% (+\$10.1 billion) and GDP by 0.10% (+\$2.8 billion). Also, because the share of intraregional trade in total trade is small, intraregional trade relative to total trade increases only from 12% to 13.6%. There is a modest trade deviation - Africa exports somewhat less to the rest of the world (\$-4.3 billion), and the rest of the world exports a bit less to Africa, with reductions of about 0.8%. The World Bank study (World Bank, 2020) is similar to the African Development Bank study (AfDB, 2019) in that it uses a GTAP (v10) CGE model and analyzes the long-run effects of a gradual removal of 97% of tariffs on intra-AfCFTA trade. The results suggested a growth in African exports and imports of goods to the world by respectively 1.78% (or \$35 billion) and 2.31% (or \$41 billion). Intra-African trade increased by 21.76% (\$131 billion) and the GDP grew by 0.13% (or \$12 billion).

3.2.2 Removal of tariffs and NTBs on intra-AfCFTA trade

The literature on trade liberalization has increasingly focused on the effects of non-tariff barriers (NTBs) on trade. It showed that reducing NTBs makes a significant contribution to economic welfare. In the second part of their study, Jensen and Sandrey (2015) estimate the effects of a total reduction in tariffs and a 50% reduction in NTBs in the goods sector using the GTAP model. The tariff equivalent of NTBs is taken from the World Bank. The estimates indicated an increase in total African exports and intra-African trade by 6.28% and 7.26% respectively. GDP grew by 1.6%. Overall, the 50% reduction in NTBs contributes to about 3% growth in total exports and intra-African trade and 0.9% growth in GDP.

Vanzetti, Peters, and Knebel (2018) in their study through the third scenario highlights the effects of NTB reduction in goods on intra-African trade. The AVEs of NTBs are taken from Cadot et al. (2015). Their study is different from others because they consider a reduction in NTBs in goods without a reduction in tariffs. They find that more significant gains in exports are associated with addressing non-tariff measures (an increase in intra-African exports of almost 2 percent). The greatest increase in exports is recorded by Cameroon, Ivory Coast, Rwanda, and South Africa. This reflects the composition of exports, with these countries exporting a larger share of goods that attract NTMs, such as livestock products and fruits and vegetables.

Abrego et al. (2019) in the context of AfCFTA, examine the welfare effects of the full elimination of import tariffs and a partial but substantial reduction in NTBs (35% reduction) for 45

African countries. Contrary to the other studies, they do not use a GTAP CGE model but a multi-country, multi-sector general equilibrium model based on Costinot and Rodriguez-Clare (2014). Data on applied effective tariffs come from the Global Trade Analysis Project (GTAP) Africa database (2014). The Ad valorem equivalents of NTBs are obtained from the Economic and Social Commission for Asia and the Pacific (ESCAP) and World Bank database for 2016. The results show significant potential welfare gains from trade liberalization in Africa (an increase of 2.1% compared with the baseline). As intra-regional import tariffs in the continent are already low, the bulk of these gains come from the lowering of NTBs. Intra-African trade increased by 8.40%. They argue that the size of the potential gains that may be obtained from AfCFTA is largely dependent on the degree of openness, the initial level of trade barriers, and the strength of initial trade linkages among African countries. In their scenario nine of them with gains of 5% or more.

The second scenario in the AfDB study (AfDB, 2019) adds to the tariff removal an elimination of 50% of NTBs in goods and services. The observed effects on intra-African trade are as follows: the elimination of tariffs and NTBs on imports of goods and services into Africa leads to a large boost in intra-African trade of about 107% (+\$74.3 billion). This increase in intra-African trade is accompanied by a large 44% (+\$107.2 billion) increase in exports to the rest of the world. GDP increased by 1.25% (+\$37 billion). Under this scenario, intra-African trade as a share of total African exports rises from 12% in the reference solution to 17.2%. Compared to scenario 1 of this study, NTBs contribute to an increase in trade of nearly 92.6%. Besides a gradual reduction of 97% of tariffs, the World Bank study (World Bank, 2020) adds in its second scenario, a reduction of 50% of NTBs in goods and services. AVEs of NTBs for goods are taken from Kee, Nicita, and Olarreaga (2009). The results suggest an increase in intra-African trade and exports to the rest of the world by 51.85% and 18.84% respectively. GDP increased by 2.24%. Compared to the first scenario, NTBs contribute to an increase of almost 24% in intra-African trade.

3.2.3 Removal of tariffs and NTBs on intra-AfCFTA trade and implementation of TFA

A part of the literature on the effects of AfCFTA considers the WTO trade facilitation agreement. The first is the AfDB study (AfDB, 2019). In addition to the reduction of tariffs and NTBs, the study examines the effects of trade facilitation measures on an MFN basis. The

measure considered is that of time reduction in customs from applying the provisions of the TFA (Melo and Sorgho, 2019). The analysis uses estimates of Melo and Sorgho (2019), who apply a model that predicts observed time in customs as a function of basic structural variables (GDP, Logistics Performance Index, and Infrastructure Quality Index); policy variables (World Governance Indicators); and the trade facilitation variables captured by the trade facilitation indicator (row L). Row L is a weighted average of the following components: (1) information availability; (2) involvement of the trade community; (3) advance rulings; (4) appeal procedures; (5) fees and charges; (6) formalities involving documents; (7) formalities involving automation; (8) formalities involving procedures; (9) internal border agency cooperation (10) external border agency cooperation; and (11) governance and impartiality. The model shows, after controlling for the structural and policy variables, that a higher trade facilitation indicator score reduces the probability of a longer time in customs. The model provides estimates of the time reductions in customs as a result of full implementation of the TFA. Those reductions are then translated into ad valorem equivalents of barriers using the methodology of Hummels and Schaur (2013).

The implementation of the TFA, in addition to reducing tariffs and NTBs, also adds a significant boost to trade. African trade grows by 51% (an increase of \$295.6 billion), with a higher multiplier effect on intra-African trade (up 132.7% or \$92 billion) than on trade with the rest of the world (up 40% or \$203.6 billion). The share of intra-African trade thus increases to 18.5%. The GDP is up by almost 3.50%, i.e., an increase of US\$100 billion. Compared to the effects of the reduction in tariffs and NTBs, the implementation of the FTA contributes to a rise in overall intra-African trade by 24% (+US\$17.7 billion) and in GDP by 2.25% (+US\$63 billion). The effect of the FTA is greater than the impact of the tariff reduction in Africa.

Similar to the previous study, the World Bank analysis (World Bank, 2020) investigates the effects of the implementation of the WTO Trade Facilitation Agreement. The study considers the same measure of TFA as above, namely the time reduction in customs procedures. The results show that the gradual elimination of 97% of tariffs on intra-African trade, a 50% reduction in NTBs, and the implementation of TFA significantly increases intra-African trade by 92.07% (+\$556 billion). Total African exports rise by 28.64% (+\$560 billion) and GDP by 4.20% (+\$413 billion). The implementation of the TFA compared to the reduction of tariffs and NTBs contributes to an increase of almost 40% in intra-African trade and 2.95% in GDP growth, a

higher effect than the reduction of intra-African tariffs.

In addition to the welfare gains, this continental free trade agreement will boost intra-African trade with the rest of the world. It will render intra-African trade more resilient to global price shocks. African countries will also trade among themselves a more diverse set of goods and products because trade with non-regional partners tends to be highly concentrated and focused on primary commodities. Finally, deeper regional integration, such as AfCFTA, also creates opportunities for a further reduction of trade barriers and potential to generate economies of scale (Ahmed et al., 2018).

3.3 Non-tariff barriers, service sector and Africa trade

There are three main categories of obstacles to intra-African trade (UNCTAD, 2019). First, weak productive capacities and limited economic diversification, which restrict the range of intermediate and final goods that can be traded and inhibit the development of regional value chains. Second, tariff-related trade costs associated with the slow implementation of tariff liberalization schedules (free trade agreements), and third, high non-tariff-related trade costs that impede the competitiveness of firms and economies in Africa. In this last category we have high trade costs, related to business and trade facilitation, can be explained in terms of the hard and soft infrastructure deficits, trade transaction costs that result from customs administrations, documentation requirements, and border procedures in Africa that have an impact on transport and transit costs and border and behind-the-border costs (UNCTAD, 2009; United Nations Economic Commission for Africa et al., 2017). The latter category takes into account non-tariff measures and rules of origin. This category is more restrictive than the first two categories. Indeed, the World Bank's 2001 report (World Bank, 2001) shows that the effect of tariff costs is relatively becoming less important, while non-tariff factors, such as regulatory barriers, the business environment, infrastructure, the institutional quality and economic freedom, are becoming major determining factors of trade flows.

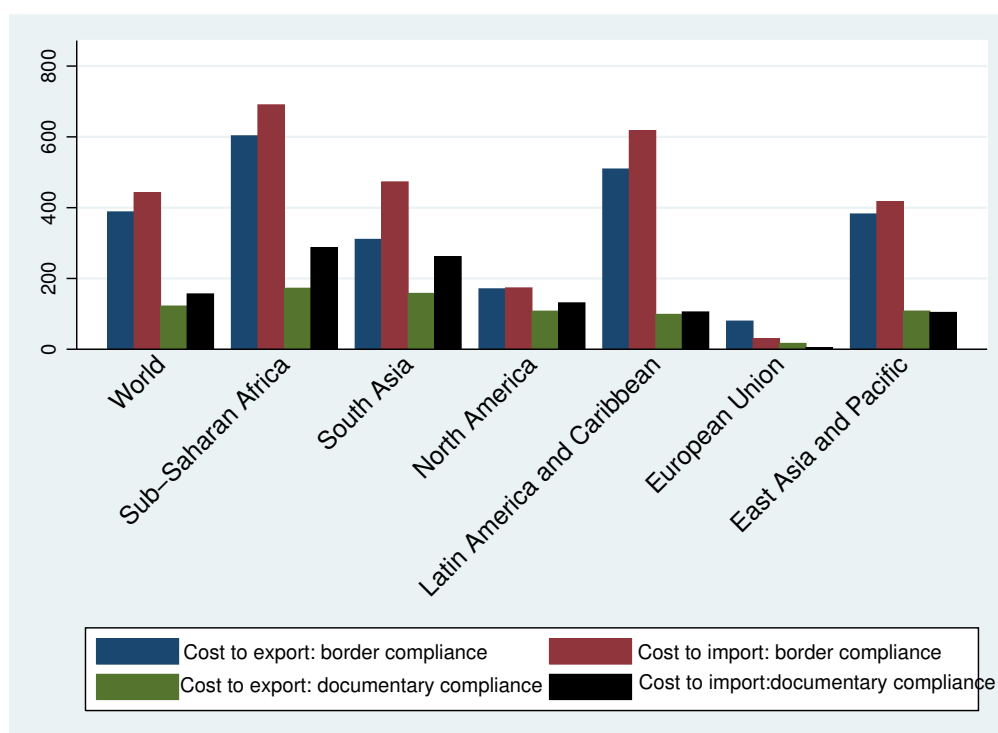
Figure 3.2 highlights two indicators of trade facilitation in different regions. We note that Sub-Saharan Africa has the highest cost to export and import compared with all other regions.¹⁰

¹⁰Border compliance captures the cost associated with compliance with the economy's customs regulations and with regulations relating to other inspections that are mandatory in order for the shipment and reception to cross the economy's border, as well as the cost for handling that takes place at its port or border. Documentary compliance captures the time and cost associated with compliance with the documentary requirements of all

It is followed by Latin America and the Caribbean, based on border compliance, and South Asia, based on documentary compliance.

Considering non-tariff trade costs, Africa has the highest incidence of non-tariff measures. Figure 3.3 shows the frequency and ratio index of NTBs applied by different parties.¹¹ The frequency index shows that nearly 30% of products are affected by one or more NTMs.¹²

Figure 3.2: Cost to import and export in US\$ (border compliance and documentary compliance) by region, 2019



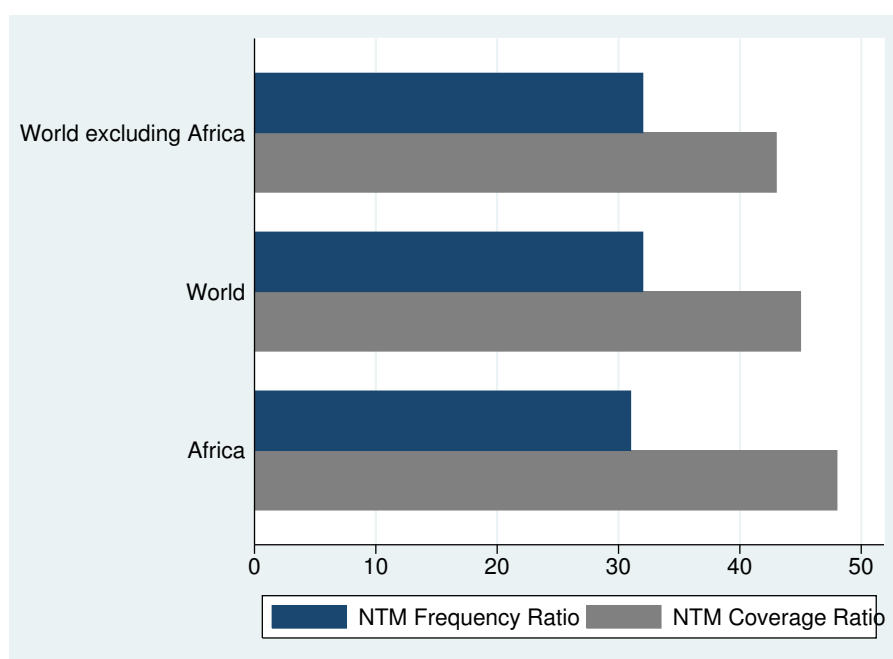
Source: World Development Indicators Database (WDI, World Bank)

government agencies of the origin economy, the destination economy and any transit economies (World Bank, WDI data).

¹¹The figure describes the NTBs on imports and exports.

¹²The frequency index, which accounts only for the presence or absence of an NTM, summarizes the percentage of products *i* to which one or more NTMs are applied.

Figure 3.3: NTM frequency and coverage ratio

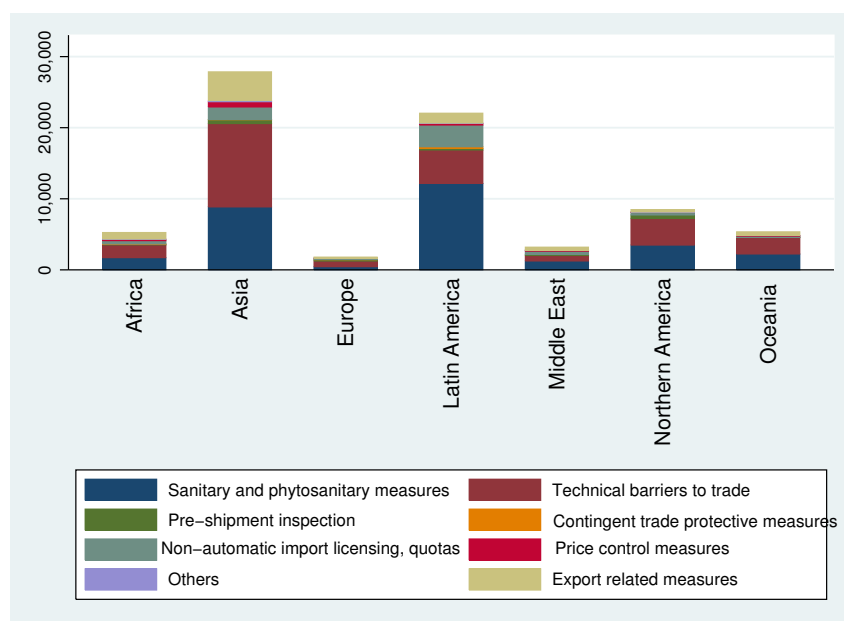


Source: World Integrated Trade Solution database: data from 2012 to 2016

In-terms of trade flows affected, on average 50% of trade flows are impacted by these measures.¹³ Indeed, 40% of exports and 55% of imports of African goods are covered by these measures, i.e., approximately \$4.6 million and \$13.7 million respectively. Figure 3.4 shows that SPS and TBT measures are the most important NTBs in Africa (both account for nearly 30% of total NTBs). In comparison, Africa's SPS and TBT standards are higher than for Europe, and Asia is the continent with the most SPS and TBT measures in the world (almost 8,000 SPS and 11,000 TBT measures). The West Africa is one of the regions in Africa with a lower number of SPS and OTC measures compared to the Southern Africa region (see Table C.8). The tariff equivalents associated with these measures show significant SPS measures in the agricultural, food, beverage, and tobacco sectors in Africa (Table C.9). TBT standards have mainly affected mineral products, labor-intensive and resource-intensive manufactures (paper, textiles and clothing, stone and glass), and low- and medium-skill and technology intensive manufactures (machinery, arms, vehicles, etc..)

¹³The coverage ratio measures the percentage of trade subject to NTMs for the importing country j.

Figure 3.4: Non-tariff measures by region: number of notification



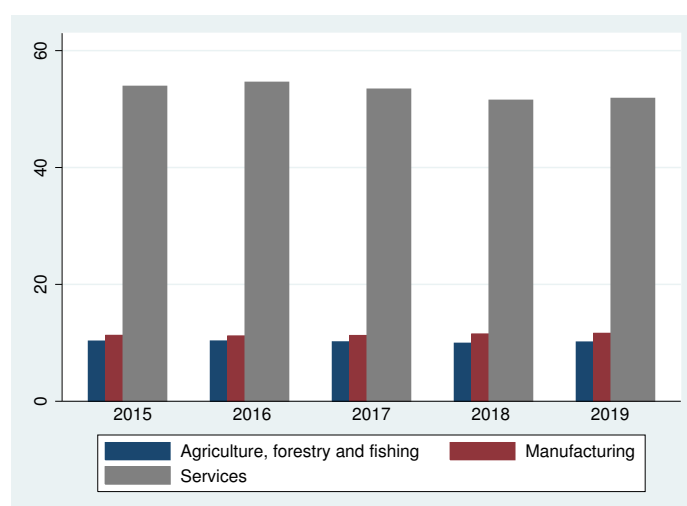
Source: UNCTAD TRAINS database-Non-Tariff Measures

African trade in services is less developed than trade in goods. While the share of value added of services in GDP and world trade is significant in industrialized countries, trade in services represents a marginal share in total African trade. Intra-African trade in services represents less than 4% of trade between Africa and the rest of the world, according to the TRALAC report (TRALAC, 2015). Between 2018 and 2019 Africa’s services exports declined by 3%, while global services exports increased by 2% (TRALAC, 2020). The services sector in Africa tends to be dominated by low value-added and informal transactions. The sector is still less competitive, digitized, and inefficient at acting as an input to economic activity for industry and agriculture (ITC, 2017). However, the United Nations Conference on Trade and Development (UNCTAD, 2015a) notes that a number of African countries have become service-oriented economies and contribute to almost half of Africa’s total output. The hub countries are South Africa, Egypt and Nigeria which are the biggest exporters and importers of services on the continent. Moreover, this sector is strong and some countries have specialized in key services such as banking and transports (e.g., Angola, Ivory Coast, Egypt, Gabon, Morocco, Nigeria, Rwanda and South Africa).

The services sector significantly contributes to the growth of African GDP (see Figure 3.5), it remains one of the sectors with the highest employment rate in Africa and absorbs a large

share of youth employment and plays a major role in gender parity (UNCTAD, 2015a; Maune, 2019). The growth rate of commercial services has increased significantly since 2017 in almost all regional blocks (see Table 3.3).

Figure 3.5: Goods and services sector value added (% of GDP), 2015-2019



Source: World Development Indicators Database (World Bank)

Table 3.3: Growth rate of commercial services exports by economic integration area

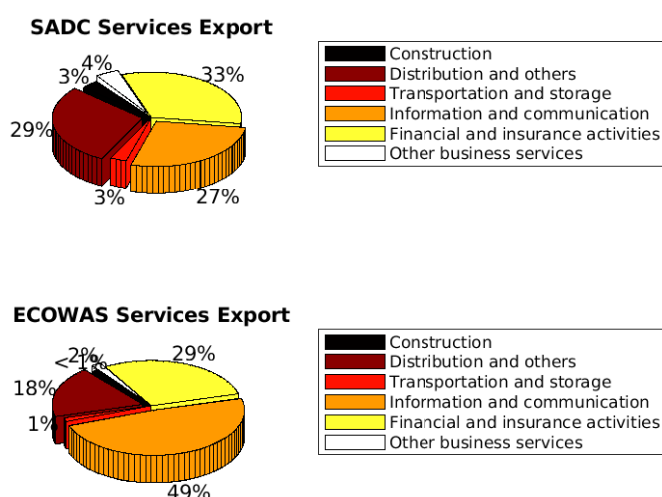
Years	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
REC										
AMU	3.74	-0.25	0.11	-4.21	7.14	-11.85	-0.67	8.04	9.82	4.39
CEN-SAD	7.25	-7.74	8.29	-8.29	8.78	-0.66	-7.06	19.21	13.38	5.77
COMESA	11.94	-7.76	13.97	-7.34	8.11	-9.07	-14.59	20.55	17.93	3.62
EAC	23.19	19.82	22.66	7.17	0.24	-4.19	-1.95	5.45	10.95	1.85
ECCAS	11.33	16.89	-14.53	27.45	10.51	-18.91	-10.75	11.4	-2.59	6.14
ECOWAS	13.01	9.07	12.4	-6.48	-8.75	54.5	8.88	11.56	10.49	8.09
IGAD	26.49	28.49	22.55	12.94	3.26	-2.84	-6.09	9.3	16.5	-0.05
SADC	15.05	10.29	7.16	-3.68	5.15	-9.09	-4.91	10.68	2.31	-4.11
Average growth	14.95	8.81	9.98	2.18	4.1	0.71	-5.32	12.8	9.98	2.99
Africa	11.35	1.45	7.3	-4.37	5.49	-4.09	-6.05	14.23	10.83	2.61

Source: Data extracted from the UNSTADstat database. Commercial services cover all service categories, except trade in government goods and services.

The most exported services by SADC and ECOWAS are financial services, information and communications, and distribution (retail and wholesale trade). About 50% of the total exports of ECOWAS member countries are information and communication services (49%). The SADC countries export a lot of financial and insurance services (33%, see Figure 3.6). The share

of exports of financial services, distribution and information and communication services in total exports has been stable since 2011 (see Figures 3.7 and 3.8).¹⁴ Services with high export value added (EVA) are distribution, finance and insurance, other business sectors, ICT services (Information and Technology) and the transportation sector.

Figure 3.6: ECOWAS and SADC services exports in % of total services



Source: WTO database on trade in services by sector and mode 3 supply (TIMOS), Basis: ISIC rev. 4, Years: 2005-2017

Figure 3.7: Share of services in total SADC services exports, 2005-2017

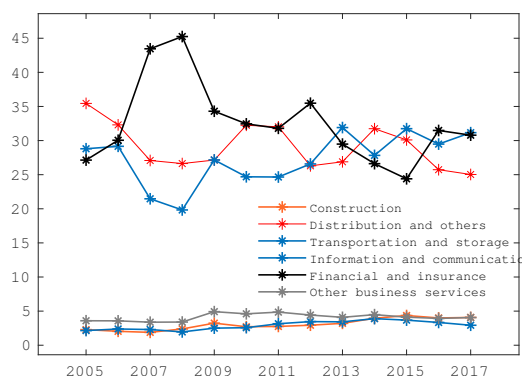
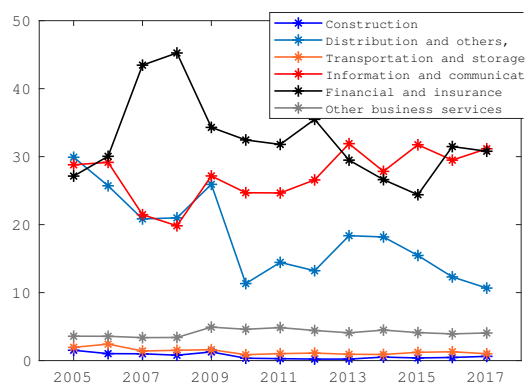


Figure 3.8: Share of services in total ECOWAS services exports, 2005-2017



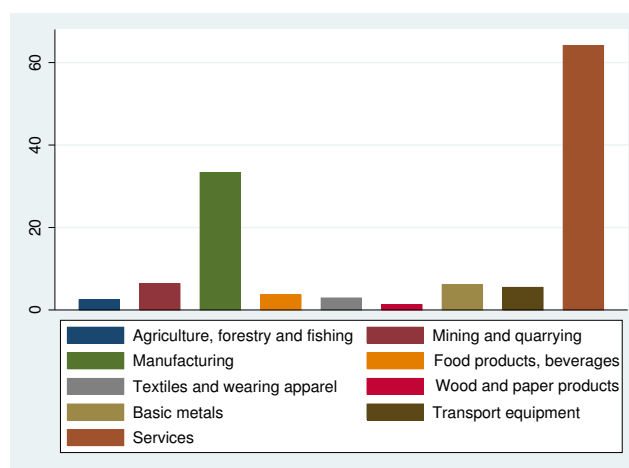
Source: TIMOS database

¹⁴Mode of supply of services in this database is mode 3 (Commercial presence).

Services in Africa is one of the most closed sectors with high barriers to entry. It is one of the continents with the most restrictions in the services sector. Although goods and commodities are subject to low tariffs, sectors such as telecommunications have tariff equivalents of about 200% (Jafari and Tarr, 2017). Looking at Table C.10, which highlights the tariff equivalents of restrictions in services based on the World Bank's Services Trade Restrictiveness Index (STRI)¹⁵, we see that AVEs in Sub-Saharan Africa area are the largest compared to other regions. The sectors closed to service providers are fixed line telecommunications, legal services, and rail transport, and those opened remain mobile line and distribution.

Figure 3.9 highlights the importance of services in goods and services exports. We note a significant contribution of services to exports of goods, particularly manufactured products. Services contributed to almost 30% of African exports of manufactured goods in 2015. Also the share of services as inputs in mining exports is important compared to other sectors (about 5%).¹⁶ The agricultural sector, the backbone of the African economy, is a sector that uses few inputs in services. This graph shows a high degree of servicification of African trade in product.¹⁷

Figure 3.9: Share of services value-added in African goods and services exports, 2015



Source: OECD TiVA database (2018)

¹⁵It measures the level of restrictiveness in services. This score includes three modes of supply of services under the General Agreement on Trade in Services (GATS). These are cross-border supply (mode 1), commercial presence (mode 3) and presence of natural persons (mode 4). It ranges from 0 to 100, where 0 indicates that none of the restrictions underlying the index is applied, and 100 means that the sector/mode is completely closed to foreign services and service providers.

¹⁶The services value added in our case is foreign sourced. Africa includes Morocco, Tunisia and South Africa.

¹⁷The phenomenon called "servicification" was used in the WTO report (WTO, 2019), it stipulated a high contribution of services in the production and exports of manufacturing products.

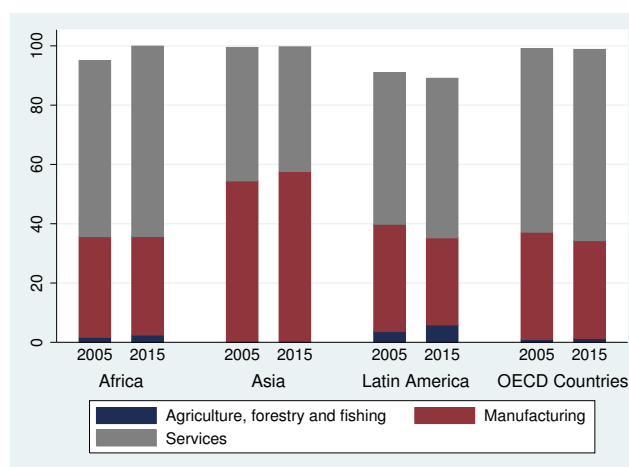
The share of services in manufacturing trade in Africa remained relatively stable between 2005 and 2015. The contribution of foreign service suppliers to manufacturing exports in emerging economies (Asia and Latin America) is the largest compared to advanced economies (see Figure 3.10). Liberalization of services will not only lead to beneficial gains for emerging countries and African countries, but also to an important place for these countries in the global value chain (GVC). Indeed, at the regional level, intra-African trade in value-added is low (9%), compared to 45% in Asia and 18% in Latin America (Slany, 2019) and services could boost this intra-regional trade.

Theoretically, services can participate in GVC in two main ways: backward integration and forward integration (Efogo, 2020). Backward integration refers to countries (or firms) that export or import raw materials or intermediate products entering as inputs in heavy industries. Backward integration refers to countries (or firms) exporting processed intermediate or final goods and services through international distribution networks. Trade in services can contribute to the integration of countries into GVCs. Services can be the object of a GVC whatever the entry mode (Baldwin and Venables, 2013). This type of GVC exists in various sectors such as financial services, tourism, education, health, information (Heuser and Mattoo, 2017; Miroudot, 2016). Services can also be an element of the GVC (UNCTAD, 2013), particularly as a raw material, as a backward activity or as a forward activity (design, logistics, transport, marketing, and so forth). They can likewise be an input into the production of other products or services. Services as inputs are supporting the export activities of manufacturing products through transport, logistics and financial services, but are also factors in Africa's export competitiveness. For example, services account for 83% of the final price of Ethiopian roses in the Netherlands (AfDB, 2015). Services may be a key input into environmental service exports. Indeed, business and financial services can promote the production of environmental services such as BioTrade¹⁸ to achieve sustainable development goals. Services would contribute to the creation of environmental service providers such as ecotourism and REDD+ projects (UNCTAD, 2021).¹⁹

¹⁸BioTrade encompasses activities related to the collection, production, transformation and commercialization of goods and services derived from biodiversity (genetic resources, species and ecosystems) under environmental, social and economic sustainability criteria (UNCTAD, 2020a).

¹⁹REDD: Reducing Emissions from Deforestation and Forest Degradation.

Figure 3.10: Share of services value-added in goods and services exports by region, 2015



Source: OECD TiVA database (2018)

3.4 Data

The core data for this study are sourced from the Global Trade Analysis Project (GTAP) database -see Appendix C. These data provide a snapshot of the global economy in 2014, including domestic interindustry flows and bilateral trade flows. The full database covers 141 regions, of which 121 are individual countries, and 65 sectors. For this analysis, the 141 regions are aggregated into 36 regions, including all 32 regions in Africa that are part of the database (see Tables C.4 and C.5). Of those 32 regions, 26 are individual countries, with the remaining countries grouped into six regional components.²⁰ The 65 sectors are aggregated into 8 sectors (see Table C.6).²¹ The core data are supplemented by additional information. The study incorporates estimates of the ad-valorem equivalents (AVEs) of non-tariff trade barriers.²² AVEs of NTBs for goods are taken from the World Bank's World Integrated Trade Solution (WITS) database and documented by Kee, Nicita, and Olarreaga (2009). They are aggregated to the model's regional and sectoral aggregation using trade weights. Estimates

²⁰Rest of Central Africa = Central African Republic, Chad, Congo, Equatorial Guinea, Gabon, and São Tomé and Príncipe; Rest of East Africa = Burundi, Comoros, Djibouti, Eritrea, Mayotte, Seychelles, Somalia, Sudan; Rest of North Africa = Algeria, Libya, Western Sahara; Rest of South African Customs Union = Eswatini, Lesotho; Rest of West Africa = Cabo Verde, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Saint Helena, Sierra Leone, The Gambia; South Central Africa = Angola, Democratic Republic of the Congo.

²¹The first 45 sectors (1-45) are aggregated into agricultural and manufacturing sectors and the last 20 (46-65) into service sectors.

²²To model the impacts of non-tariff barriers for goods and services, we need the data on ad-valorem equivalents.

for missing countries and regions are simple averages of available estimates. AVEs of NTBs for services are sourced from Jafari and Tarr (2015). The average of the AVEs across the 11 services is the overall AVE for the services sector (Tables C.11 and C.12). Modeling services trade in Africa is tricky because bilateral services trade data are scarce and AVEs for African countries are mostly based on extrapolations. These data sources are incorporated into the 2014 baseline.

3.4.1 Different shocks and scenarios

We simulate the creation of a free trade area between African countries by reducing tariff and non-tariff barriers in goods and services. To evaluate these effects, two shocks or scenarios have been developed. Shocked variable is $rTMS(i, r, s)$. This exogenous variable represents the import tariff rate on trade goods or services (i) imported by country (s) from country (r). This parameter has three dimensions: it is defined for the set of traded goods or services (i); the set of source countries (r); and the set of destination countries (s). The $rTMS$ is a percentage target rate.

We have two different scenarios in our study: (1) a reduction of tariff lines by 90% and NTBs by 50% only in the agricultural and manufacturing sectors, (2) we consider the first scenario but including a 50% reduction of NTBs in all services sector. The goal of the AfCFTA is to eliminate tariffs on 90% of tariff lines (tariffs on non-sensitive goods). Non-least developed countries liberalize tariffs on non-sensitive goods over 5 years and least developed countries (LDCs) over 10 years. Second, a 7% reduction in tariff lines on sensitive goods. Non-least-developed countries liberalize tariffs on sensitive products over 10 years and LDCs over 13 years. finally, 3% of tariff lines can be excluded from liberalization. The value of these imports may not exceed 10% of total intra-African imports. In our study, we assume a liberalization of 90% of the total number of tariff lines. The implementation of the AfCFTA leads to a reduction of the trade costs associated with NTBs by creating a common set of rules for participating countries in areas such as competition, technical barriers to trade, and sanitary and phytosanitary standards. Implementing reforms in these areas by reducing trade costs is a difficult task. In line with the objectives of the AfCFTA, we assume that the scenario of 50% of NTBs are actionable (reduced). Indeed, only a fraction of NTBs are actual barriers that could be actionable (i.e., politically feasible in a trade agreement); the rest are assumed to be beyond the reach of

politically viable trade policies (World Bank, 2020). This assumption is consistent with previous studies on AfCFTA (AfDB, 2019 and World Bank, 2020) and other deep agreements, such as the Trans-Pacific Partnership study by Petri and Plummer (2016). The NTB changes are assumed to apply to MFN countries, i.e., they apply as well to imports from non-African countries (AfDB, 2019 and World Bank, 2020).²³

The two scenarios highlight the effects of NTBs reduction in services on intra-African trade. The effects are observed on macroeconomic variables such as GDP, regional household income, trade variables of interest and welfare decomposition.

To model the NTBs in the GTAP model, we will build a new tax named "Altertax". This tax will take both the tariffs and the NTB (AVE) of goods or services i imposed by each country. Indeed, it will be the sum of the two types of tax (AVE + customs tariff).

3.5 Simulation results and discussion

The results generated from our different scenarios are analyzed in this section. We evaluated our results on macroeconomic variables: change in GDP and household income, bilateral exports and welfare decomposition.

3.5.1 Macroeconomic impacts of AfCFTA

The AfCFTA's goal is to reduce progressively tariff and non-tariff trade costs to boost intra-African trade. In our analysis we consider two micro-closures to take into account the short- and long-term effects: the capital stock is exogenous in the first case and endogenous in the second.²⁴ However, we will focus on the long-term effects.

3.5.2 Change in percentage GDP and regional income

The tables above describe the effects of our two scenarios on the change in real GDP and regional income in the short and long term. Real GDP increases with the introduction of the two policies in the short and long term (see Table 3.4). Moreover, the effects are more significant in the long term. Interestingly, GDP growth rises with the liberalisation of the services sector. Indeed, a reduction in tariff lines by 90% and NTBs by 50% in the agricultural and manufactur-

²³Africa's trading partners: China, Europe and the United States.

²⁴For more details, see appendix C1.

ing sectors is associated with an increase in African GDP by 0.22% and 0.95% respectively in the short and long run. The liberalisation of services leads to an increase in GDP by 0.47 and 1.07% in the short and long run, respectively.²⁵ In comparison, the study by AfDB (2019) highlights an increase in African GDP by 1.25% and the study by World Bank (2020) a rise by 2.24% following the reduction of tariffs and NTBs. The services play a key role in intra-African trade because they have a positive impact on the performance of African manufacturing firms. The increase in GDP following the reduction in tariffs and NTBs for goods is more pronounced in West African countries (Guinea, Ivory Coast, Burkina Faso, Ghana, etc.). The reason is that the GDP growth of these countries is larger, their intra-African exports of goods are significant, and finally, these countries have the highest import tariffs on the continent (see Table C.7), contrary to Northern and Southern African countries. Moreover, the contribution of services to long-term economic growth is more pronounced in Southern African countries. Countries that are highly restrictive to trade in services are experiencing significant GDP growth rates as a result of services liberalization (Ethiopia, Kenya and Mozambique).

Interestingly, the gains are unevenly spread. Indeed, the effect of liberalization of trade in goods has low or no impact on long-term GDP growth in countries such as Mauritius, Malawi and Madagascar.²⁶ This result confirms those of World Bank, (2020). These findings are partly explained by the fact that these countries have previously liberalized their tariffs and there are no further gains to be had. Their neighbors are catching up with them, so the countries that liberalized first appear to become relatively worse off (Vanzetti, Peters and Knebel, 2017). Benin was the country that recorded a decline in GDP growth following the liberalization of goods and services. This can be explained by the fall in capital goods investment. Indeed, Benin was one of the countries where the share of capital goods in imports is the lowest in Africa in 2015 (nearly 15%, AfDB, 2019). This low share has a negative impact on the industries' productivity and even the share of industries in Benin's GDP. Indeed, imports of capital goods play a key role in the structural change and growth in export-led industries. Countries where imports have focused on upstream, capital-intensive products and industries have been more likely to see accelerated growth, increased industrialization, improved trade balances, and lower external debt following an increase in exports and import substitution compared to

²⁵These results are obtained by the difference between the average GDP growth in column 2 and 1 for the short run and that in column 4 and 3 for the long run.

²⁶Negative effects on long-run GDP growth in Botswana.

countries in which initial imports were driven mostly by the final consumption sectors (AfDB, 2019).

Table 3.4: Changes in Real GDP (in percent)

Countries	Types of Scenario			
	Short run		Long run	
	AfCFTA 1 Reduction of tariffs and NTBs in all sectors except services (1)	AfCFTA 2 Reduction of tariffs and NTBs in all sectors including services (2)	AfCFTA 1 Reduction of tariffs and NTBs in all sectors except services (3)	AfCFTA 2 Reduction of tariffs and NTBs in all sectors including services (4)
Guinea	1.24	1.88	6.48	10.37
Rest of Eastern Africa	2.95	3.23	8.43	9.02
Rest of South African Customs	0.18	1.36	0.9	4.94
South central Africa	-0.06	1.51	0.01	4.54
Mozambique	-0.06	2.08	0.14	4.3
Burkina Faso	0.13	0.9	1.4	3.84
Togo	1.31	1.7	2.66	3.11
Senegal	0.19	0.24	2.47	2.19
Ghana	0.08	1.02	0.71	2.08
Rest of Central Africa	-0.13	0.79	0.28	2.08
Namibia	0.14	0.32	1.27	1.88
Rest of West Africa	0.02	0.94	0.59	1.62
Ivory Coast	0.68	0.78	1.4	1.52
Ethiopia	0.02	0.75	0.06	1.39
Uganda	0.04	0.57	0.3	1.34
Kenya	0.01	0.57	0.12	1.34
Malawi	-0.01	0.87	0.11	1.24
Tanzania	0.17	0.69	0.47	1.23
Zimbabwe	-0.1	0.42	0.23	1.13
Zambia	0.04	0.34	0.32	1
Tunisia	0.03	0.23	0.63	0.92
South Africa	0.14	0.19	0.71	0.84
Botswana	0	0.21	-0.25	0.75
Rwanda	0.06	0.37	0.22	0.66
Madagascar	0	0.65	0	0.64
Egypt	0.02	0.12	0.15	0.53
Morocco	0.04	0.1	0.28	0.4
Cameroon	0.17	0.17	0.33	0.34
Nigeria	0.02	0.06	0.08	0.3
Mauritius	0	0.12	0.08	0.26
Rest of North Africa	0	0.16	0.05	0.21
Benin	-0.13	-1.11	-0.12	-1.22
Average (%)	0.22	0.69	0.95	2.02

Source: GTAP model, GTAP v10, AfCFTA database

Reducing NTBs in services increases African GDP by about \$20.68 billion on average in the long run (see Table 3.5). The contribution of services to GDP is higher in service-oriented economies such as Nigeria, Egypt, and South Africa with an increase of \$1.319 billion, \$1.255 billion, and \$478 million respectively. Services liberalization has a lower impact on GDP in West African countries than in North, South, and East Africa. South Africa and Nigeria account for nearly 32% of African GDP in 2018 (UNCTAD data, 2018) and are the largest exporters and importers of services in Africa followed by Angola, Egypt and Morocco (TRALAC, 2015). Reducing barriers to entry for service providers has positive and significant effects in these economies. However, services trade-restrictive countries such as Ethiopia, Mozambique, and Kenya registered significant GDP growth (+\$1.045 billion, \$906 million and \$848 million respectively). As mentioned above, Benin registered a decline in GDP in US\$ millions. In addition, liberalization of trade in services led to a decline in Senegal's GDP. The tourism and telecommunications sectors are the service sectors that contribute significantly to GDP growth (nearly 11% and 5% of GDP respectively in 2014, BCEAO, 2014). Tourism appears to be the largest single foreign exchange earner, but since the 2010s, the sector's share of GDP growth has been falling. Liberalization of the telecommunications sector could have negative effects on the profit margins of providers, potentially explaining the drop in GDP (Rouzet and Spinelli, 2016).²⁷

²⁷They find that a higher broadband density is associated with lower profit margins, which suggests that mark-ups tend to fall as markets mature.

Table 3.5: Changes in Real GDP (in USD millions): The impact of services liberalization

Countries	Types of Scenario		
	Long run		
	AfCFTA 1	AfCFTA 2	Service contribution
	Reduction of tariffs and NTBs in all sectors including services (1)	Reduction of tariffs and NTBs in all sectors except services (2)	(1) - (2) (3)
South central Africa	8785.44	22.89	8762.55
Nigeria	1814.88	495.63	1319.25
Rest of Central Africa	1513.41	201.05	1312.36
Egypt	1758.31	502.78	1255.53
Ethiopia	1094.14	49.12	1045.02
Mozambique	937.97	31.04	906.93
Kenya	929.27	80.49	848.78
Rest of Eastern Africa	8972.33	8381.66	590.67
Ghana	893.25	305.91	587.34
South Africa	3112.38	2633.53	478.85
Rest of West Africa	748.2	274.07	474.13
Rest of North Africa	580.63	136.13	444.5
Tanzania	680.03	258.87	421.16
Burkina Faso	524.61	192.07	332.54
Uganda	403.6	89.02	314.58
Rest of South African Customs	373.18	68.35	304.83
Guinea	794.6	496.85	297.75
Zambia	289.04	91.36	197.68
Botswana	124.57	-41.26	165.83
Tunisia	463.93	314.77	149.16
Zimbabwe	184.42	37.69	146.73
Morocco	454.05	317.73	136.32
Namibia	263.87	178.47	85.4
Malawi	84.49	7.52	76.97
Madagascar	77.29	0.37	76.92
Ivory Coast	555.94	511.46	44.48
Rwanda	60.58	20.54	40.04
Mauritius	35.62	10.52	25.1
Togo	158.54	135.47	23.07
Cameroon	115.77	113.29	2.47
Senegal	395.7	446.47	-50.77
Benin	-149.89	-14.92	-134.97
Total in USD millions	37030.15	16348.94	20681.21

Source: GTAP model, GTAP v10, AfCFTA database. The change in millions of GDP is calculated using the column Ch/%Ch. It measures the change as the difference between the post-shock and pre-shock value of GDP.

Considering the income variable is very capital because an increase in this component has ef-

fects on consumption, savings and thus investment and trade. The results on regional household income growth are presented in Table 3.6. They show that regional household income decreases in the short run (-0.1%). In the long run, income increases by 0.52%. We note an increase in income by 1.25% and 2.4% after the reduction of tariffs and NTBs respectively in the studies by AfDB (2019) and World Bank (2020). Moreover, the liberalization of services contributes to reducing income by 0.74% and 0.39% in the short and long run. Individually, all countries experienced a decline in regional household income as a result of services liberalization, except for some highly trade-restrictive services countries such as Mozambique and Zambia. These results are explained by lower margins for service providers as a result of reduced barriers to entry. Restrictive regulations are enabling firms to charge higher mark-ups in a majority of service sectors, generating large margins (Rouzet and Spinelli, 2016). The reduction of NTBs in services will reduce margins and thus household income because employment in the services sector accounted for more than 50% of total employment in 2015 (WDI data).

Table 3.6: Regional household income (changes in percent)

Countries	Types of Scenario				
	Short run		Long run		
	AfCFTA 1 Reduction of tariffs and NTBs in all sectors except services (1)	AfCFTA 2 Reduction of tariffs and NTBs in all sectors including services (2)	AfCFTA 1 Reduction of tariffs and NTBs in all sectors except services (3)	AfCFTA 2 Reduction of tariffs and NTBs in all sectors including services (4)	Long run Service contribution (4)-(3) (5)
Guinea	3.9	3.02	8.77	10.86	2.09
Rest of South African Customs	0.76	0.92	1.25	3.22	1.97
Mozambique	-0.43	0.19	-0.29	1.46	1.75
Zambia	1.78	2.4	1.93	2.94	1.01
Burkina Faso	-0.4	-0.76	0.56	1.44	0.88
Ghana	0.15	0.4	0.22	0.54	0.32
Botswana	-0.25	-0.8	-0.4	-0.37	0.03
Rwanda	0.13	0.07	0.21	0.11	-0.1
South central Africa	-1.11	-1.04	-1.13	-1.23	-0.1
Madagascar	-0.11	-0.26	-0.11	-0.26	-0.15
Namibia	2.4	1.98	2.67	2.45	-0.22
South Africa	1.5	1.24	1.74	1.51	-0.23
Tunisia	0.73	0.43	1.05	0.81	-0.24
Uganda	0.19	-0.38	0.33	-0.03	-0.36
Morocco	0.89	0.43	1.04	0.62	-0.42
Kenya	-0.15	-0.85	-0.12	-0.58	-0.46
Ivory Coast	4.55	4.02	4.31	3.82	-0.49
Malawi	0.14	-0.3	0.1	-0.39	-0.49
Egypt	0.43	-0.21	0.51	0.01	-0.5
Cameroon	-0.19	-0.94	-0.17	-0.89	-0.72
Tanzania	0.82	-0.04	0.95	0.16	-0.79
Togo	3.94	3.05	3.22	2.42	-0.8
Nigeria	0.31	-0.66	0.33	-0.6	-0.93
Zimbabwe	-1.2	-2.29	-1.15	-2.16	-1.01
Rest of Central Africa	-0.99	-2.5	-0.76	-1.79	-1.03
Rest of Eastern Africa	1.88	0.69	2.45	1.42	-1.03
Rest of North Africa	-0.15	-1.29	-0.14	-1.31	-1.17
Ethiopia	-0.54	-1.98	-0.42	-1.65	-1.23
Mauritius	-0.02	-1.39	0.01	-1.34	-1.35
Senegal	2.95	1.54	3.75	2.32	-1.43
Rest of West Africa	-0.53	-2.17	-0.15	-1.74	-1.59
Benin	-0.79	-5.65	-1.42	-5.24	-3.82
Average (%)	0.64	-0.1	0.91	0.52	-0.39

Source: GTAP model, GTAP v10, AfCFTA database

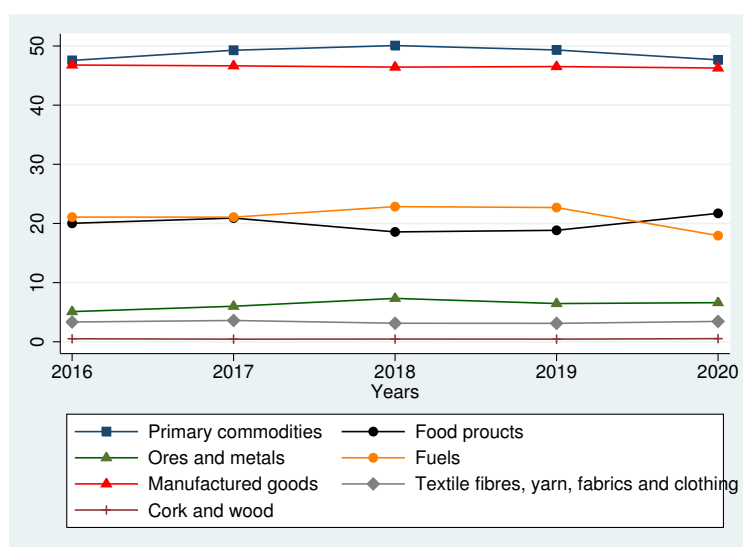
3.5.3 Results on bilateral trade

3.5.3.1 Agriculture, forestry and fish

The results of the impact of AfCFTA among African countries on bilateral trade in agricultural products are shown in Table 3.7. Agriculture is still one of the main economic activities in a majority of African countries. Intra-African exports of agricultural commodities are still higher than other products (see Figure 3.11) and this sector provides the employment for

about two-thirds of the continent’s workforce population and contributes an average of 15% of GDP and about 70% of value of exports in 2017.²⁸ In 2019, total intra-African agricultural trade was valued at \$23 billion (\$11.6 billion exports and \$10.7 billion imports) representing some 17% of total intra-African exports and 16% of intra-African imports. Only 23% of Africa’s total agricultural exports are intra-Africa exports, while only 15% of Africa’s total agricultural imports are sourced from within the continent (TRALAC, 2020). The AfCFTA increases intra-African exports of agricultural goods by 18.39% in the long run. Moreover, a decrease in exports to non-AfCFTA partners has been observed (-1.95% to China, -1.59% to Europe, and -1.88% to the USA, see Table 3.7). Services liberalisation increases intra-African exports by 1.62% (nearly \$69.97 million, see Table 3.15), exports to China by 1.01% (an increase of nearly \$44.42 million), exports to Europe by 1.02% (about \$148.43 million), and exports to the USA by 1.02% (about \$20.73 million).

Figure 3.11: Intra-African exports of goods (% of total trade), 2016-2020



Source: UNCTAD

Individually, South Africa is the country with the highest growth rate in intra-African exports of primary goods (an increase of almost 61.27%), followed by Ethiopia (+47.27), Egypt (+39.49) (considered as the largest exporters of food goods in Africa). In terms of value, South Africa is the largest intra-African exporter of primary commodities under goods and services liberalization, with an increase of \$408.6 million, followed by Ivory Coast (+\$200.66 million) and

²⁸UNCTADstat and World Development Indicators data in 2015.

Ethiopia (+\$134.59 million, see Table 3.14). Countries such as Burkina Faso, Guinea, Togo, and Rwanda have seen their exports decline as a result of the liberalization of goods and services. South African exports accounted for almost 30% of intra-African food exports in 2018 (Data from UNCTADStat in 2018). Citrus, table grapes, apples and pears accounted for the largest exports by value. South Africa also exports nuts, corn, wool, etc. Rwanda, Botswana and Mauritius have the lowest growth rates.²⁹

In monetary terms, the reduction of NTBs in services increase intra-African exports of agricultural products by almost \$408 million for South Africa, \$189.6 million for Ivory Coast, \$126.92 million for Ethiopia, almost \$12 and \$9 million for Egypt and Nigeria, respectively (see Table 3.15).³⁰ Services liberalization significantly contributes to the export growth of large African agricultural exporters relative to small exporters, which explains the decline in exports of many African countries. Interestingly, African exports of agricultural products to trading partners could increase following the liberalization of trade in services. Indeed, we note an increase in exports to China (+\$48.42 million), Europe (+\$148.43 million) and the United States (+\$20.73 million). Exports to Europe are the most important because it is still Africa's largest trading partner (see Figure 3.1).

²⁹The economies that are already relatively open (World Bank, 2020).

³⁰These countries accounted for about 43% of intra-African exports of primary products in 2015 (UNCTAD data).

Table 3.7: Agricultural exports (changes in percent): Long run impact

Exporters	Long run Types of Scenario							
	AfcFTA 1 Reduction of tariffs and NTBs in all sectors except services				AfcFTA 2 Reduction of tariffs and NTBs in all sectors including services			
	Partners (Importing region)							
	Intra-Africa Trade	No AfCFTA			Intra-Africa Trade	No AfCFTA		
		China	EU-EFTA	USA		China	EU-EFTA	USA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
South Africa	60.04	-5.82	-5.16	-5.59	61.27	-5.29	-4.66	-5.08
Rest of North Africa	48.4	1.22	1.43	1.33	54.4	5.01	5.06	5.08
Ethiopia	37.69	0.6	0.85	0.73	44.27	5.07	5.22	5.28
Egypt	37.26	-1.85	-1.49	-1.76	39.49	-0.56	-0.25	-0.45
South central Africa	36.31	6.72	7.37	7.4	38.9	8.4	9.18	9.23
Morocco	28.76	-3.63	-2.84	-3.18	29.98	-3.01	-2.29	-2.63
Rest of Eastern Africa	23.83	1.25	1.53	1.4	28.04	4.3	4.65	4.51
Nigeria	21.42	-1.71	-1.47	-1.61	26.74	2.38	2.72	2.54
Tunisia	25.51	-3.44	-2.8	-3.03	26.47	-3.06	-2.45	-2.7
Ghana	24.95	-2.57	-2.4	-2.56	24.05	-3.31	-3.14	-3.34
Kenya	20.32	0.29	0.53	0.41	23.67	2.84	2.92	3.02
Cameroon	20.4	0.63	0.9	0.79	22.96	2.52	2.83	2.82
Benin	13.51	1.91	2.23	2.15	22.83	9.61	10.17	10.36
Zimbabwe	20.49	1.75	1.89	1.88	21.71	2.65	2.72	2.78
Rest of Central Africa	18.82	3.28	3.7	3.67	20.76	4.42	4.92	4.9
Rest of West Africa	15.17	-0.78	-0.5	-0.72	19.03	2.1	2.34	2.37
Ivory Coast	16.69	-10.24	-10.19	-10.53	17.86	-9.62	-9.54	-9.89
Mozambique	20.49	-0.4	-0.14	-0.3	15.52	-4.55	-4.33	-4.72
Madagascar	14.73	0.22	0.5	0.36	15.13	0.4	0.7	0.55
Malawi	11.18	-2.27	-2.03	-2.19	13.46	-0.57	-0.28	-0.46
Uganda	9.96	-1.7	-1.44	-1.62	11.64	-0.57	-0.21	-0.47
Senegal	5.97	-12.89	-11.18	-13.17	10.07	-9.83	-8.44	-10.02
Namibia	9.13	-7.76	-6.68	-7.72	9.28	-7.78	-6.69	-7.76
Tanzania	3.68	-4.85	-4.69	-4.87	6.95	-2.18	-1.94	-2.13
Rwanda	2.01	-1.41	-1.13	-1.27	3.69	-0.12	0.17	-0.09
Mauritius	1.62	-0.23	0.06	-0.09	3.32	1.19	1.4	1.22
Zambia	5.53	-7.49	-7.13	-7.87	3.03	-9.85	-9.45	-10.38
Botswana	1.67	-0.85	-0.58	-0.72	2.7	-0.13	0.16	-0.02
Rest of South African Customs	3.16	-4.69	-3.89	-4.69	-0.02	-8	-6.83	-8.08
Togo	-1.7	-7.61	-7.41	-7.68	-0.28	-6.64	-6.4	-6.69
Burkina Faso	2.04	-2.87	-2.58	-2.86	-0.86	-5.87	-5.54	-5.96
Guinea	-22.39	-27.51	-28.65	-28.99	-27.67	-32.31	-33.6	-33.98
Average (%)	16.77	-2.96	-2.61	-2.9	18.39	-1.95	-1.59	-1.88

Source: GTAP model, GTAP v10, AfCFTA database

3.5.3.2 Manufactured goods

The manufacturing sector accounts for a significant share of intra-African trade. It represented almost 46% of intra-African trade in 2015. Approximately 57% of intra-Africa exports are neither commodities nor agricultural products and include flexible tubing, vessels, electrical energy, diamonds, motor vehicles and cement (TRALAC, 2020). The largest exporters are South Africa, Egypt and Nigeria according to the Global Manufacturing Competitiveness Index. Liberalisation of this sector will be beneficial for newer players such as Ethiopia,

Morocco, Rwanda, Ghana and Ivory Coast³¹ and boost intra-African trade in manufacturing goods. The manufacturing sector includes medium-high skill and technology intensive manufactures. The establishment of the AfCFTA would rise intra-African exports of manufacturing products by 63.86% in the long run, with a 9.91% increase in exports to China, 10.7% to Europe, and 10.33% to the United States (Table 3.8). The growth is significant in the manufacturing sector due to the effect of the reduction in trade barriers (World Bank, 2020). Indeed, the average trade-weighted NTBs for goods amounts to 30%, with the highest levels in manufacturing (37%), followed by agriculture (30%) and natural resources (15%). Services liberalisation increases intra-African exports by 16.37%, or nearly \$827.3 million, exports to China by 9.07% (an increase of nearly \$187.5 million), exports to the Europe by 9.53% (about \$961.41 million), and exports to the United States by 9.35% (about \$149.44 million, see Table 3.15). We find a significant dependence of the manufacturing sector on services (servicification) in Africa. These results refer to the existing literature on the effects of restrictions in services on the performance of manufacturing firms (Ariu et al., 2019 ; Ariu et al., 2020).

Benin, Ethiopia, Ivory Coast and Nigeria are the countries that are recording a high growth rate in intra-African exports of manufacturing goods (an increase of nearly 97.92, 96.7, 95.64 and 92.53%, respectively, see Table 3.8). In monetary terms, South Africa is the biggest intra-African exporter of manufactured goods (+\$3.417 billion), followed by Nigeria, Morocco, Egypt and Ivory Coast with increases of \$698.26 million, \$533.81 million, \$416.65 million, and \$349.02 million respectively as a result of reductions in trade barriers (Table 3.14). Countries such as Malawi, Mauritius, Namibia and Zambia which have low intra-African manufacturing exports, registered lower growth rates after AfCFTA's establishment.³² The liberalization of services would be beneficial to the largest exporters of manufacturing goods (South Africa, Nigeria, Morocco, Egypt, see Table 3.15 and Figure 3.13) rather than to small exporters. Indeed, in many African countries, services exports are limited to direct exports of services, while for others, services exports also include exports incorporated in goods and other services, through their forward linkages (Sáez, McKenna and Hoffman, 2015). For example, in the most advanced African economies, the contribution of services to manufactured exports is more important than their contribution to the domestic value added of manufacturing, so

³¹All of whom have recently adopted policies promoting manufacturing and industrial development (Sun Yuan, 2017).

³²According to UNCTAD data, they contribute almost 3% of intra-African exports of manufactured goods in 2018.

services liberalization would positively affect the largest exporters of manufactured goods. As before, African exports of manufactured goods to its trading partners are increasing with the liberalization of services. The rise is significant when considering exports to Europe (Europe accounts for nearly 30% of total African manufacturing exports, UNCTAD data).

Table 3.8: Manufactured exports (changes in percent): Long run impact

Countries	Long run Types of Scenario							
	AfcFTA 1 Reduction of tariffs and NTBs in all sectors except services				AfcFTA 2 Reduction of tariffs and NTBs in all sectors including services			
	Partners (Importing region)							
	Intra-Africa Trade	No AfcFTA			Intra-Africa Trade	No AfcFTA		
China		EU-EFTA	USA	China		EU-EFTA	USA	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rest of Eastern Africa	0	56.73	60.67	61.23	163.31	70.7	76.28	76.79
South central Africa	69.7	5.75	6.21	6.04	135.39	48.69	51.58	51.43
Benin	46.54	5.5	5.68	5.48	97.92	18.43	18.8	18.39
Ethiopia	45.71	2.84	3.15	2.97	96.7	29.89	31.39	31
Ivory Coast	51.42	-16.65	-16.48	-16.75	95.64	-13.97	-13.54	-13.94
Nigeria	76.87	-1.25	-1.02	-1.24	92.53	6.29	6.87	6.71
Ghana	68.43	8.73	8.89	8.77	88.82	13.64	14.06	13.79
Togo	80.45	-5.04	-4.84	-4.98	83.99	-0.06	0.48	0.11
Guinea	64.37	-11.78	-11.79	-12.67	81.17	-2.24	-1.77	-2.25
Rest of North Africa	82.99	0.93	1.14	0.96	79.67	8.11	8.44	8.16
Rest of West Africa	91.36	2.79	3.04	2.67	79.67	13.5	14.04	12.76
Rest of Central Africa	63.35	5.33	5.41	5.1	76.07	19.96	19.89	19.05
Senegal	28.56	-5.1	-4.94	-5.13	74.33	-0.86	-0.34	-0.7
Cameroon	78.73	2.02	2.24	2.09	69.73	7.01	7.51	7.28
Kenya	21.38	1.33	1.64	1.44	58.21	8.94	9.93	9.54
Rest of South								
African Customs	22.55	-5.15	-4.91	-5.06	53.49	6.85	7.41	6.98
Tunisia	32.92	-1.97	-1.77	-1.97	52.98	0.17	0.71	0.35
Egypt	26.67	-0.92	-0.66	-0.85	52.94	4.64	5	4.67
South Africa	34.05	-5.06	-4.86	-5.04	51.89	-3.52	-3.03	-3.37
Mozambique	12.69	0.57	0.83	0.63	50.07	14.38	14.93	14.57
Madagascar	17.12	0.57	0.81	0.62	49.43	5.8	6.33	5.98
Morocco	43.63	-3.62	-3.31	-3.51	47.4	-1.57	-1.01	-1.37
Burkina Faso	48.62	5.7	5.94	5.71	45.15	20.92	21.49	20.97
Tanzania	56.78	-3.39	-3.39	-3.57	41.7	3.91	4.76	4.39
Zimbabwe	29.56	6.34	6.5	6.34	38.91	15.48	15.84	15.55
Uganda	29.53	-0.2	-0.02	-0.15	36.88	12.21	13.48	13.05
Botswana	17.01	-0.82	-0.58	-0.77	32.26	2.44	2.98	2.61
Rwanda	51.09	-0.45	-0.21	-0.4	31.22	4.2	4.75	4.37
Malawi	65.02	0.46	0.69	0.5	29.55	12.71	13.19	12.69
Namibia	68.27	-7.91	-7.65	-7.75	21.66	-3.08	-2.55	-2.87
Zambia	56.39	-9.47	-9.33	-9.53	19.65	-9.73	-9.32	-9.68
Mauritius	37.76	-0.01	0.23	0.04	15.16	3.33	3.84	3.49
Average (%)	47.49	0.84	1.17	0.98	63.86	9.91	10.7	10.33

Source: GTAP model, GTAP v10, AfcFTA database

3.5.3.3 Processed foods

We consider the processed food sector because it represented a significant share of intra-African manufactured exports (about 44% of total manufacturing exports in 2018) and is highly

dependent on the services sector (Amara, 2021). Also at the continental level, the average trade weight tariffs are at about 5%, with the highest tariffs imposed on processed foods, textiles and wearing apparel. The manufacturing sector accounts for 12.6% of employment, of which 42% is in food processing (World Bank, 2020). The AfCFTA would increase intra-African exports of processed foods by 36.79% in the long run, exports to China by 3.37%, to the Europe by 3.84%, and to the United States by 3.59% (Table 3.9). Services liberalisation increases intra-African exports by 3.45%, or nearly \$116.93 million, a 4.28% increase in exports to China (an increase of nearly \$37.81 million), a 4.51% increase in exports to the Europe (about \$298.89 million), and a 4.39% increase in exports to the United States (about \$30 million, see Table 3.15).

South Africa, Egypt, Nigeria and Morocco countries are the countries with the highest growth rates in intra-African exports of agri-food goods after the implementation of the agreement (considered to be the major exporters in Africa). South Africa is experiencing an increase in intra-African processed food exports of about \$1.2 billion, followed by Morocco, Egypt and Nigeria (+\$389.55 million; +\$329.64 million; and +\$305.48 million, respectively) following the reduction of NTBs in the services (Table 3.15). As mentioned above, the liberalization of services boosts exports from the major food exporting countries in Africa (see, Figure 3.13). African food exports to Europe increase significantly as a result of services liberalization.

Table 3.9: Processed foods exports (changes in percent): Long run impact

Countries	Long run Types of Scenario							
	AfCFTA 1 Reduction of tariffs and NTBs in all sectors except services				AfCFTA 2 Reduction of tariffs and NTBs in all sectors including services			
	Partners (Importing region)							
	Intra-Africa Trade	No AfCFTA			Intra-Africa Trade	No AfCFTA		
		China	EU-EFTA	USA		China	EU-EFTA	USA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
Rest of North Africa	102.21	1.7	1.88	1.78	106.42	5.42	5.81	5.61
South Africa	99.37	-4.41	-4.18	-4.33	97.85	-3.4	-2.94	-3.21
Egypt	96.34	-1.35	-1.09	-1.22	97.82	1	1.4	1.15
South central Africa	43.05	6.06	6.19	6.06	62.54	23.04	23.2	22.91
Nigeria	55.86	-1.82	-1.58	-1.69	61.52	3.5	3.87	3.57
Morocco	58.96	-3.15	-2.91	-3.06	58.3	-2.05	-1.59	-1.86
Mozambique	52.86	1.97	2.16	2	56.26	6.03	6.41	6.09
Ghana	52.86	-2.36	-2.16	-2.28	50.79	-2.22	-1.79	-2.03
Rest of Eastern Africa	44.58	17.71	18.58	19.02	50.64	24.35	25.81	26.32
Tunisia	46.05	-1.95	-1.71	-1.84	45.37	-1	-0.54	-0.8
Rest of West Africa	36.39	0.84	1.04	0.92	43.2	7.41	7.81	7.62
Kenya	35.91	0.81	0.99	0.88	43.03	7.86	8.01	7.96
Cameroon	34.93	1.71	1.89	1.74	36.33	4.37	4.76	4.43
Ivory Coast	34.48	-10.86	-10.79	-10.89	35.35	-9.04	-8.73	-8.95
Ethiopia	16.8	1.69	1.97	1.82	31.09	15.12	16.26	15.76
Senegal	28.71	-6.16	-5.95	-6.19	31.01	-3.12	-2.69	-2.99
Benin	20.82	2.64	3.02	2.89	30.67	12.22	13.5	13.26
Rest of Central Africa	20.81	4.53	4.62	4.43	28.13	12.65	12.79	12.35
Namibia	27.22	-6.32	-6.12	-6.32	27.47	-4.67	-4.24	-4.55
Zimbabwe	23.93	3.5	3.66	3.52	27.15	7.79	8.15	7.85
Rest of South African Customs	23.72	-4.27	-3.87	-3.98	25.43	-1.29	-0.79	-1.04
Uganda	16.21	-0.35	-0.14	-0.27	22.64	6.88	7.12	6.99
Malawi	16.8	-0.95	-0.74	-0.87	21.51	4.63	5.08	4.83
Togo	18.93	-5.22	-4.75	-4.88	19.37	-3.28	-2.67	-2.94
Tanzania	15.03	-3.14	-2.88	-3.06	18.52	1.33	1.75	1.52
Mauritius	13.21	0.01	0.22	0.09	13.59	1.88	2.32	2.07
Madagascar	12.25	0.26	0.47	0.34	11.8	1.37	1.79	1.55
Guinea	6.99	-12.56	-12.52	-12.77	11.65	-7.54	-7.21	-7.53
Burkina Faso	7.59	0.64	0.84	0.72	9.53	3.91	4.29	4.1
Zambia	4.07	-7.09	-6.85	-7.16	1.39	-8.24	-7.77	-8.22
Botswana	0.26	-0.42	-0.2	-0.34	0.45	1.25	1.66	1.44
Rwanda	-0.37	-0.7	-0.48	-0.6	0.42	1.56	1.99	1.72
Average (%)	33.34	-0.91	-0.67	-0.8	36.79	3.37	3.84	3.59

Source: GTAP model, GTAP v10, AfCFTA database

3.5.3.4 Fossil fuels

The fossil fuel sector in Africa is vital as the continent struggles to implement renewable energy policies. The African economy is highly dependent on fossil fuels and Africa has a enormous potential of fossil fuels, accounting for about 9.5%, 8% and 4% of the total proven reserves of crude oil, natural gas and coal in the world, respectively (BP, 2011). In 2018, Nigeria and South Africa account for nearly 50% of intra-African fuel exports and 10% of global fuel exports come from Africa (UNCTAD data, 2018).

The AfCFTA would increase intra-African fossil fuel exports by 22.13% in the long term, a 1.96% increase in exports to China, 2.21% to the Europe, and 2.32% to the United States (Table 3.10). The Services liberalisation would boost intra-African exports by 4.92%, or nearly \$290.52 million, exports to China by 4.07% (an increase of nearly \$992.24 million), exports to the Europe by 4.32% (about \$1.422 billion), and exports to the United States by 4.25% (about \$324.41 million, see Table 3.15). Senegal, Ethiopia, Morocco and Egypt countries would record a large growth rate in intra-African trade in the long term. South Africa and Nigeria registered a significant increase in intra-African fossil fuel exports by \$857.59 million, \$593.47 million respectively after the implementation of the agreement (Table 3.14). South Africa and Nigeria recorded significant growth in fossil fuel exports, increasing by \$857.46 million and \$592.34 million respectively, as a result of services liberalization (see, Table 3.15 and Figure 3.13). Interestingly, services liberalization led to a significant increase in Africa's fossil fuel exports to its trading partners (see, Figure 3.12). Indeed, Europe and China are the top destination countries for Africa's fossil fuels (respectively nearly 40% and 20% of total African fuel exports, UNCTAD data).

Table 3.10: Fossil fuels exports (changes in percent): Long run impact

Countries	Long run Types of Scenario							
	AfcFTA 1 Reduction of tariffs and NTBs in all sectors except services				AfcFTA 2 Reduction of tariffs and NTBs in all sectors including services			
	Partners (Importing region)							
	Intra-Africa Trade	No AfCFTA			Intra-Africa Trade	No AfCFTA		
		China	EU-EFTA	USA		China	EU-EFTA	USA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
Senegal	87.29	2.18	2.25	2.27	89.49	2.9	2.98	3.24
Ethiopia	5.92	4.02	4.16	4.11	78.69	75.1	75.27	75.66
Rest of North Africa	61.22	-0.19	-0.04	-0.1	63.6	0.83	1.08	1.16
Morocco	53.55	-0.95	-0.79	-0.87	54.41	-0.81	-0.6	-0.49
Egypt	35.98	-1.13	-0.99	-1.07	37	-0.64	-0.39	-0.27
South Africa	35.11	-7.45	-7.32	-7.61	35.92	-7.27	-7.05	-7.15
Ghana	17.18	-3.51	-3.37	-3.54	33.79	9.6	9.89	10.4
Tunisia	27.14	-0.73	-0.57	-0.63	27.9	-0.65	-0.45	-0.37
Cameroon	24.49	0.79	0.95	0.88	25.56	1.31	1.58	1.65
Rest of Eastern Africa	23.07	1.52	1.69	1.61	24.77	2.45	2.76	2.81
Rest of Central Africa	22.11	0.72	0.87	0.81	24.26	1.88	2.14	2.22
Togo	17.12	-14.77	-14.46	-15.01	22.87	-10.98	-10.64	-10.89
Rest of West Africa	20.72	-0.6	-0.44	-0.5	22.66	0.69	0.87	0.93
Benin	10.3	-5.93	-5.73	-5.84	19.92	2.2	2.41	2.53
Zimbabwe	15.74	9.66	9.62	9.8	19.59	12.81	12.78	13.25
Nigeria	16.05	-0.87	-0.72	-0.78	17.06	-0.34	-0.09	-0.01
Namibia	8.72	-12.2	-11.65	-12.11	16.37	-6.17	-5.77	-5.85
Kenya	8.74	0.7	0.86	0.8	14.31	5.48	5.72	5.84
Guinea	12.88	-0.19	-0.05	-0.1	12.84	-0.52	-0.3	-0.2
South central Africa	7.88	0.38	0.53	0.47	11.54	3.23	3.49	3.57
Burkina Faso	7.65	0.37	0.52	0.46	8.81	1.16	1.41	1.49
Ivory Coast	6.32	-27.77	-26.84	-26.84	7.5	-27.28	-26.33	-26.22
Rwanda	2.65	-0.32	-0.17	-0.23	7.4	3.85	4.11	4.19
Uganda	5.59	-0.35	-0.2	-0.26	7.28	0.83	1.09	1.17
Zambia	6.43	-2.21	-2.07	-2.13	6.58	-2.5	-2.26	-2.19
Rest of South African Customs	3.71	-1.13	-0.98	-1.04	4.22	-1	-0.75	-0.68
Mauritius	-0.21	-0.67	-0.52	-0.58	3.81	2.98	3.19	3.32
Botswana	2.16	-2.49	-2.54	-2.62	3.03	-2.27	-2.06	-1.98
Malawi	1.08	-0.33	-0.18	-0.24	2.65	0.85	1.11	1.19
Tanzania	5.39	-0.95	-0.8	-0.86	2.46	-4.15	-3.91	-3.83
Madagascar	0.41	-0.15	0	-0.06	0.91	-0.04	0.22	0.29
Mozambique	-1.63	-2.84	-2.67	-2.92	0.9	-0.92	-0.69	-0.53
Average (%)	17.21	-2.11	-1.93	-2.02	22.13	1.96	2.21	2.32

Source: GTAP model, GTAP v10, AfCFTA database

3.5.3.5 Energy-intensive manufacturing

The energy-intensive manufacturing sector is still dynamic in Africa due to the abundance of natural resources (minerals and precious metals). In addition, about 30% of the world's mineral reserves are in Africa. The continent's proven oil reserves constitute 8% of the world's stock and natural gas reserves at 7%. Minerals account for an average of 70% of total African exports and about 28% of GDP. However, only 10% of Africa's global mineral and precious stone exports are to Africa, 30% are destined for Europe, 33% for China and 7% for the USA in

2018 (UNCTAD data).³³

Following the agreement, intra-African exports of minerals, ferrous metals and metals would increase by 37.25% in the long term, with a 7.54% increase in exports to China, 8.01% to the Europe, and 8.08% to the United States (Table 3.11). Ghana and Ethiopia are the countries with the highest growth rates in intra-African exports (Table 3.11). In monetary terms, the large increase is observed in major exporting countries such as South Africa, South Central Africa countries (Angola, Democratic Republic of Congo), Ivory Coast and Morocco (account for almost 80% of intra-African exports of energy-intensive manufactured goods in 2019, UNCTAD data). The liberalisation of services would increase intra-African exports by 8.02% (nearly \$515.23 million), a 7.56% increase in exports to China (almost \$1.249 billion), a 8.01% increase in exports to the Europe (about \$1.854 billion), and a 7.82% increase in exports to the United States (about \$139.17 million, see Table 3.16). Exports to Europe and China are the most significant (World Bank, 2020). Indeed, almost 70% of Africa's total exports of energy-intensive manufactured goods are destined for Europe and China (UNCTAD data). Ivory Coast, South Africa, and Morocco would have significant increases in intra-African exports by \$384 million, \$270.66 million, \$238.45 million, and \$113.35 million, respectively, following the reduction in NTBs in services (see, Table 3.16 and Figure 3.14).

³³This is because most of the global value chains that use minerals and precious stones are located outside of Africa.

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Table 3.11: Energy-intensive manufacturing exports (changes in percent): Long run impact

Countries	Long run Types of Scenario							
	AfcFTA 1 Reduction of tariffs and NTBs in all sectors except services				AfcFTA 2 Reduction of tariffs and NTBs in all sectors including services			
	Partners (Importing region)							
	Intra-Africa Trade	No AfCFTA			Intra-Africa Trade	No AfCFTA		
		China	EU-EFTA	USA		China	EU-EFTA	USA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
Ghana	78.64	0.76	1.01	0.87	82.05	3.87	4.55	4.64
Ethiopia	48.47	2.18	2.52	2.23	76.64	21.72	24.07	22.39
Rest of West Africa	62.45	1.79	2.04	1.91	74.88	10.7	11.55	11.66
Rest of North Africa	65.71	0.69	0.83	0.71	74.79	7.69	7.74	8.02
Rest of Eastern Africa	62.15	30.39	32.28	32.73	72.37	39.65	42.26	43.23
South central Africa	31.39	3.93	4.09	3.97	70	37.66	37.91	38.23
Tunisia	64.48	-2.11	-2	-2.07	65.59	-0.26	-0.04	0.02
Nigeria	53.07	-0.74	-0.61	-0.76	57.82	3.88	4.25	4.41
Morocco	55.5	-3.12	-2.89	-2.87	56.6	-1.76	-1.53	-1.4
Egypt	46.44	-1.11	-1.03	-1.08	51.85	3.38	3.87	3.62
Rest of Central Africa	31.02	3.75	4.06	3.75	47.1	17.34	18.33	17.57
Mozambique	12.04	0.41	0.58	0.44	35.82	22.89	23.19	23.55
Senegal	31.84	-3.96	-3.86	-3.95	34.68	-0.76	-0.57	-0.49
Benin	21.1	4.58	4.84	4.52	33.9	17.12	17.76	17.09
South Africa	33.56	-3.99	-3.97	-4.1	33.57	-2.87	-2.75	-2.68
Cameroon	25.71	2.13	2.24	2.11	27.58	4.88	4.95	5.04
Zimbabwe	22.58	3.97	4.23	4.11	27.53	9.4	9.87	10
Namibia	24.91	-3.66	-3.54	-3.89	27.13	-0.49	-0.28	-0.21
Ivory Coast	24.59	-12.64	-13.3	-12.72	26.34	-10.5	-10.96	-10.33
Rest of South African Customs	18.3	-3.55	-3.68	-3.8	25.56	2.89	3.37	3.45
Burkina Faso	14.01	3.35	3.52	3.39	22.41	12.48	12.76	12.88
Kenya	15.69	0.77	0.91	0.79	22.01	7.47	7.45	7.77
Botswana	19.68	-0.16	-0.01	-0.14	20.65	1.91	2.21	2.29
Malawi	8.49	0.1	0.25	0.12	19.9	12.1	12.2	12.65
Tanzania	12.66	-2.33	-2.26	-2.49	18.5	3.92	4.29	4.59
Guinea	6.19	-9.94	-9.71	-9.47	17.42	-0.46	-0.25	-0.18
Togo	13.28	-5.1	-5.08	-5.17	17.31	-0.39	-0.18	-0.11
Uganda	8.31	-0.64	-0.49	-0.64	16.47	8.01	8.27	8.66
Madagascar	5.95	0.58	0.76	0.62	14.5	9.75	10.35	10.45
Mauritius	9.18	0.24	0.39	0.26	9.87	2.09	2.24	2.36
Zambia	7.03	-5.29	-5.14	-5.27	8.24	-2.94	-2.74	-2.67
Rwanda	1.05	-0.91	-0.8	-0.88	2.87	1.76	2.09	2.01
Average (%)	29.23	0.01	0.19	0.1	37.25	7.57	8.01	8.08

Source: GTAP model, GTAP v10, AfCFTA database

3.5.3.6 Wood and paper products

The wood and paper sector is important in African trade. Indeed, according to the Food and Agriculture Organization (FAO) Africa's forests and woodlands are estimated to cover 650 million hectares, or 21.8% of the continent's land area (FAO, 2003). Using the FAO (2003) estimation, African forests and woodlands are unevenly distributed among sub-regions and countries. Central Africa has the largest proportion of African forest (37.1%), followed by Southern Africa (28.0%), Eastern Africa (13.2%), Western Africa (11.1%) and Northern Africa

(10.5%). Central Africa has the second largest area of tropical forest in the world and the exploitation of this forest for wood is an important economic activity. Cork and wood exports from Cameroon, the Democratic Republic of Congo and Gabon (the world's second largest forest area) accounted for almost 22% of intra-African exports in 2018, 22% of global exports from these countries go to Europe and 60% to China (UNCTAD data).

The forestry sector does not entail only wood production. It is associated with food security and better nutrition (AfDB, 2018). Indeed, it contributes directly to subsistence food production due to the richness of forest soils. It provides energy, especially for cooking. Income and employment generation; and the provision of ecosystem services (soil fertility enhancement, water storage, pollination, windbreaks, shelter). The AfCFTA would lead to a 37.67% increase in intra-African exports of wood and paper products, a 5.78% increase in exports to China, a 6.38% increase to Europe, and a 5.98% increase to the United States in the long term (Table 3.12). Northern, Southern, and Eastern African countries have the highest long-term growth rates for intra-African exports. South Africa, Egypt and Tunisia recorded a significant increase in their intra-African wood and paper exports following the implementation of the agreement (respectively an increase of \$161.92, \$112.72 and \$86.09 million). Services liberalisation increases intra-African exports by 5.49% (nearly \$32.26 million), a 6.26% increase in exports to China (an increase of nearly \$38.85 million), a 6.63% increase in exports to the Europe (about \$74.15 million), and a 6.45% increase in exports to the United States (about \$11.69 million, see Table 3.16). South Africa, Egypt, Morocco and Tunisia recorded significant increases in intra-African exports by \$160.96, \$105.8, \$91.2 and \$82.7 million respectively (Table 3.16).

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Table 3.12: Wood and paper exports(changes in percent): Long run impact

Countries	Long run Types of Scenario							
	AfcFTA 1 Reduction of tariffs and NTBs in all sectors except services				AfcFTA 2 Reduction of tariffs and NTBs in all sectors including services			
	Partners (Importing region)							
	Intra-Africa Trade	No AfCFTA			Intra-Africa Trade	No AfCFTA		
		China	EU-EFTA	USA		China	EU-EFTA	USA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
Rest of North Africa	72.16	0.79	0.99	0.82	78.9	6.68	7.21	6.94
Egypt	68.47	-1.12	-0.87	-1.07	76.46	6.19	6.41	6.11
Tunisia	71.46	-1.74	-1.48	-1.7	70.12	-0.51	0.07	-0.33
Rest of Eastern Africa	59.56	34.15	34.25	34.04	69.11	45.21	45.77	45.25
South central Africa	32.88	5.11	5.36	5.18	65.18	32.38	33.39	32.97
Rest of West Africa	49.05	0.98	1.19	1.02	60.78	10.85	11.52	11.21
Cameroon	58.06	1.46	1.67	1.48	60.57	4.98	5.58	5.16
Rest of Central Africa	40.32	4.41	4.63	4.44	52.3	15.03	15.7	15.25
Ghana	53.19	-2.25	-2.03	-2.21	50.93	-1.82	-1.26	-1.65
South Africa	50.76	-5.16	-4.93	-5.18	49.53	-4.15	-3.58	-4.01
Morocco	49.46	-3.44	-3.11	-3.5	48.94	-2.03	-1.4	-1.91
Senegal	44.94	-3.89	-3.56	-3.74	47.64	-0.21	0.35	-0.05
Kenya	40.22	0.86	1.06	0.86	46.65	7.72	8.27	7.72
Ethiopia	29.27	2.96	3.15	2.96	46.07	18.54	19.11	18.59
Nigeria	37.35	-1.62	-1.46	-1.73	43.4	4.17	4.88	4.73
Togo	37.26	-6.75	-6.54	-6.6	38.64	-4.2	-3.65	-3.97
Burkina Faso	28.39	7.5	7.58	7.5	38.17	17.81	18.12	17.94
Benin	20.56	3.41	3.73	3.64	37.73	19.23	20.61	20.71
Rest of South African Customs	27.16	-4.83	-4.38	-4.48	33.61	2.33	2.76	2.32
Mauritius	29.06	-0.29	-0.09	-0.27	29.01	1.84	2.32	2
Ivory Coast	25.73	-15.56	-15.49	-15.71	26.53	-13.68	-13.29	-13.68
Tanzania	19.07	-3.97	-3.96	-4.09	23.98	1.69	2.35	1.93
Madagascar	19.62	0.45	0.64	0.45	22.01	4.14	4.6	4.18
Botswana	16.37	-0.39	-0.18	-0.36	16.5	1.82	2.38	1.94
Zimbabwe	12.04	4.1	4.32	4.11	15.32	9.49	10.13	9.65
Uganda	8.94	-0.28	-0.13	-0.25	15.09	7.61	8.08	7.66
Mozambique	10.66	-0.13	0.09	-0.09	14.22	4.94	5.66	5.31
Malawi	6.41	-0.34	-0.14	-0.33	12.26	7	7.67	7.47
Zambia	16.52	-8.26	-7.94	-8.69	12.12	-9.99	-9.32	-10.36
Namibia	3.38	-7.77	-6.91	-7.63	4.5	-4.7	-3.77	-4.47
Rwanda	0.15	-0.3	-0.15	-0.27	1.81	3.29	3.73	3.18
Guinea	-8.69	-13.45	-13.37	-13.52	-2.78	-6.62	-6.14	-6.5
Average(%)	32.18	-0.48	-0.25	-0.47	37.67	5.78	6.38	5.98

Source: GTAP model, GTAP v10, AfCFTA database

3.5.3.7 Textiles and wearing apparel

African countries have a comparative advantage in labor-intensive light manufacturing, such as textiles sector. However, the textile and apparel sector represents a low share of intra-African trade. Intra-African exports of textiles and clothing represent only 14% of total African exports in 2018, with almost 50% of exports to Europe and 13% to the United States. South Africa is the leading exporter of textiles and clothing in Africa with nearly 30% of intra-African exports, followed by Egypt (8%) and Morocco (3%) according UNCTAD data.

The textile and clothing industry can drive Africa's industrial transformation and create many jobs. It is estimated that up to 600% of the value can be created along the cotton value chain: from cotton production, spinning and twisting into yarn, to weaving and knitting into fabric, and then to dyeing, printing and design (Moungar and Gregorio, 2018). The implementation of the AfCFTA would lead to an increase in intra-African exports of textiles and clothing by 122.79% in the long run, an increase of 8.6% in exports to China, 9.03% to the Europe, and 8.77% to the United States (see Table 3.13). Individually, Nigeria, Ghana Ethiopia and South Africa are experiencing high long-term intra-African trade growth rates. Services liberalisation would increase intra-African exports by 13.73%, or nearly \$126.26 million, a 8.42% increase in exports to China (an increase of nearly \$284.61 million), a 8.64% increase in exports to the Europe (about \$599.33 million), and a 8.53% increase in exports to the United States (about \$324.28 million, see Table 3.16). Nigeria, South Africa and Morocco are recording significant increases in intra-African exports of about \$364.46, \$185.31 and \$146.18 million, respectively following the reduction of NTBs in the services. As above, the liberalization of services would boost exports of textiles and wearing apparel from the most advanced African countries (see, Figure 3.14). Tunisia, Zimbabwe and Burkina Faso would increase their exports to China, Europe and the United States. Europe is the main trading partner of Burkina and Tunisia for textile products. It accounts for nearly 47% of total exports of textile products from Burkina Faso (38% from Tunisia), compared to 0.3% of Burkina's intra-African exports and 20% for Tunisia in 2017 (UNCTAD data).

In summary, the liberalization of the primary, secondary, and tertiary sectors has positive effects on intra-African trade, thus creating long-term trade (Table 3.14). Moreover, except for agricultural exports, where we find trade creation, Tables 3.8-3.13 show an increase in goods trade between Africa and its trading partners, which represents a trade diversion. However, the rise in intra-African trade is greater than the growth with trading partners. Trade in manufactured goods, energy-intensive manufactured products, wood, and textiles would create more trade diversion than other sectors as a result of the AfCFTA (Tables 3.8, 3.11, 3.12 and 3.13).

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Table 3.13: Textiles and wearing apparel exports (changes in percent): Lon run impact

Countries	Long run Types of Scenario							
	Reduction of tariffs and NTBs in all sectors except services				Reduction of tariffs and NTBs in all sectors including services			
	Partners (Importing region)							
	Intra-Africa Trade	No AfCFTA			Intra-Africa Trade	No AfCFTA		
China		EU-EFTA	USA	China		EU-EFTA	USA	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
South central Africa	229.48	6.58	6.75	6.57	352.81	54.57	54.98	54.72
Rest of North Africa	263.34	0.92	1.1	0.91	286.62	9.3	9.75	9.4
Nigeria	234.98	-2.45	-2.27	-2.42	255.99	5.32	5.7	5.35
Rest of West Africa	159.42	1.51	1.67	1.52	182.76	13.02	13.37	13.3
Ghana	182.68	-2.86	-2.69	-2.83	181.33	-1.42	-1.03	-1.3
Ethiopia	119.24	2.59	2.77	2.58	164.18	25.56	26.1	25.71
Rest of Eastern Africa	148.21	33.8	34.27	34.36	163.2	44.65	45.53	45.58
South Africa	161.46	-6.66	-6.4	-6.6	160.87	-5.08	-4.63	-4.93
Morocco	161.53	-4.73	-4.43	-4.63	160.57	-3.7	-3.22	-3.52
Rest of Central Africa	125.58	9.38	9.5	9.36	144.53	21.29	21.59	21.4
Kenya	123.04	1.39	1.57	1.36	141.93	12.03	12.47	11.92
Tunisia	137.06	-2.23	-2.03	-2.21	138.36	0.15	0.54	0.25
Togo	139.49	4.24	4.54	4.45	137.16	5.41	5.97	5.8
Egypt	124.74	-2.2	-2	-2.17	135.33	4.52	4.84	4.53
Cameroon	126.1	1.89	2.04	1.84	131.77	6.43	6.77	6.4
Burkina Faso	110.87	15.12	15.11	15.18	126.87	27.07	27.18	27.34
Rest of South African Customs	105	-1.94	-1.74	-1.91	125.73	10.59	10.84	10.5
Senegal	113.6	-5.72	-5.54	-5.79	120.51	-0.88	-0.5	-0.79
Ivory Coast	106.27	-15.44	-14.93	-14.93	108.22	-12.95	-12.3	-12.43
Benin	92.43	3.69	3.95	3.78	107.4	13.72	14.5	14.25
Uganda	72.29	-0.41	-0.24	-0.42	90.38	12.86	13.36	13.14
Mauritius	71.09	0.1	0.27	0.09	72.86	2.94	3.31	3.02
Madagascar	58.47	0.81	0.98	0.8	61.45	4.07	4.44	4.14
Malawi	44.48	0.86	1.05	0.85	53.8	9.37	10	9.39
Mozambique	37.96	0.48	0.67	0.48	49.61	10.96	11.35	11.35
Botswana	47.75	-0.77	-0.6	-0.76	49.17	2.11	2.5	2.13
Guinea	29.05	-13.67	-13.17	-13.29	44.15	-0.94	-0.54	-0.81
Rwanda	40.18	-0.2	-0.09	-0.21	44.13	4.85	5.2	4.84
Tanzania	35.41	-5.86	-5.73	-5.8	43.32	1.48	1.88	1.56
Zimbabwe	32.92	4.64	4.78	4.66	38.86	11.34	11.68	11.51
Namibia	35.03	-8.28	-8.07	-8.31	38.51	-3.92	-3.52	-3.83
Zambia	20.17	-8.76	-8.63	-8.8	16.87	-9.42	-9.09	-9.36
Average (%)	109.04	0.18	0.39	0.24	122.79	8.6	9.03	8.77

Source: GTAP model, GTAP v10, AfCFTA database

Table 3.14: The impact of intra-African free trade agreement (AfCFTA) on intra-African exports (changes in USD millions)

	Long run						
	Agriculture	Manufacturing	Processed foods	Fossil fuels	Energy-intensive manufacturing	Wood and paper products	Textiles and wearing apparel
Benin	4.22	41.97	11.95	6.33	22.1	0.39	3.75
Botswana	0.63	17.91	2.08	0.1	-11.63	1.16	0.87
Burkina Faso	-3.64	35.84	5.11	2.9	65.12	0.4	8.1
Cameroon	16.78	20.59	-3.27	180.39	6.78	12.17	2.16
Egypt	10.94	416.65	334	60.92	92.3	112.72	78.24
Ethiopia	134.59	0.87	3.93	0	50.74	0.8	9.15
Ghana	10.76	243.61	200.56	77.44	95.91	20.44	62.95
Guinea	-1.05	33.98	1.99	1.22	476.17	1.2	0.33
Ivory Coast	200.66	349.02	263.82	310.72	477.04	53.46	68.94
Kenya	29.94	129.82	24.2	6.91	21.88	8.77	32.79
Madagascar	3.2	-17.01	0.94	1.33	0.32	0.14	7.72
Malawi	25.58	11.82	12.54	1.06	0.53	5.26	0.99
Mauritius	0.96	8.68	0.97	0.05	-0.78	2.01	14.28
Morocco	21.75	533.81	489.28	59.12	139.19	94.92	148.79
Mozambique	14.08	25.68	22.89	49.87	8.57	1.58	1.37
Namibia	4.95	151.18	63.38	0.01	39.12	11.94	12.15
Nigeria	8.58	698.26	315.12	593.47	33.74	4.13	366.67
Rest of Central Africa	2.77	104.27	10.01	16.66	20.56	18.78	1.51
Rest of Eastern Africa	25.33	94.28	29.82	46.02	48.96	1.04	53.31
Rest of North Africa	1.98	26.29	40.4	172.96	14.38	1.16	6.68
Rest of South Africa							
African Customs	-1.32	245.13	19.83	1.17	3.39	4.82	44.42
Rest of West Africa	14.57	65.02	139.25	47.49	5.08	7.6	17.36
Rwanda	-0.19	5.41	8.51	2.53	16.93	0.04	2.09
Senegal	8.43	99.46	137.45	89.63	50.65	4.21	13.54
South Africa	408.66	3417.87	1213.32	857.59	224.92	161.92	185.73
South central Africa	10.65	136.48	74.87	215.71	283.1	5.85	24
Tanzania	0.41	82.55	411.46	0.08	21.21	-0.02	21.66
Togo	-0.73	142.73	4.62	0.98	24.22	6.79	85.69
Tunisia	3.35	202.17	103.96	1.16	99.58	86.09	56.28
Uganda	22.66	17.11	47.98	4.94	69.57	2.7	8.21
Zambia	7.37	156.74	81.3	22.4	34.21	2.73	1.93
Zimbabwe	7.85	20.55	50.49	2.52	23.97	5.82	4.65
All Africa	994.72	7518.74	4122.76	2833.68	2457.83	641.02	1346.31

Source: GTAP model, GTAP v10, AfCFTA database. AfCFTA included the liberalisation of goods and services sector.

Table 3.15: The impact of services liberalisation on exports (changes in USD millions)

Countries	Long run															
	Agriculture				Manufacturing				Processed foods				Fossil fuels			
	AfCFTA	No AfCFTA			AfCFTA	No AfCFTA			AfCFTA	No AfCFTA			AfCFTA	No AfCFTA		
	Intra-Africa Trade	China	EU-EFTA	USA	Intra-Africa Trade	China	EU-EFTA	USA	Intra-Africa Trade	China	EU-EFTA	USA	Intra-Africa Trade	China	EU-EFTA	USA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	
Benin	2.66	0.11	1.56	0.19	22.69	2.85	89.74	9.94	-24.98	0.21	2.98	0.34	-128.47	16.43	517.21	37.88
Botswana	-9.02	0.55	9.27	0.65	-318.88	2.81	136.14	10.84	-326.78	0.61	9.89	2.23	-59.59	0.99	21.28	0.58
Burkina Faso	-25.59	0.19	8.11	0.62	-483.41	5.79	160.1	10.58	-490.38	0.65	22.7	1.92	-56.09	0.01	0.35	0.01
Cameroon	12.91	0.02	0.76	0.05	-175.08	1.55	142.94	4.01	-111.12	0.15	4.32	0.69	179.23	0	1.38	0.14
Egypt	12.31	2.04	0.59	0.03	283.58	0.01	0.49	0.2	329.64	0	0.33	0.02	60.07	0	0	0
Ethiopia	126.92	0.4	3.7	0.13	-86.87	0.1	1.35	0.88	-125.02	0.91	7.88	0.2	-88.59	0	0.04	0
Ghana	3.42	0.67	18.49	2.32	-383.78	2.54	13.3	2.48	-90.42	0.06	11.17	1.53	-498.76	5.51	213.84	25.48
Guinea	-0.32	-0.18	-0.67	-0.05	5.26	0.01	2.53	0.16	0.27	0.07	0.11	0.02	-0.02	0	0	0
Ivory Coast	189.6	-1.69	-8.94	-1.31	118.38	0.43	4.11	0.59	56.17	0.02	2.27	0.1	305.25	78.65	200.15	0.36
Kenya	-171.21	0.74	12.24	4.49	-196.73	0.77	9.84	2.3	-235.34	0.28	26.47	5.4	-290.01	0	0.69	0.13
Madagascar	-13.02	4.44	13.25	0.12	-33.32	0.19	4.92	0.91	4.7	0.03	2.96	0.43	-172.4	1.52	5.57	0.34
Malawi	25.84	-3.53	-1.51	-0.23	-13.92	0.27	7.4	0.42	7.82	0.06	0.5	0.07	-1.27	0.63	4.3	1.41
Mauritius	-1.7	15.6	2.06	0.44	-26.61	0.04	0.79	0.08	-7.91	0.28	0.81	0.2	-5.5	0	0	0
Morocco	9.17	-1.63	-1.25	-0.07	351.9	-0.02	0	-0.01	389.55	-0.69	-0.82	-0.04	37.5	0	0	0
Mozambique	-7.73	1	5.82	0.49	23.43	1.12	4.31	1.21	-11.33	0.49	9.15	1.09	46.63	2.41	10.53	4.37
Namibia	9.72	6.45	9.72	2.21	83.82	1.49	4.3	1.61	-329.39	1.16	18.8	1.73	-0.09	0	-0.02	0
Nigeria	9.52	0.02	0.53	0.29	693.08	0.02	0.17	0.17	305.48	0.01	0.07	0.04	592.34	2.48	10.18	3.95
Rest of Central Africa	-14.99	-16.82	-1.01	-0.73	94.07	125.9	8.65	1.37	-10.62	0.21	17.14	0.42	-5.35	0.27	4.12	0.12
Rest of Eastern Africa	24.89	0.02	0.43	0.15	90.68	0.46	8.18	2.08	29.14	0.11	12.44	1	45.99	0	0	0
Rest of North Africa	-20.98	0.15	0.72	0.42	18.99	0.03	0.25	0.03	33.07	0.76	24.25	2.03	172.27	0.54	2.34	0.97
Rest of South Africa																
African Customs	-4.57	0.06	0.51	0.14	262.85	0.74	3.13	0.57	18.65	0.04	2.81	0.03	0.06	0.09	0.73	0.42
Rest of West Africa	-6.26	0.76	24.8	3.04	-10.89	0.79	5.54	1.47	128.97	0.85	16.63	1.96	43.06	0.01	0.08	0.01
Rwanda	-105.55	18.74	27.27	5.21	14.47	5.11	17.18	1.94	6.2	1.5	1.88	0.87	2.53	0	0.01	0
Senegal	1.28	0.35	0.68	0.04	87.43	0.23	1.07	0.61	104.82	23.78	11.39	0.85	87.53	0	0.01	0
South Africa	408.11	0.01	0.01	0.01	3407.92	3.19	9.08	1.69	1211.7	0.04	1.22	0.05	857.46	0	0	0
South central Africa	6.7	-0.01	-0.02	0	-5.97	3.78	8.04	1.95	14.47	0.18	7.23	0.18	215.71	0	0.01	0
Tanzania	-383.28	2.81	9.17	0.7	-3198.76	8.86	129.85	52.21	-817.91	1.4	14.23	2.13	-816.13	1.31	3.65	0.23
Togo	-14.6	6.89	4.68	0.31	91.72	5.2	94.35	8.01	-117.15	2.14	22.24	1.2	-44.14	0.3	13.91	23.76
Tunisia	-7.25	1.31	1.02	0.21	137.39	9.79	30.02	10.17	42.65	0.99	8.3	1.45	-163.4	753.21	352.18	185.77
Uganda	19.93	4.75	1.1	0.18	-6.13	1.09	51.02	18.66	39.79	0.27	1.42	0.82	-8.45	68.68	58.81	37.99
Zambia	7.42	-0.21	-0.2	0	46.23	0.68	2.49	0.43	67.99	0.01	5.29	0.66	21.37	0.06	0.46	0.28
Zimbabwe	-14.36	4.41	5.54	0.68	-66.24	1.68	10.13	1.88	24.2	1.23	32.83	0.38	-38.22	59.14	0.58	0.21
All Africa (Total)	69.97	48.42	148.43	20.73	827.3	187.5	961.41	149.44	116.93	37.81	298.89	30	290.52	992.24	1422.39	324.41

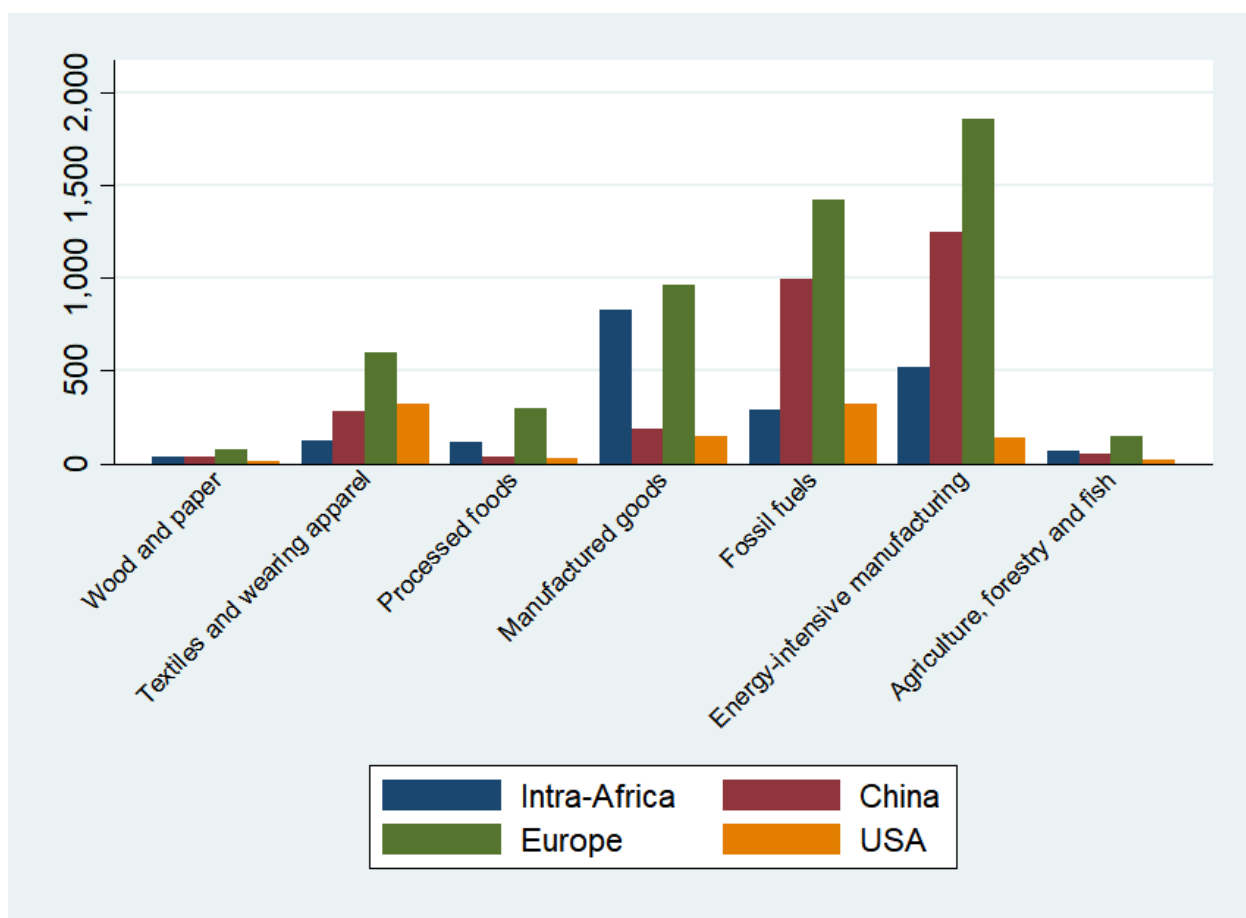
Source: GTAP model, GTAP v10, AfCFTA database

Table 3.16: Continued

Countries	Long run											
	Energy-intensive manufacturing				Wood and paper products				Textiles and wearing apparel			
	AfCFTA		No AfCFTA		AfCFTA		No AfCFTA		AfCFTA		No AfCFTA	
	Intra-Africa Trade	China	EU-EFTA	USA	Intra-Africa Trade	China	EU-EFTA	USA	Intra-Africa Trade	China	EU-EFTA	USA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
Benin	14.87	1.97	15.58	0.88	-0.33	0.24	0.52	0.17	-2.29	9.24	9.33	9.32
Botswana	-70.15	11.17	43.44	4.64	-97.5	1.04	9.9	3.63	-66.07	6.98	39.38	31.53
Burkina Faso	-72.12	2.65	10.16	2.15	-95.38	0.07	1.56	0.09	-142.64	-1.82	185.21	5.38
Cameroon	-92.91	0.14	6.62	0.14	-77.18	0.01	0.81	0.02	-53.74	0.76	78.7	2.42
Egypt	71.73	0.21	11.52	0	105.8	0.02	0	0	-8.35	5.39	5.93	5.79
Ethiopia	8.94	0.16	10.68	0.1	-3.37	0.01	0.1	0.02	-3.31	-0.68	0.53	-0.67
Ghana	64.12	7.23	5.67	0.54	16.69	0.05	2.48	0.03	-271.26	5.73	10.65	5.49
Guinea	73.91	2.8	41.83	7.83	0.18	0.04	0.01	0.01	0.06	-0.94	-0.52	-0.81
Ivory Coast	384.33	6.49	62.47	0.53	32.25	0.06	0.38	0.14	6.11	-1.3	-0.51	-1.06
Kenya	-438.45	0.92	10.32	0.01	-42.32	0.07	2.82	0.31	-32.51	-12.89	-11.34	-12.24
Madagascar	-5.4	0	3.42	0.03	-11.66	2.11	10.43	1.09	5.6	6.41	6.63	6.35
Malawi	-45	0.7	113.44	0.19	4.91	0.01	0.08	0.02	-6.1	26.85	25.78	27.12
Mauritius	-16.34	2.04	11.78	0.01	1.69	5.32	0.46	0.07	11.35	13.67	14.44	14.24
Morocco	113.35	66.71	6.58	0.59	91.52	-0.07	0	0	146.18	-9.02	-7.86	-9.06
Mozambique	-46.24	0.06	0.36	0.08	0.59	0.04	0.24	0.06	-5.3	12.99	13.43	13.16
Namibia	22.92	10.72	25.51	0.59	13.3	0.6	0.16	0.04	-0.74	2.84	5.08	3.63
Nigeria	17.41	2.23	0.03	0.3	4.1	0	0.01	0.02	364.46	4.85	5.2	4.84
Rest of Central Africa	20.38	19.5	304.2	7.87	17.28	3.58	0.06	0.01	0.62	10.95	11.32	11.35
Rest of Eastern Africa	48.13	0.01	0.28	0.01	-1	0.01	0.24	0.02	45.05	2.93	2.14	2.83
Rest of North Africa	14.13	0.01	0.04	0.01	-2.99	0	0.01	0	6.07	9.36	9.99	9.32
Rest of South Africa												
African Customs	3.6	6.88	21.39	9.36	4.9	0.01	0.38	0.04	38.9	4.06	0.43	3.97
Rest of West Africa	-9.87	2.71	1.76	1.08	2.45	0.07	0.47	0.13	-9.36	11.76	10.65	7.14
Rwanda	-23.31	1.58	54.52	1.22	-0.16	0.03	0.14	0.05	-3.52	24.11	23.01	24.59
Senegal	44.72	11.88	15.01	2.09	0.56	0.05	0.1	0.09	10.7	11.11	10.77	11.17
South Africa	238.45	3.68	55.23	1.3	160.96	0	0.02	0.01	185.31	2.11	2.51	2.26
South central Africa	270.66	6.55	34.95	5.04	-6.6	0	0.48	0.01	11.01	-3.59	-1.49	-3.58
Tanzania	-228.19	127.93	141.83	47.64	-165.21	4.04	4.77	0.47	-165.78	2.76	15.99	0.66
Togo	20.77	230.82	121.05	2.33	0.10	0.21	0.79	0.2	70.92	12.92	12.68	13.22
Tunisia	57.01	651.02	595.14	32.06	82.17	1.13	8.15	2.48	40.03	54.34	53.76	54.44
Uganda	57.17	38.88	104.7	8.86	-11.32	19.99	28.01	2.31	6.97	21.05	20.81	21.03
Zambia	32.17	2.57	22.87	1.55	2.95	0	0.02	0	-4.18	10.59	10.86	16.68
Zimbabwe	-15.26	29.5	2.13	0.14	4.88	0.11	0.55	0.15	-47.93	41.09	35.84	43.77
All Africa (Total)	515.53	1249.72	1854.51	139.17	32.26	38.85	74.15	11.69	126.26	284.61	599.33	324.28

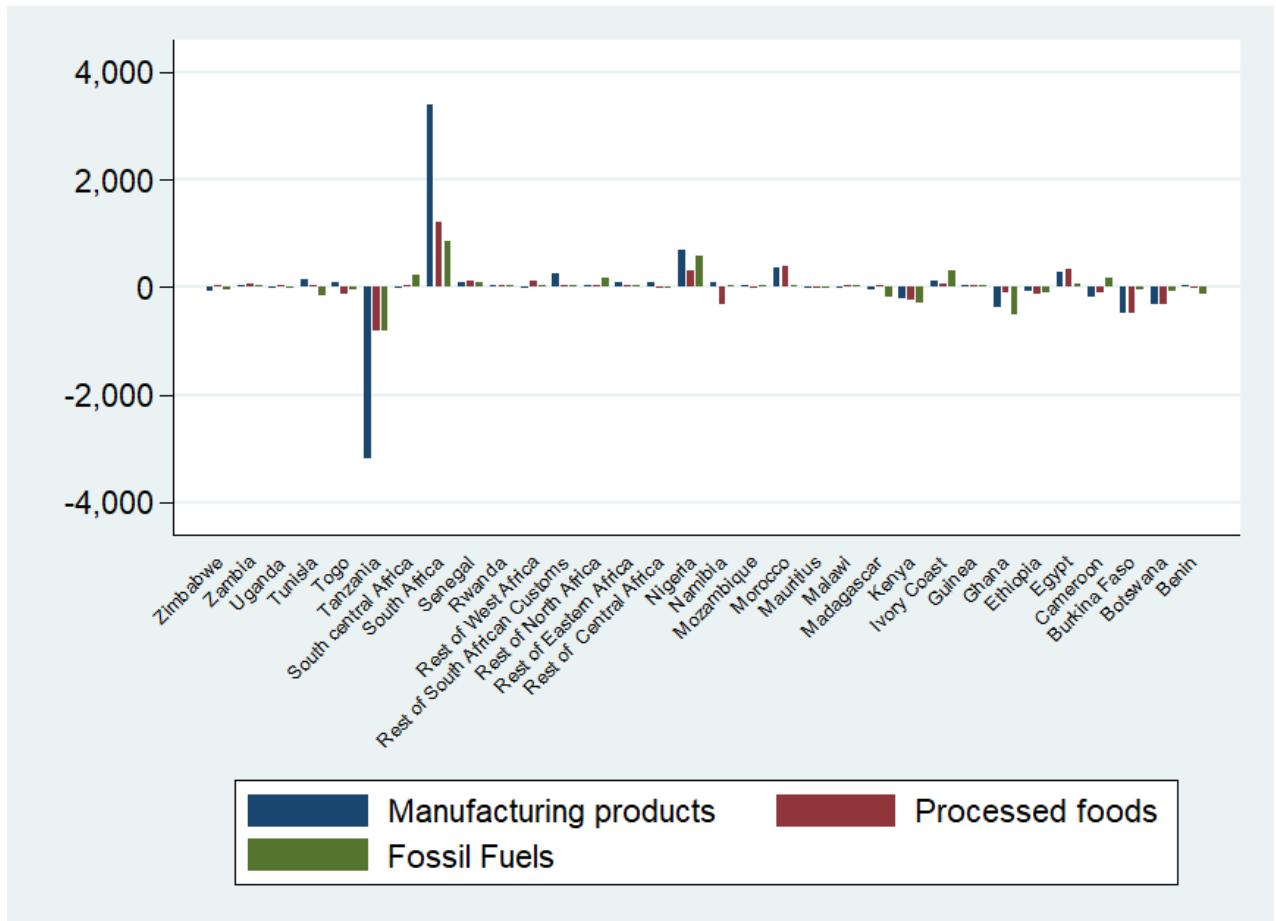
Source: GTAP model, GTAP v10, AfCFTA database

Figure 3.12: The effects of NTB reductions in services on Africa's exports (US\$ millions)



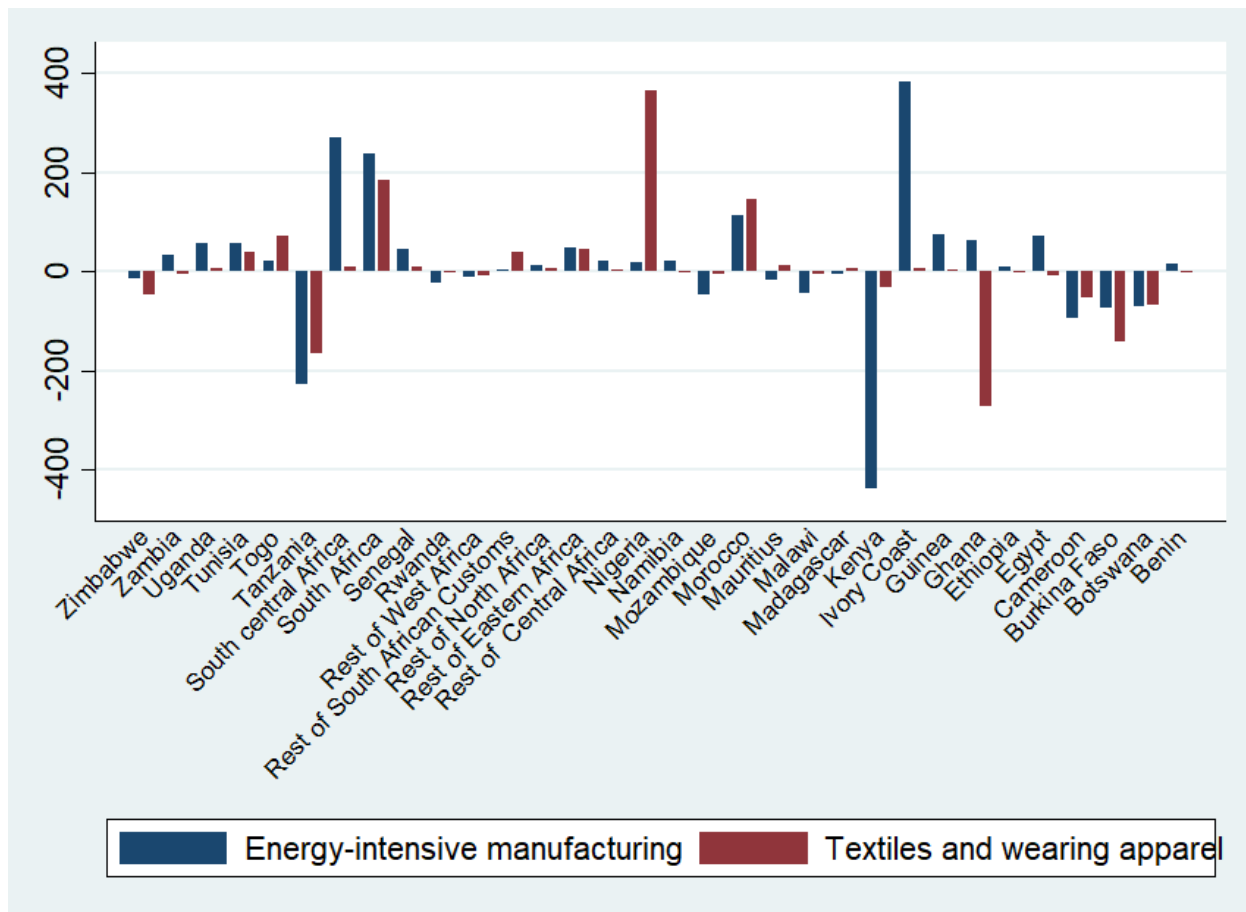
Source: The author's construction using GTAP v10 data

Figure 3.13: The Effects of services liberalization on intra-African exports by country (in millions of US dollars)



Source: The author's construction using GTAP v10 data

Figure 3.14: The Effects of services liberalization on intra-African exports by country (in millions of US dollars)



Source: The author's construction using GTAP v10 data

In monetary terms, the liberalization of services led to a significant increase in intra-African exports of manufacturing products, natural and energy resources (fossil fuels, metals and precious stones, etc.), textiles and processed foods products (see Figure 3.12). Moreover, the agricultural and wood sectors are less dependent on services in Africa. These results confirm those of Figure 3.9, which highlighted the significant servicification of the manufacturing, mining and quarrying, and food sectors. Under the AfCFTA scenario by World Bank (2020), manufacturing exports gain the most, 62% in overall terms, with intra-African trade increasing by 110% and exports to the rest of the world by 46%. There are smaller gains in agriculture, 49% and 10% for intra- and extra-African trade, respectively. Indeed, of the \$2.5 trillion in exports projected for Africa, \$823 billion are in manufactured goods, \$690 billion in natural resources, \$191 billion in agriculture

Further on, Services liberalization contribute to a higher growth of African exports of fossil fuels, energy-intensive manufactured and textiles products to its trading partners (see Figure 3.12). As a result, services liberalization generates trade diversion. This is explained by the fact that these products are important raw materials for manufacturing industries in Europe, United States and China. Intra-African exports of energy resources and mining products are low compared to those with its trading partners (UNCTAD data) and, thus services liberalization generates more benefits through extra-Africa trade.

3.5.4 Welfare decomposition

Table 3.17 describes the effects of AfCFTA on consumer welfare. These welfare effects are quantified in the GTAP model. Indeed, the model includes a utility that decomposes the equivalent variation (EV) welfare effect of an economic shock. It is a money metric measure, comparing the cost of pre- and post-shock levels of consumer utility, both valued at base year prices. The utility disaggregates the total welfare effect into seven components: resource allocation (efficiency) effect, endowment effects due to changes in factor supplies, technical change due to productivity gains or losses, the effects of population growth, change in terms of trade for goods, change in terms of trade for investment-savings, and change in preferences (the structure of aggregate demand).

The trade creation from the reduction of tariff and non-tariff barriers has improved the efficiency of resource allocation in production, consumption, import and export. Factor endowments increase in the long run due to labor immigration and education (which leads to an increase in the number of skilled workers and capital inflows).³⁴ The terms of trade for goods are negative in almost all African countries over the long term due to trade diversion (increase in imports from AfCFTA partners), except for large African economies such as South Africa, Ivory Coast and Morocco. Trade creation induced by trade liberalization has negative effects on the investment-savings terms of trade of most African countries. Indeed, the income growth generated by trade creation leads to a considerable rise in household savings instead of investment. Moreover, overall welfare is positive over the long run in all African countries except Mauritius and Benin.³⁵ African economic giants such as South Africa and Nigeria have recorded the largest welfare gains on the African continent.

³⁴We find a positive growth in all countries except Benin.

³⁵Mauritius is one of the most liberalized African countries in terms of trade.

Table 3.17: Welfare decomposition (\$U.S. millions)

Long run								
Reduction of tariffs and NTBs in all sectors including services								
Resource Allocation Effect	Endowment Effect	Technical Change	Population Growth	Terms of Trade (goods)	Terms of Trade (Investment-Saving)	Preference Change	Total	
Africa								
South central Africa	3084.11	3780.06	0	0	-940.89	871.72	0	6795.01
Rest of Eastern Africa	4283.56	3464.58	0	0	-462.27	-508.48	0	6777.4
South Africa	1229.23	1229.91	0	0	719.33	-7.01	0	3171.46
Nigeria	496.43	949.18	0	0	-182.26	217.33	0	1480.68
Egypt	567.64	1047.65	0	0	-200.81	-175.1	0	1239.38
Rest of Central Africa	766.33	556.89	0	0	-328.59	208.71	0	1203.34
Ivory Coast	309.68	133.9	0	0	270.29	8.04	0	721.91
Guinea	332.86	407.83	0	0	6.2	-30.51	0	716.39
Mozambique	559.73	261.92	0	0	-130.45	-101.08	0	590.12
Ghana	513.28	173.48	0	0	-63.43	-51.06	0	572.27
Morocco	171.1	206.71	0	0	123.6	40.42	0	541.82
Ethiopia	598.07	377.3	0	0	-147.38	-288.3	0	539.69
Tanzania	436.21	152.17	0	0	-17.46	-64.93	0	505.99
Kenya	400.23	433.57	0	0	-112.83	-291.97	0	429
Burkina Faso	213.19	236.8	0	0	-52.88	19.68	0	416.79
Tunisia	185.4	226.79	0	0	-0.71	-2.39	0	409.1
Zambia	103.8	132.49	0	0	131.85	7.43	0	375.57
Senegal	135.35	180.24	0	0	10.89	6.85	0	333.33
Uganda	174.27	182.2	0	0	-35.07	11.11	0	332.51
Rest of West Africa	526.97	164.03	0	0	-254.03	-133.55	0	303.42
Rest of South African Customs	158.21	154.9	0	0	-41.54	-1.54	0	270.04
Namibia	85.12	114.85	0	0	11.77	9.99	0	221.74
Togo	99.93	27.03	0	0	9.87	-3.81	0	133.03
Rest of North Africa	452.67	90.65	0	0	-288.71	-193.79	0	60.82
Malawi	62.57	13.72	0	0	-15.07	-5.54	0	55.68
Madagascar	77.24	0	0	0	-25.3	0.16	0	52.11
Rwanda	37.35	17.32	0	0	0.93	-3.63	0	51.97
Botswana	44.85	59.08	0	0	-63.49	2.01	0	42.44
Cameroon	67.39	33.77	0	0	-43.73	-19.9	0	37.54
Zimbabwe	84.04	66.26	0	0	-88.69	-44.35	0	17.25
Mauritius	19.78	9.74	0	0	-32.72	-10.72	0	-13.93
Benin	-124.83	-10.98	0	0	-44.66	-234.33	0	-414.81
All Africa	16151.76	14874.04	0	0	-2288.24	-768.54	0	27969.06
No AfCFTA (Partners)								
China	-309.41	0	0	0	303.93	230.55	0	225.07
Europe	1167.49	0	0	0	4554.51	-50.92	0	5671.09
USA	172.38	0	0	0	1360.86	354.09	0	1887.33
Rest of World (ROW)	-601.61	0	0	0	-3976.49	240.3	0	-4337.8

Source: GTAP model, GTAP v10, AfCFTA database

3.6 Conclusion and policy recommendations

This paper contributes to the literature about the impacts of AfCFTA on intra-African trade. We examine the effects by highlighting the contribution of services sector to economic growth and intra-African trade in two scenarios. The contribution of services to economic growth in Africa is significant, providing large jobs and used as inputs in production and exports. However, barriers to entry are significant and therefore impede intra-African trade.

To assess the impacts of this FTA on intra-African trade, we use the GTAP model and to model the restrictions in services with, we consider the ad valorem equivalents of NTBs in services of Jafari and Tarr (2017). AVEs of NTBs for goods are taken from the World Bank's World Integrated Trade Solution (WITS) database and documented by Kee, Nicita, and Olarreaga

(2009). The effects are observed in the short and long term with a focus on the long term.

We find that AfCFTA is associated with an increase in GDP in the short and long run, with a larger effect in the long run. Regional income declines in the short term and rises over the long term. The liberalization of services stimulates GDP growth in the short and long term. However, it leads to a decline in African regional income over the short and long term. The reduction of NTBs in services leads to a rise in intra-African exports of agricultural products, manufactured goods, processed food, fuel, energy-intensive products, wood and paper products, textiles and clothing in the long run. The "servicification" is still important in intra-African exports of manufacturing goods. Moreover, this trade agreement creates both long-term trade creation and diversion, but the welfare gain is still positive and significant over the long run.

This paper is the first to quantify the effects of services liberalisation on intra-African trade, however it has shortcomings. The AVEs constructed by Jafari and Tarr (2017) do not account for the regulatory disparity between pairs of countries. Indeed, AVEs measure restrictions on services entry in each country and not bilateral restrictions between pairs of countries. It is important to have bilateral measures in the case of a CGE study. The measure of Benz and Jaax (2020) is bilateral and addresses this problem however it does not include African countries with the exemption of South Africa. This study does not address the issue of whether liberalization of services increases or decreases rents for foreign providers. This measure of Jafari and Tarr (2017) does not decompose AVE into economic rents for the exporter and the importer. The solution might be to use the approach of Francois et al (2013), who allocates an average of 60% of the estimated AVEs to trade efficiency cost and assumed that one-third of the remaining 40% were appropriately described as economic rents to exporter and two-thirds as economic rents to importer.

Services liberalisation has positive effects on economic growth and intra-African trade. However, several challenges need to be addressed to ensure that the establishment of AfCFTA has beneficial effects on intra-African trade. These challenges should be in the form of support policies. We formulate five policy recommendations:

- Transportation and logistics services are essential inputs in the production and commercialization of manufacturing products. Moreover, competitive transport and logistics services are key to reduce trade costs, in particular in the food sector (Amara, 2021).

Also, information and communication infrastructure play a key role in intra-African trade. Indeed the study by Bankole et al. (2015) examined the impact of information and communication technology infrastructure on intra-African trade. Their results suggested that information and communication infrastructure and institutional quality have a robust positive effect on intra-African trade. The first policy to consider would be the development of regional transport, communication and energy infrastructure to facilitate the movement of goods, people and trade in services. Government cooperation with financial actors, particularly the African Development Bank, should continue to invest in transport infrastructure projects and in new information and communication technologies in order to boost intra-African trade.

- Customs services are a crucial sector in intra-African trade. The OECD Services Trade Restrictiveness Index (STRI) estimated the level of restrictions in the customs services sector in South Africa at 0.28, compared to an average of 0.046 in the European Economic Area in 2018, which is significant. Reforms aimed at simplifying customs procedures are to be implemented (Kouty Manfred, 2021).³⁶ Measures ranging from the digitalization of these services to the publication of information on trade activities and border customs procedures should be implemented to reduce trade costs.³⁷ The reduction of trade costs can be achieved through the WTO's Trade Facilitation Agreement (TFA).³⁸ The agreement entered into force on 22 February 2017 aims to simplify, modernize and harmonize export and import processes to promote trade (WTO, 2020). WTO estimates show that the full implementation of TFA could reduce trade costs by an average of 14.3% and boost global trade by up to \$1 trillion per year, with the largest gains in the poorest countries. Melo and Sorgho (2019) found that one extra day in customs is equivalent to a 1.3% extra tariff at destination, based on ocean trade flows to the United States. The World Bank study showed the gains from implementing TFA simulated by applying econometric estimates of ad valorem equivalents of the time lost in customs (World Bank, 2020). The results suggested that African importers see a roughly 7 percentage

³⁶It shows that trade procedures such as the number of documents required to import goods and border compliance negatively affect intra-African trade.

³⁷Godwin et al. (2020) find that digitalization (mobile subscriptions, internet users and broadband subscriptions) has a positive contribution to the economic growth in Sub Saharan Africa.

³⁸The implementation of trade facilitation measures through cooperation of African countries is included in Phase I of AfCFTA objectives.

point decline in the iceberg costs of importing, with minor variations across sectors and source regions. African exporters see roughly the same improvement in their iceberg costs of exporting.³⁹

- The production and commercialization of goods and services in Africa is dependent on the financial sector (banking intermediation).⁴⁰ Moreover, lack of trade finance is a significant non-tariff barrier to trade, particularly (but not exclusively) in developing countries (WTO, 2016). Restrictions in the banking sector hamper the provision of massive credit in Africa and the trade finance gap is very large in Africa compared to other regions (WTO, 2016). The African Development Bank in its report "Trade finance in Africa" published in 2014 (AfDB, 2014), surveyed the trade activities of 276 African commercial banks operating in 45 African countries. It found that the market for bank intermediated trade finance was between \$330-350 billion, an amount that would have been high had a significant share of financing requests from traders not been rejected. Among the rejected requests, the value of unmet demand for trade finance in Africa was \$110 billion in 2011 and \$120 billion in 2012. The main reasons for rejecting financing requests were lack of creditworthiness or credit history, insufficient limits granted by endorsing banks to local African issuing banks, small balance sheets and limited capital of African banks, and insufficient U.S. dollar liquidity. Lack of access to finance is the main concern when operating in international markets. The WTO study (WTO, 2016) indicates that lack of access to finance is a major obstacle for traders, especially small and medium-sized exporters in Africa. For an intra-African free trade area to be beneficial, the African Development Bank's Trade Finance Facilitation Program, as well as those of other development finance institutions (multilateral financial institutions, export credit agencies etc.), are needed to boost intra-African trade. Also regulating the banking system in order to implement policies to boost the banking rate in Africa, with a wide range of financial services such as online payments, and connecting the financial sector to mobile payments (highly developed in sub-Saharan Africa).
- Fourth, the professional services sector can play a major role in intra-African trade through the mobility of skilled labor i.e., legal, accounting, scientific and technical ac-

³⁹The "iceberg" trade cost assumption implies that a fraction of the good is lost in transport due to transportation costs.

⁴⁰Almost 80% of global trade is supported by trade finance or credit insurance (WTO, 2016).

tivities (high value-added services).⁴¹ This sector is very restrictive due to high entry costs such as expertise and qualifications, nationality requirements, etc. The liberalization of this sector should be supported by a skilled labor and policies to support higher education to exploit this knowledge-intensive trade. Measures to promote inter-university exchange programs (e.g. ERASMUS program in Africa), visiting researchers to share expertise and knowledge in order to stimulate the professional services sector. These policies can be implemented through the Skills Initiative for Africa (SIFA) initiated by the African Union Commission (AUC) and the African Union Development Agency (AUDA-NEPAD) with the support of the German government and the European Union. In collaboration with the International Labour Organization (ILO), it promotes the occupational prospects of young Africans through the support of innovative skills development programs and close cooperation with the private sector, as a key stakeholder in the creation of jobs. It aims to reduce the under-utilization of existing skills at the workplace, as well as limited portability of skills and qualifications across African countries. The funding project has to date been launched in 7 out of 8 participating countries⁴² and should be expanded across the continent to enable the sharing of knowledge, skills and expertise without barriers to entry.

- Last, political and economic crises in regional trading blocs can impede the gains from trade liberalization in Africa. Indeed, political instability in certain regions of Africa has a negative effect on economic activities. The study by Yushi and Borojo (2019) shows that intra-African trade and overall trade in Africa are robustly determined by the quality of institutions, border and transport efficiency, and physical and communication infrastructure. The estimates also indicate that the marginal effect of institutional quality, physical and communication infrastructure on trade flows appears to be increasing in GDP per capita. Political instability and lack of good governance are impediment to economic growth and to the implementation of free trade agreements, including AfCFTA, regional cooperation in Africa should therefore be strengthened. COVID-19 highlighted the strong relationship between global trade, particularly ser-

⁴¹In its study, the International Labor Organization (ILO) finds that around one in five of all jobs in a sample of 40 countries (EU countries, G20 countries and some additional high-income countries) are linked to international trade (ILO, 2015a), and intensifying trade restrictions could have a significant impact on employment in the countries concerned.

⁴²Cameroon, Ethiopia, Ghana, Kenya, Nigeria, South Africa, Togo and Tunisia.

vices trade, and the health system. Africa's global trade was negatively impacted by the crisis in 2020, and a large part of its population remains unvaccinated (WTO, 2021). Access to the vaccine in Africa has been made possible through the COVAX initiative (COVAX AMC). Moreover, of the 6.4 billion vaccine doses administered worldwide, only 2.5% have been administered in Africa-although the continent accounts for a little over 17% of the world's population (World Health Organization data). The unequal access to vaccines is due to poor health systems in Africa, ranging from a lack of trained medical personnel to inadequate health and transportation infrastructure (including adequate vaccine storage facilities). Reducing barriers to trade in services should boost trade in services, especially transport and logistics. The establishment of the AfCFTA should be supported by the cooperation of governments in public investments in the African health system (hospital infrastructure, investment in research and development (R&D), reduction of barriers to intellectual property (IP) rights, and technology transfer) in order to address potential health crises that could affect African economic growth.⁴³

⁴³Cooperation on investment, intellectual property rights and competition policy are among the objectives (Phase II) of the AfCFTA.

General Conclusion

This thesis investigated the impacts of Non-Tariff Barriers in services on trade. First, it highlighted the negative effects of restrictions in services on trade and FDI and second, the gains from services liberalization. Therefore, the dissertation is organized into three chapters. In the first chapter, we study the effects of restrictions in services on food trade between OECD countries. By using a gravity model of trade, the OECD indices of individual country restrictions (STRI) and regulatory differences by country pair to capture the level of restrictions in these sectors, we highlight the different impacts of NTBs in services (transport, logistics, distribution, financial and other business sectors) on food trade. The second chapter explores the effects of global and sectoral FDI restrictions on cross-border investment between advanced and emerging countries. Based on a gravity analysis as before, we use the OECD's FDI regulatory restriction index, which quantifies the level of restriction on foreign direct investment (FDI). This chapter highlights the sectoral restrictions (primary, secondary and tertiary) that impede inward FDI in countries by level of development (advanced, large and small emerging countries). The third chapter examines the gains from services trade liberalization. It considers the African Continental Free Trade Area (AfCFTA) agreement. The particularity of this chapter is that it studies the effects of services liberalization on economic growth and intra-African trade. Using a CGE model (GTAP v10), it analyzes the effects of NTB reductions in the goods and services sector on intra-African trade in the short and long term.

The results of the first chapter suggested that higher restrictions in the logistics and transport sector lead to lower exports of food commodities. Also, restrictions in the financial and other business sectors are associated with lower imports. Interestingly, restrictions in the distribution sector have positive and significant effects on both exports and imports of food products. The sectors most affected by these restrictions are food, live animals and perishable products (milk, eggs and meat). The regulatory disparity has a significant negative impact on food trade. This impact decreases when the exporter country is closed to service providers. The deregulation or harmonization of these measures would be highly beneficial to food trade.

In the second chapter we found that global restrictive measures do not significantly affect cross-border FDI in OECD countries, while restrictions in the service sector have significant negative effects on FDI. Moreover, the overall restrictive measures and those in the primary,

secondary and service sectors negatively impact inward FDI among OECD and large emerging countries. Restrictions in the primary sector are a main obstacle to inward FDI in large emerging countries. In addition, global and sectoral restrictions do not have a significant effect on FDI between advanced and African countries. The analysis of disaggregated sectoral restrictive measures shows that restrictions in business and other financial services are negatively associated with intra-OECD FDI. We also find that restrictions in the manufacturing sector have restrictive impacts on inward FDI in large emerging countries and that restrictions in the mining, quarrying, and oil extraction sector hinder inward FDI in African countries. Reforms to liberalize sectoral restrictions by country have positive effects on FDI, but deregulation of the service sector has beneficial effects on inward FDI from advanced and emerging countries. The findings of the third chapter showed that African Continental Free Trade Area (AfCFTA) is associated with an increase in regional GDP and income in the long run. Moreover, services liberalisation boosts the regional GDP in the long run. The reduction in NTBs in services is leading to an increase in intra-African exports of agricultural products, manufactured goods, processed food products, fuels, energy-intensive products, wood and paper products, and textiles and apparel in the long run. The manufacturing and natural resources sectors are the most affected by the reduction of barriers to services trade in Africa. Moreover, this trade agreement creates both long-term trade creation and diversion, but the welfare gain is still positive and significant over the long term in Africa.

The three chapters of this thesis aim to contribute to the understanding of how NTBs in services trade, especially disaggregated services affect FDI and international trade. This thesis highlights the importance of the services sector to economic growth and trade. As mentioned above, in each chapter, interesting policy implications are identified in order to enhance global trade. Overall, the interpretation of the results suggests that liberalization of the services sector would boost trade in food products. Deregulation of restrictive measures in FDI, particularly in manufacturing and services, would be attractive to inward FDI in advanced and emerging countries. Africa should be opening its markets to service suppliers in order to boost trade in goods, reduce poverty and increase GDP.

Our present work could be improved by further research. First, it would be interesting to examine the impacts of restrictions in the information technology (IT) sector on trade in goods. The global economy is increasingly digitized and the digitalization of the economy has posi-

tive impacts on economic growth and trade for both advanced and emerging countries (Godwin et al. 2020; Dahlman, Mealy and Wermelinger, 2016). The Covid-19 pandemic crisis has shown the importance of IT services on economic activity through remote work. The predictions of the WTO show that the sector that has experienced significant growth during the crisis. Statistics show a growth from 23% in 1993 to almost 80% in 2012 in computer usage and from 18% in 1997 to about 76% in 2016 for internet usage in the US (World Bank, 2018). However, many restrictions weigh on this sector that blocks trade in digital (OECD, 2020). Moreover, most studies focused on the link between the digital sector and trade in services, and very few studies highlighted the relationship between trade in goods and restrictions in the digital sector.

The second area of future research would be to study the effects of services liberalization on regional block trade in Africa. Indeed, the effects of AfCFTA on intra-African trade in our third chapter show heterogeneous effects of services liberalization on intra-African trade. Some countries experience significant growth in GDP and trade compared to others. The findings of Ekobena et al. (2021) show that the reduction in tariff barriers under the AfCFTA will lead to a decrease in tariff revenues in some Central African countries in the short term. However, in the long run, these losses are largely offset by the socio-economic benefits generated by the implementation of the agreement, particularly in terms of economic growth and the well-being of the region's population. They therefore encourage Central African countries to ratify and implement the AfCFTA. The question arises: *Would services liberalization increase trade between countries in the same trading bloc? or would services liberalization reduce intra-regional trade in Africa?* Intra-African trade is characterized by trade between countries within the same trading bloc. Conducting a study of this kind will be useful in order to see whether certain regional blocs in Africa would benefit from signing this agreement or not.

Finally, it would be interesting to use other indices of restrictiveness to trade in services to conduct the empirical studies related to the first chapter. The World Bank services trade restrictiveness indices is alternative to the OECD STRI.

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Appendices

APPENDIX A

Appendix of Chapter 1

Table A.1: List of countries: OECD, non OECD, EEA, major net food exporting-importing and high-low value-added service countries

<i>OECD countries</i>	<i>Non-OECD (Emerging countries)</i>	<i>EEA countries</i>	<i>Major net food-exporting economies</i>	<i>High value -added service countries</i>
Australia	China	Austria	Australia	Belgium
Austria	(People's Republic of)	Belgium	Belgium	France
Belgium	Colombia	Czech Republic	Canada	Greece
Canada	Costa Rica	Denmark	Denmark	Israel
Chile	India	Estonia	Hungary	Japan
Czech Republic	Indonesia	Finland	Iceland	Luxembourg
Denmark	Malaysia	France	Ireland	Netherlands
Estonia	Russia	Germany	Mexico	Switzerland
Finland	South Africa	Greece	Netherlands	United Kingdom
France	Thailand	Hungary	New-Zealand	United States of America
Germany		Iceland	Norway	
Greece		Ireland	Poland	
Hungary		Italy	Spain	
Iceland		Latvia	Thailand	
Ireland		Lithuania	Turkey	
Israel		Luxembourg	United States of America	
Italy		Netherlands		
Japan		Norway		
Korea		Poland		
Latvia		Portugal	Major net food-importing countries	Low value -added service countries
Lithuania		Slovak Republic		
Luxembourg		Slovenia		
Mexico		Spain		
Netherlands		Sweden		
New-Zealand		Switzerland	Austria	Chile
Norway		United Kingdom	Czech Republic	Czech Republic
Poland			Estonia	Hungary
Portugal			Finland	Ireland
Slovak Republic			France	Korea
Slovenia			Germany	Norway
Spain			Greece	Poland
Sweden			Israel	Slovak Republic
Switzerland			Italy	Slovenia
Turkey			Japan	Turkey
United Kingdom			Korea	
United States of America			Latvia	
			Lithuania	
			Luxembourg	
			Portugal	
			Slovak Republic	
			Slovenia	
			Sweden	
			Switzerland	
			United Kingdom	

Table A.2: Cross-correlation table of STRI

Variables	<i>STRI</i> <i>Logistics</i>	<i>STRI</i> <i>Financial-Business</i>	<i>STRI</i> <i>Transports</i>	<i>STRI</i> <i>Distribution</i>
<i>STRI-Logistics</i>	1.000			
<i>STRI-Financial-Business</i>	0.416	1.000		
<i>STRI-Transports</i>	0.401	0.758	1.000	
<i>STRI-Distribution</i>	0.404	0.372	0.221	1.000

Table A.3: Descriptive statistics: Country STRI and regulatory heterogeneity score

Variables	Country STRI									
	Emerging					OECD				
	obs.	Mean	Std. Dev.	Min	Max	obs.	Mean	Std. Dev.	Min	Max
STRI-Logistics	1,800	0.37385	0.11775	0.2425	0.675	1,800	0.20745	0.06984	0.125	0.4825
STRI-Transports	1,800	0.41395	0.13319	0.225	0.6425	1,800	0.28058	0.06861	0.1825	0.4875
STRI-Financial-Business	1,800	0.4134	0.15926	0.23	0.67666	1,800	0.22714	0.06699	0.13	0.43666
STRI-Distribution	1,800	0.3116	0.14642	0.14	0.67	1,800	0.17127	0.04641	0.11	0.33
Heterogeneity score										
Variables	OECD-Emerging					Intra-OECD				
	obs.	Mean	Std. Dev.	Min	Max	obs.	Mean	Std. Dev.	Min	Max
Heterogeneity score-logistics	1,800	0.33301	0.09296	0.14377	0.6092	6,300	0.21940	0.07590	0.061	0.50807
Heterogeneity score-Transports	1,800	0.36088	0.07870	0.1793	0.57766	6,300	0.22296	0.08885	0.06213	0.4946
Heterogeneity score-Financial-Business	1,800	0.38069	0.10480	0.1582	0.6029	6,300	0.24674	0.06564	0.05766	0.49766
Heterogeneity score-Distribution	1,800	0.31243	0.13367	0.0952	0.7131	6,300	0.18634	0.05335	0.058	0.364
Overall Heterogeneity-score	1,800	0.35237	0.07193	0.1896	0.51926	6,300	0.22522	0.06782	0.07632	0.44353
Country STRI										
Variables	Intra-EEA					EU				
	obs.	Mean	Std. Dev.	Min	Max	obs.	Mean	Std. Dev.	Min	Max
	obs.	Mean	Std. Dev.	Min	Max	obs.	Mean	Std. Dev.	Min	Max
STRI-Logistics	3,250	0.20221	0.05515	0.1175	0.405	2,530	0.19013	0.04099	0.1175	0.2875
STRI-Transports	3,250	0.25721	0.05166	0.14	0.40666	2,530	0.24661	0.04146	0.14	0.3275
STRI-Financial-Business	3,250	0.21846	0.05680	0.13	0.35666	2,530	0.20704	0.04881	0.13	0.31
STRI-Distribution	3,250	0.17646	0.0534	0.11	0.37	2,530	0.16434	0.03988	0.11	0.28
Heterogeneity score										
Heterogeneity score-logistics	3,250	0.17735	0.05054	0.061	0.34445	2,530	0.16449	0.03978	0.061	0.2879
Heterogeneity score-Transports	3,250	0.15623	0.04210	0.06213	0.29	2,530	0.14659	0.03484	0.06213	0.25915
Heterogeneity score-Financial-Business	3,250	0.21157	0.04702	0.05766	0.36	2,530	0.20088	0.04204	0.05766	0.30966
Heterogeneity score-Distribution	3,250	0.16266	0.04735	0.058	0.364	2,530	0.15029	0.03462	0.058	0.239
Overall Heterogeneity-score	3,250	0.17904	0.04279	0.07632	0.32367	2,530	0.16743	0.03291	0.07632	0.26495

Table A.4: Country-STRI and other control variables

Specification Dependant variable	Poisson-PML Estimate: 2014-2019 All Food Products (Pooled)						
	Baseline		Country-STRI	Other control variables			
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$STRI_{ijt,Logistics}$	-7.6906*** (1.8916)	-7.3176*** (1.5895)		-7.8344*** (1.8738)	-7.1746*** (1.6509)	-7.9510*** (1.9764)	-8.1397*** (1.7900)
$STRI_{ijt,Financial-Business}$	-6.8823*** (2.3890)	-6.6244*** (2.0004)		-7.3817*** (2.4483)	-7.5066*** (2.1036)	-6.7848*** (2.4149)	-6.5539*** (2.0977)
$STRI_{ijt,Transports}$	1.9993 (2.3698)	2.1451 (2.1118)		3.1682 (2.3736)	3.3905 (2.1755)	1.9463 (2.4513)	1.9549 (2.1959)
$STRI_{ijt,Distribution}$	9.7833*** (2.0444)	8.7531*** (1.7437)		9.1919*** (2.1922)	8.7872*** (1.8512)	9.9410*** (2.1317)	9.6181*** (1.8891)
$STRI_{j,t}$			-1.4287*** (0.4794)				
$STRI_{i,t}$			-2.9249** (1.3305)				
RTA_{ijt}	0.3806*** (0.1156)	0.4912*** (0.1059)	0.7647*** (0.1014)				
<i>Intra – EEA</i>				1.2530*** (0.2045)	1.3279*** (0.1878)		
<i>NAFTA</i>				0.1689 (0.2475)	0.4014* (0.2254)		
<i>EIA – SPS harmonization_{ij,t}</i>						-0.1510 (0.1499)	-0.2364 (0.1462)
<i>EIA – TBT harmonization_{ij,t}</i>						0.3147** (0.1502)	0.4901*** (0.1410)
$Ln(1 + tariff_{ji,t})$	-0.2962*** (0.0542)	-0.3299*** (0.0470)	-0.1038*** (0.0338)	-0.0058 (0.0519)	-0.0344 (0.0472)	-0.3120*** (0.0624)	-0.3329*** (0.0593)
$Ln dist_{ij}$	-1.8028*** (0.1036)	-1.8199*** (0.0936)	-1.0412*** (0.1075)	-1.7563*** (0.1088)	-1.7552*** (0.0996)	-1.8469*** (0.1052)	-1.8754*** (0.0978)
$lang_{ij}$	0.2071** (0.1049)	0.2379*** (0.0867)	0.0074 (0.0898)	0.2532** (0.1050)	0.3026*** (0.0860)	0.2172** (0.1056)	0.2551*** (0.0885)
$border_{ij}$	0.7335*** (0.0876)	0.7499*** (0.0810)	0.9706*** (0.0921)	0.7356*** (0.0890)	0.7403*** (0.0820)	0.7162*** (0.0880)	0.7209*** (0.0826)
Exporter-importer controls	No	No	Yes	No	No	No	No
Sector-FE	Yes	No	Yes	Yes	No	Yes	No
Time-FE	No	No	Yes	No	No	No	No
Exporter-time-FE	Yes	No	No	Yes	No	Yes	No
Importer-time-FE	Yes	No	Yes	No	Yes	No	No
Exporter-sector-time-FE	No	Yes	No	No	Yes	No	Yes
Importer-sector-time-FE	No	Yes	No	No	Yes	No	Yes
R^2	0.922	0.9396	0.664	0.925	0.9404	0.922	0.9372
Observations	24867	24763	24867	24867	24763	24867	18651
Chi-2		2321.34***			2337.29***		2314.19***

Notes: The dependent variable is nominal bilateral food product from i to j at to t in sector k as in equation (1.3). Regressions 2, 4, 6, 8 and are performed using the `ppmlhdfe` STATA command written by Correia, Guimarães, Zylkin (2019). Exporter-importer controls are the GDP of both countries. Standard errors are reported in parentheses and clustered by country-pair level except regression 7 where they are clustered by importer and exporter. *, **, *** denote significance at the 10% 5% and 1% level respectively.

Table A.5: Impact of disaggregated sectoral STRIs on cross-border exports of food Commodities

Specification Dependant variable	Poisson-PML Estimate: 2014-2019 All Food Products (Pooled)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>RTA_{ijt}</i>	0.2262** (0.1123)	0.3428** (0.1074)	0.3453** (0.1129)	0.4686** (0.1045)	0.4276** (0.1181)	0.5232** (0.1108)	0.3058** (0.1216)	0.3885** (0.1163)
<i>Ln(1 + tariff_{fjt,t})</i>	-0.3078*** (0.0567)	-0.3384*** (0.0492)	-0.3045*** (0.0566)	-0.3369*** (0.0497)	-0.2986*** (0.0585)	-0.3345*** (0.0538)	-0.2822*** (0.0569)	-0.3206*** (0.0515)
<i>Ln dist_{ij}</i>	-1.7712*** (0.1074)	-1.7945*** (0.0970)	-1.7551*** (0.1029)	-1.7764*** (0.0941)	-1.7604*** (0.1114)	-1.7711*** (0.1007)	-1.7965*** (0.1123)	-1.8121*** (0.1002)
<i>lang_{ij}</i>	0.1989* (0.1061)	0.2326*** (0.0882)	0.1610 (0.1054)	0.1987** (0.0890)	0.1441 (0.1272)	0.1826* (0.1091)	0.1462 (0.1247)	0.1820* (0.1046)
<i>border_{ij}</i>	0.7141*** (0.0864)	0.7333*** (0.0799)	0.7432*** (0.0903)	0.7616*** (0.0833)	0.7603*** (0.0950)	0.7772*** (0.0894)	0.7512*** (0.0921)	0.7673*** (0.0854)
Logistics Sector								
<i>STRI_{ijt,Storage-warehouse}</i>	5.9945 (4.5835)	6.7194* (3.9413)					5.9192 (4.5935)	7.2951* (4.1567)
<i>STRI_{ijt,Freight forwarding}</i>	-4.5174*** (1.7025)	-4.1346*** (1.5321)					-2.7968 (1.7150)	-2.5256 (1.6271)
<i>STRI_{ijt,Cargo handling}</i>	-6.0579* (3.5519)	-7.5224** (3.2490)					-11.4078*** (4.4234)	-13.9262*** (4.0578)
<i>STRI_{ijt,Customer brokerage}</i>	-2.6590** (1.0789)	-2.2604** (0.9650)					-3.9983*** (1.3223)	-3.8399*** (1.2337)
Financial-Other Business Sectors								
<i>STRI_{ijt,Accounting}</i>			-1.8437*** (0.6868)	-1.7654*** (0.5489)			-1.6123 (1.0528)	-1.4688* (0.8198)
<i>STRI_{ijt,Banking}</i>			-5.8073*** (1.6360)	-4.9442*** (1.4730)			-0.3606 (3.5872)	1.2212 (3.1779)
<i>STRI_{ijt,Insurance}</i>			-0.6933 (2.1983)	-1.0485 (1.7472)			1.8728 (3.1965)	1.0154 (2.6514)
Transports and Distribution Sectors								
<i>STRI_{ijt,Air transport}</i>					-0.9819 (1.3218)	-0.9214 (1.2366)	-0.7750 (1.5283)	-0.6197 (1.4134)
<i>STRI_{ijt,Rail freight transport}</i>					-0.9889 (0.9119)	-1.1404 (0.7521)	0.1235 (1.2034)	-0.2401 (0.8972)
<i>STRI_{ijt,Road freight transport}</i>					-2.9675** (1.1906)	-2.6602** (1.1050)	3.5031* (2.1079)	3.4020 (2.0891)
<i>STRI_{ijt,sea transport}</i>					-6.1879** (3.0645)	-5.0457* (2.6837)	-1.0913 (3.5028)	0.4768 (2.9614)
<i>STRI_{ijt,Distribution}</i>					9.4034*** (2.5192)	7.9703*** (2.1428)	9.4635*** (2.1409)	8.6681*** (1.8466)
Sector-FE	Yes	No	Yes	No	Yes	No	Yes	No
Exporter-time-FE	Yes	No	Yes	No	Yes	No	Yes	No
Importer-time-FE	Yes	No	Yes	No	Yes	No	Yes	No
Exporter-sector-time-FE	No	Yes	No	Yes	No	Yes	No	Yes
Importer-sector-time-FE	No	Yes	No	Yes	No	Yes	No	Yes
<i>R</i> ²	0.923		0.917		0.927		0.930	
Observations	24867	24763	24867	24763	15996	15996	15996	15996
Chi-2		2253.54***		2113.76***		1972.41***		2177.10***

Notes: The dependent variable is nominal bilateral food product from i to j at to t in sector k as in equation (1.3). Regressions 2, 4, 6, 8 are performed using the `ppmlhdfc` STATA command written by Correia, Guimarães, Zylkin (2019). Exporter-importer controls are the GDP of both countries Standard errors are reported in parentheses and clustered by country-pair level. *, **, *** denote significance at the 10% 5% and 1% level respectively.

Table A.6: Major exporter-importers countries, OECD-emerging countries, high-low services value added countries, economic integration and heterogeneity regulatory

Specification Dependant variable	Poisson-PML Estimate: 2014-2019 Export of Food Products (Pooled)									
	Net Food Exporting Importing countries		OECD-Emerging countries		High services value added Vs Low services value added		Intra-EEA Countries		European Union Countries	
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Heterogeneity score_{ijt,logistics}</i>	-3.8681 (2.4214)	-4.3965* (2.4164)	-3.6917 (4.1156)	-0.3897 (1.9373)	0.1005 (3.9748)	0.2688 (3.8356)	-3.8588** (1.7619)	-3.9080** (1.6664)	-3.3777* (1.9130)	-3.4764* (1.8180)
<i>Heterogeneity score_{ijt,Financial-Business}</i>	-0.5337 (1.5046)	-0.3509 (1.4992)	-0.8464 (3.0913)	1.2619 (1.9871)	3.2450* (1.7972)	3.3032** (1.5785)	-3.4637*** (1.0526)	-3.4275*** (0.9792)	-3.3689*** (1.0949)	-3.2980*** (1.0109)
<i>Heterogeneity score_{ijt,Transports}</i>	1.6938 (2.6602)	2.1404 (2.4901)	4.1827 (2.7422)	3.1601* (1.9195)	7.6636 (5.2431)	7.7216* (4.2441)	6.2900*** (2.0520)	6.2427*** (1.9372)	5.6697*** (2.1753)	5.6745*** (2.0524)
<i>Heterogeneity score_{ijt,Distribution}</i>	-1.1836 (2.0846)	-1.0213 (2.0976)	-3.7817 (3.0041)	-4.4993** (1.8964)	-11.0001*** (3.4409)	-10.9903*** (2.7686)	-0.4756 (1.2267)	-0.4091 (1.1888)	-0.8273 (1.2178)	-0.7673 (1.1579)
<i>RTA_{ijt}</i>	0.8740*** (0.2120)	0.9283*** (0.2097)	0.3247 (0.1991)	0.3230* (0.1681)	(0.3784) (0.1251)	(0.3903) (0.1169)				
<i>Ln(1 + tariff_{ji,t})</i>	-0.4081*** (0.0883)	-0.4116*** (0.0888)	-0.3824*** (0.1008)	-0.3832*** (0.0839)	-0.3201*** (0.1286)	-0.3496*** (0.1339)	-0.1264** (0.0634)	-0.1361** (0.0622)	-0.1310* (0.0722)	-0.1407** (0.0684)
<i>Ln dist_{ij}</i>	-1.5199*** (0.1901)	-1.5297*** (0.1870)	-2.7729*** (0.4369)	-2.7365*** (0.3592)	-2.6195*** (0.3459)	-2.7295*** (0.3511)	-1.6911*** (0.1351)	-1.6914*** (0.1357)	-1.7259*** (0.1318)	-1.7261*** (0.1318)
<i>lang_{ij}</i>	0.1574 (0.1391)	0.1796 (0.1243)	0.8255*** (0.2954)	1.0013*** (0.2185)	1.0179*** (0.3128)	1.0263*** (0.2881)	0.5935*** (0.1119)	0.5890*** (0.1088)	0.6130*** (0.1217)	0.6129*** (0.1180)
<i>border_{ij}</i>	0.7671*** (0.1191)	0.7810*** (0.1187)	1.3295*** (0.3862)	1.2305*** (0.2324)	0.5277* (0.0793)	0.5752** (0.0751)	0.6572*** (0.0812)	0.6601*** (0.0793)	0.6525*** (0.0816)	0.6551*** (0.0794)
Sector-FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Exporter-time-FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Importer-time-FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Exporter-sector-time-FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Importer-sector-time-FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
<i>R</i> ²	0.935	0.9482	0.541	0.9434	0.983	0.9740	0.946	0.9514	0.949	0.9545
<i>Observations</i>	6336	6257	6700	6537	1952	1952	13000	12925	10120	10120
<i>Chi-2</i>		630.98***		194.35***		1481.19!***		884.04***		875.01***

Notes: the dependent variable is nominal bilateral food product from *i* to *j* at *t* in sector *k* as in equation (1.3). Regressions 2, 4, 6, 10 are performed using the `ppmlhdfc` STATA command written by Correia, Guimarães, Zylkin (2019). Exporter-importer controls are the GDP of both countries. Standard errors are reported in parentheses and clustered by country-pair level. *, **, *** denote significance at the 10% 5% and 1% level respectively.

Appendix of Chapter 2

Table B.1: List of countries: OECD, emerging and Africa countries

<i>OECD countries</i>	<i>Emerging countries</i>	<i>Africa countries</i>
Asustralia	Argentina	Egypt
Austria	Brazil	Morocco
Belgium	China	South Africa
Canada	Colombia	Tunisia
Chile	India	
Czech Republic	Indonesia	
Denmark	Malaysia	
Estonia	Russia	
Finland	South Africa	
France	Thailand	
Germany		
Greece		
Hungary		
Iceland		
Ireland		
Israel		
Italy		
Japan		
Korea		
Latvia		
Lithuania		
Luxembourg		
Mexico		
Netherlands		
New Zealand		
Norway		
Poland		
Portugal		
Slovak Republic		
Slovenia		
Spain		
Sweden		
Switzerland		
Turkey		
United Kingdom		
United States		

Table B.2: Variable description and sources

<i>Variables</i>	<i>Description</i>	<i>Source</i>
$FDI_{ij,t}$	Aggregate bilateral greenfield investments	OECD.stat
$RTA_{ij,t}$	Is a dummy that indicates whether both countries have a trade agreement in force	WTO (RTA-IS)
$BIT_{ij,t}$	Is a dummy that indicates whether both countries have an investment agreement in force	UNCTADinvestment
$border_{ij}$	Takes the value 1 when countries share a common border, and 0 otherwise	CEPII
$lang_{ij}$	Takes the value 1 when countries share a common language	CEPII
$colonial\ links_{ij}$	Takes the value 1 when two countries share colonial links and 0 otherwise	CEPII
$Distance_{ij}$	Distance in kilometers between country capitals	CEPII
$FDI\ RI\ Global_{j,t}$	Overall FDI Regulatory Restrictiveness Index of OECD captures the level of restrictiveness in FDI on all sectors in the host country	OECD.stat
$FDI\ RI\ Primary_{j,t}$	FDI Regulatory Restrictiveness Index of OECD captures the level of restrictiveness in FDI on manufacturing sector in the host country	OECD.stat
$FDI\ RI\ Secondary_{j,t}$	FDI Regulatory Restrictiveness Index of OECD captures the level of restrictiveness in FDI on secondary sector in the host country	OECD.stat
$FDI\ RI\ Tertiary_{j,t}$	FDI Regulatory Restrictiveness Index of OECD captures the level of restrictiveness in FDI on tertiary sector in the host country	OECD.stat
$GDP_{i,t}$	Home country GDP (constant 2010 US)	World Bank database
$GDP_{j,t}$	Host country GDP (constant 2010 US)	World Bank database
$Trade\ openness_{j,t}$	Sum of destination country's imports and exports normalized by GDP	World Bank database
$Regul\ quality_{j,t}$	Index that captures the ability of the government of the host country to formulate and implement sound policies and regulations	World Governance indicators
$Productivity_{j,t}$	Labour productivity measured by GDP per hour worked (U.S dollars)	OECD.stat
$Tax\ burden_{j,t}$	Measures the tax burden imposed by the government of host country	Heritage Foundation
$Labour\ freedom_{j,t}$	Index that measures the legal and regulatory framework of a host country's labour market	Heritage Foundation
$Education_{j,t}$	Index that measures the average years of schooling in host country	Penn World database

Table B.3: Descriptive statistics

Variables	obs.	Mean	Std. Dev.	Min	Max
Bilateral FDI					
$FDI_{ij,t}$	21,960	7345.433	44071.73	0	1056271
Traditional variables of the gravity model					
$BIT_{ij,t}$	21,960	0.5297814	0.4991236	0	1
$RTA_{ij,t}$	21,960	0.6142077	0.486793	0	1
$border_{ij}$	21,960	0.0441712	0.20548	0	1
$lang_{ij}$	21,960	0.0619308	0.2410353	0	1
$colonial\ links_{ij}$	21,960	0.0350638	0.1839452	0	1
$Ln\ distance_{ij}$	21,960	3.613527	0.4664477	1.775372	4.29195
$Ln\ GDP_{j,t}$	21,960	11.65486	0.6676412	10.1362	13.26245
$Ln\ GDP_{i,t}$	21,960	10.85451	2.929926	1.011451	13.26245
Host country specific characteristics					
$Regul\ quality_{j,t}$	21,960	0.9679318	0.739656	-1.074257	2.088636
FDI determinants in Host country					
$Productivity_{j,t}$	21,959	7476.289	15497.5	19.43301	59390.48
$Tax\ burden_{j,t}$	21,960	68.28214	12.28882	35.9	93.6
$Labour\ freedom_{j,t}$	21,960	62.14343	14.75172	21.7	98.5
$Education_{j,t}$	21,864	3.165414	0.4624206	1.750288	3.89154
$Education_{i,t}$	21,760	3.121759	0.5139138	1.750288	3.89154
$Trade\ openness_{j,t}$	21,864	0.9518639	0.6097027	0.2248623	4.08362
FDI Regulatory Restrictiveness Index					
$FDI\ RI\ Global_{j,t}$	21,960	0.089699	0.0878699	0.004	0.435
$FDI\ RI\ Primary_{j,t}$	21,960	0.1192143	0.1168962	0	0.495
$FDI\ RI\ Secondary_{j,t}$	21,960	0.0403809	0.0612678	0	0.295
$FDI\ RI\ Tertiary_{j,t}$	21,960	0.1095849	0.1073558	0.007	0.506

Table B.4: Cross-correlation table

Variables	<i>FDI</i>	<i>BIT</i>	<i>RTA</i>	<i>border</i>	<i>lang</i>	<i>colonial links</i>	<i>Ln distance</i>	<i>Productivity</i>	<i>Tax burden</i>	<i>Labour freedom</i>	<i>Regulatory quality</i>	<i>Ln GDP_j</i>	<i>Ln GDP_i</i>	<i>FDI RI Global</i>	<i>FDI RI Primary</i>	<i>FDI RI Secondary</i>	<i>FDI RI Tertiary</i>	<i>Education_i</i>	<i>Education_j</i>	<i>Trade openness</i>	
<i>FDI</i>	1.000																				
<i>BIT</i>	-0.039	1.000																			
<i>RTA</i>	-0.015	0.290	1.000																		
<i>border</i>	0.110	0.096	0.105	1.000																	
<i>lang</i>	0.150	-0.097	-0.008	0.202	1.000																
<i>colonial links</i>	0.105	0.006	-0.016	0.224	0.269	1.000															
<i>Ln distance</i>	-0.105	-0.428	-0.527	-0.393	-0.048	-0.088	1.000														
<i>Productivity</i>	-0.052	-0.059	-0.250	-0.044	-0.002	0.017	0.199	1.000													
<i>Tax burden</i>	-0.063	-0.070	-0.105	-0.056	-0.041	-0.015	0.142	0.320	1.000												
<i>Labor freedom</i>	0.068	-0.157	-0.159	-0.032	0.077	0.004	0.144	-0.130	0.017	1.000											
<i>Regulatory quality</i>	0.069	0.018	0.162	0.051	0.034	-0.004	-0.137	-0.705	-0.339	0.296	1.000										
<i>Ln GDP_j</i>	0.124	-0.056	-0.237	0.019	0.069	0.053	0.173	0.047	-0.244	0.176	-0.044	1.000									
<i>Ln GDP_i</i>	0.002	-0.027	-0.108	-0.009	0.020	0.013	0.065	0.127	0.050	-0.034	-0.122	-0.015	1.000								
<i>FDI RI Overall</i>	-0.042	-0.166	-0.316	-0.076	0.018	-0.025	0.311	0.390	0.272	0.136	-0.391	0.227	0.073	1.000							
<i>FDI RI Primary</i>	-0.005	-0.146	-0.255	-0.077	0.021	-0.011	0.307	0.264	0.141	0.122	-0.288	0.277	0.054	0.886	1.000						
<i>FDI RI Secondary</i>	-0.040	-0.151	-0.241	-0.051	0.026	-0.028	0.254	0.192	0.160	0.226	-0.180	0.070	0.036	0.841	0.694	1.000					
<i>FDI RI Tertiary</i>	-0.052	-0.154	-0.332	-0.076	0.013	-0.025	0.298	0.469	0.341	0.100	-0.467	0.237	0.083	0.970	0.801	0.743	1.000				
<i>Education_i</i>	0.112	0.024	0.128	0.066	0.021	-0.003	-0.180	0.181	0.066	-0.035	-0.155	0.014	-0.025	0.102	0.081	0.055	0.117	1.000			
<i>Education_j</i>	0.082	0.035	0.045	0.082	-0.014	0.012	-0.147	-0.463	-0.223	0.354	0.665	0.028	-0.132	-0.326	-0.302	-0.119	-0.375	-0.127	1.000		
<i>Trade openness</i>	0.049	0.170	0.196	0.044	0.011	-0.041	-0.270	-0.239	0.043	-0.060	0.289	-0.529	-0.061	-0.303	-0.290	-0.232	-0.294	-0.050	0.232	1.000	

Table B.5: Splitting the time into two sub-periods (continued): 2010-2014

Specification Dependant variable	PPML Estimate											
	OECD				OECD vs Emerging				OECD vs Africa			
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<i>FDI RI Global</i> _{<i>j,t-1</i>}	-0.8035 (1.5949)				-2.9042*** (0.8700)				1.7913 (3.6596)			
<i>FDI RI Primary</i> _{<i>j,t-1</i>}		0.0044 (0.8509)				-2.4616*** (0.7176)				-1.4672 (3.3615)		
<i>FDI RI Secondary</i> _{<i>j,t-1</i>}			-2.6420 (1.6668)				-2.3422** (1.1919)				11.0598* (6.4950)	
<i>FDI RI Tertiary</i> _{<i>j,t-1</i>}				-1.1087 (1.4766)				-2.6442*** (0.7351)				1.3884 (3.0024)
<i>OECD dum_j * FDI RI Global</i> _{<i>j,t-1</i>}					2.6453 (1.9471)				-2.6827 (4.2966)			
<i>OECD dum_j * FDI RI Primary</i> _{<i>j,t-1</i>}						2.5668** (1.0440)				1.5468 (3.4361)		
<i>OECD dum_j * FDI RI Secondary</i> _{<i>j,t-1</i>}							0.2670 (2.1579)				-13.8955** (6.8324)	
<i>OECD dum_j * FDI RI Tertiary</i> _{<i>j,t-1</i>}								2.2358 (1.7983)				-2.4663 (3.5851)
<i>R</i> ²	0.7646	0.7645	0.7654	0.7647	0.7692	0.7693	0.7689	0.7695	0.7740	0.7739	0.7752	0.7741
<i>Observations</i>	6161	6161	6161	6161	9679	9679	9679	9679	7568	7568	7568	7568

Notes: The dependent variable is bilateral FDI stocks. For space reasons, the results of the other control variables are omitted and the estimations include both country and time fixed effects. Standard errors are reported in parentheses and clustered by country-pair level. *, **, *** denote significance at the 10% 5% and 1% level respectively.

Table B.6: Splitting the time into two sub-periods (continued): 2015-2019

Specification Dependant variable	PPML Estimate											
	OECD				OECD vs Emerging				OECD vs Africa			
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<i>FDI RI Global_{j,t-1}</i>	-0.6455** (0.2530)				-2.9875*** (1.0427)				-1.1660 (4.3533)			
<i>FDI RI Primary_{j,t-1}</i>		0.2143 (0.1394)				-1.9664** (0.8713)				-1.7187 (2.5014)		
<i>FDI RI Secondary_{j,t-1}</i>			-0.6751** (0.2847)				-3.6110*** (1.3830)				8.0324 (8.1735)	
<i>FDI RI Tertiary_{j,t-1}</i>				-0.8726*** (0.2180)				-2.4465*** (0.8774)				-1.7553 (3.9527)
<i>OECD dum_j * FDI RI Global_{j,t-1}</i>					1.4609 (2.2472)				-0.8639 (5.2328)			
<i>OECD dum_j * FDI RI Primary_{j,t-1}</i>						3.4158*** (1.1541)				3.1809 (2.7398)		
<i>OECD dum_j * FDI RI Secondary_{j,t-1}</i>							2.3114 (2.3449)				-9.9196 (8.6866)	
<i>OECD dum_j * FDI RI Tertiary_{j,t-1}</i>								-0.6981 (1.9666)				-1.9940 (4.7030)
<i>R²</i>	0.9522	0.9521	0.9522	0.9523	0.8342	0.8344	0.8338	0.8357	0.8398	0.8404	0.8398	0.8417
<i>Observations</i>	6230	6230	6230	6230	9770	9770	9770	9770	7645	7645	7645	7645

Notes: The dependent variable is bilateral FDI stocks. For space reasons, the results of the other control variables are omitted and the estimations include both country and time fixed effects. Standard errors are reported in parentheses and clustered by country-pair level. *, **, *** denote significance at the 10% 5% and 1% level respectively.

Table B.7: The Impacts of restrictive measures on FDI stocks: OECD vs. BRICS and others emerging countries

Specification	PPML Estimate							
	BRICS countries				Emerging excluding BRICS			
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>FDI RI Global</i> _{<i>j,t-1</i>}	-3.6988*** (1.0036)				-0.5836 (1.4247)			
<i>FDI RI Primary</i> _{<i>j,t-1</i>}		-2.5263*** (0.8008)				-0.3120 (1.1461)		
<i>FDI RI Secondary</i> _{<i>j,t-1</i>}			-3.4788*** (1.2470)				-0.1522 (3.2038)	
<i>FDI RI Tertiary</i> _{<i>j,t-1</i>}				-3.3924*** (0.8787)				-0.4613 (1.0990)
<i>OECD dum_j * FDI RI Global</i> _{<i>j,t-1</i>}	2.5939 (1.9748)				-1.0063 (2.3426)			
<i>OECD dum_j * FDI RI Primary</i> _{<i>j,t-1</i>}		3.4919*** (1.0356)				1.1969 (1.3935)		
<i>OECD dum_j * FDI RI Secondary</i> _{<i>j,t-1</i>}			1.8378 (2.0256)				-1.8887 (3.7328)	
<i>OECD dum_j * FDI RI Tertiary</i> _{<i>j,t-1</i>}				1.1257 (1.8107)				-2.3157 (2.0006)
<i>OECD dum_j</i>	1.1180* (0.6439)	1.0801* (0.6379)	1.6544** (0.7930)	0.9982* (0.5878)	2.7841*** (0.8244)	2.5764*** (0.8213)	2.7809*** (0.8495)	2.7468*** (0.7731)
<i>Ln FDI</i> _{<i>ij,t-1</i>}	0.1003** (0.0479)	0.0998** (0.0488)	0.1057** (0.0478)	0.0989** (0.0462)	0.0955* (0.0490)	0.0949* (0.0502)	0.0962** (0.0487)	0.0951** (0.0472)
<i>Ln distance</i> _{<i>ij,t-1</i>}	-1.1124*** (0.1413)	-1.1687*** (0.1469)	-1.1137*** (0.1435)	-1.0909*** (0.1446)	-1.1058*** (0.1519)	-1.1821*** (0.1577)	-1.1226*** (0.1539)	-1.0782*** (0.1569)
<i>Common border</i> _{<i>ij,t-1</i>}	-0.4245*** (0.1530)	-0.4526*** (0.1550)	-0.4156*** (0.1515)	-0.3928*** (0.1498)	-0.4216*** (0.1590)	-0.4687*** (0.1609)	-0.4247*** (0.1565)	-0.3811** (0.1552)
<i>Common lang</i> _{<i>ij,t-1</i>}	0.2685* (0.1515)	0.2329 (0.1556)	0.2697* (0.1519)	0.2911** (0.1466)	0.2776* (0.1528)	0.2391 (0.1587)	0.2820* (0.1548)	0.2965** (0.1480)
<i>Colonial links</i> _{<i>ij,t-1</i>}	0.3781** (0.1569)	0.3738** (0.1588)	0.3744** (0.1545)	0.3540** (0.1542)	0.3791** (0.1592)	0.3748** (0.1614)	0.3725** (0.1570)	0.3523** (0.1565)
<i>BIT</i> _{<i>ij,t-1</i>}	-0.3301* (0.1831)	-0.3219* (0.1728)	-0.3519** (0.1785)	-0.3940** (0.1923)	-0.3570* (0.2012)	-0.3211* (0.1874)	-0.3696* (0.1966)	-0.4417** (0.2128)
<i>RTA</i> _{<i>ij,t-1</i>}	0.3362** (0.1495)	0.2882* (0.1476)	0.3359** (0.1541)	0.3603** (0.1584)	0.3958** (0.1618)	0.3274** (0.1551)	0.3906** (0.1651)	0.4289** (0.1743)
<i>Ln GDP</i> _{<i>1,t-1</i>}	-0.0899 (0.0837)	-0.1078 (0.0786)	-0.1060 (0.0880)	-0.0668 (0.0810)	-0.1296 (0.0933)	-0.1495* (0.0870)	-0.1290 (0.0910)	-0.0988 (0.0895)
<i>Ln GDP</i> _{<i>j,t-1</i>}	2.4323*** (0.1325)	2.4014*** (0.1382)	2.3799*** (0.1321)	2.3865*** (0.1310)	2.4128*** (0.1402)	2.4074*** (0.1478)	2.3869*** (0.1400)	2.3555*** (0.1381)
<i>Trade openness</i> _{<i>j,t-1</i>}	1.4381*** (0.1160)	1.4759*** (0.1164)	1.4139*** (0.1164)	1.3941*** (0.1156)	1.4125*** (0.1187)	1.4669*** (0.1196)	1.4174*** (0.1195)	1.3649*** (0.1176)
<i>Regulatory quality</i> _{<i>j,t-1</i>}	0.1869*** (0.0673)	0.1940*** (0.0663)	0.1941*** (0.0671)	0.1820*** (0.0668)	0.1597** (0.0661)	0.1570** (0.0650)	0.1668** (0.0660)	0.1587** (0.0653)
<i>Regulatory quality</i> _{<i>ij,t-1</i>}	0.1869*** (0.0673)	0.1940*** (0.0663)	0.1941*** (0.0671)	0.1820*** (0.0668)	0.1597** (0.0661)	0.1570** (0.0650)	0.1668** (0.0660)	0.1587** (0.0653)
<i>Ln productivity</i> _{<i>j,t-1</i>}	0.6638*** (0.2233)	0.6636*** (0.2121)	0.7136*** (0.2701)	0.6291*** (0.2076)	0.8445*** (0.3029)	0.8415*** (0.2768)	0.8257*** (0.3045)	0.7738*** (0.2956)
<i>Ln tax burden</i> _{<i>j,t-1</i>}	-0.2544 (0.6799)	-0.5505 (0.7124)	-0.2974 (0.7118)	0.0501 (0.6783)	-0.0828 (0.7308)	-0.4093 (0.7681)	-0.1988 (0.7555)	0.2111 (0.7257)
<i>HCD</i> _{<i>ij,t-1</i>}	-0.4411 (1.2010)	-0.4441 (1.2021)	-0.8780 (1.1987)	-0.4459 (1.1991)	0.0522 (1.4662)	0.0046 (1.4609)	-0.0536 (1.4588)	-0.0699 (1.4752)
<i>Ln labor freedom</i> _{<i>j,t-1</i>}	2.5584*** (0.5395)	2.4446*** (0.5204)	2.5430*** (0.5407)	2.6364*** (0.5435)	2.6242*** (0.5673)	2.4776*** (0.5444)	2.6600*** (0.5654)	2.7083*** (0.5718)
<i>R</i> ²	0.7938	0.7936	0.7932	0.7950	0.8041	0.8041	0.8042	0.8052
<i>Observations</i>	16627	16627	16627	16627	16275	16275	16275	16275

Notes: The dependent variable is bilateral FDI stocks. Columns (1) to (4) represent the results of the impact of FDI restrictiveness index on cross border investment between OECD and BRICS countries and (5) to (8) the results on FDI among OECD and emerging excluding BRICS countries. All regressions include both country and time fixed effects. Standard errors are reported in parentheses and clustered by country pair level. *, **, *** denote significance at the 10% 5% and 1% level respectively.

Table B.8: The impact of FDI restrictions in the services sector on FDI stocks: Intra-OECD

Specification Dependant variable	PPML Estimate										
	$\frac{FDI_{ij,t}}{GDPdeflator_{ij,t}}$										
	Tertiary sector		Overall financial sector		Business sector		Disaggregated financial sector				
							Banking		Insurance		Other finance
	FDI RI	STRI	FDI RI	STRI	FDI RI	STRI	FDI RI	STRI	FDI RI	STRI	FDI RI
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
<i>RI Tertiary</i> _{<i>j,t-1</i>}	-1.5445*** (0.4171)	-1.7513*** (0.4302)									
<i>RI Financial</i> _{<i>j,t-1</i>}			-0.2896 (0.5813)	-0.2154 (0.2762)							
<i>RI Business</i> _{<i>j,t-1</i>}					-1.3532*** (0.3224)	-1.1480*** (0.2816)					
<i>RI Banking</i> _{<i>j,t-1</i>}							0.0475 (0.3788)	0.0538 (0.4581)			
<i>RI Insurance</i> _{<i>j,t-1</i>}									0.3112 (0.5472)	-0.1989 (0.2085)	
<i>FDI RI Other finance</i> _{<i>j,t-1</i>}											-1.2082** (0.5260)
<i>R</i> ²	0.9311	0.9523	0.9306	0.9521	0.9316	0.9523	0.9306	0.9306	0.9306	0.9521	0.8377
<i>Observations</i>	7490	6230	7490	6230	7490	6230	7490	7490	7490	6230	12391

Notes: The dependent variable is bilateral FDI stocks. Column (1) and (2) represent the effects of FDI restrictions in the services sector on bilateral FDI using the two indexes (FDI RI and STRI). Column (3) and (4) show the results of the impact of global financial sector restrictiveness indexes on cross-border investment (FDI RI and STRI) and (5)-(6) the impacts of FDI restrictions in business sector (FDI RI and STRI). (7) to (11) the impacts of disaggregated financial sector. For space reasons, the results of the other control variables are omitted. All regressions include both country and time fixed effects. STRI in the financial sector includes banking and insurance. Standard errors are reported in parentheses and clustered by country- pair level. *, **, *** denote significance at the 10% 5% and 1% level respectively.

Table B.9: The Impact of FDI restrictive measures in the agricultural and manufacturing sectors on FDI stocks: OECD vs. emerging countries

Model	Total Emerging countries				BRICS countries			
	Baseline		Sectoral FDI RI		Baseline		Sectoral FDI RI	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>FDI RI Primary</i> _{<i>j,t-1</i>}	-2.0281*** (0.7121)				-2.5263*** (0.8008)			
<i>FDI RI Secondary</i> _{<i>j,t-1</i>}		-2.9298** (1.1595)				-3.4788*** (1.2470)		
<i>FDI RI Agriculture</i> _{<i>j,t-1</i>}			-0.7443 (0.5993)				-0.2949 (0.8292)	
<i>FDI RI Manufacturing</i> _{<i>j,t-1</i>}				-2.7421** (1.2997)				-4.7903*** (1.5484)
<i>OECD dum_j * FDI RI Primary</i> _{<i>j,t-1</i>}	2.9714*** (0.9868)				3.4919*** (1.0356)			
<i>OECD dum_j * FDI RI Secondary</i> _{<i>j,t-1</i>}		1.4257 (1.9882)				1.8378 (2.0256)		
<i>OECD dum_j * FDI RI Agriculture</i> _{<i>j,t-1</i>}			-0.3501 (0.9768)				-0.7999 (1.1046)	
<i>OECD dum_j * FDI RI Manufacturing</i> _{<i>j,t-1</i>}				3.3403 (2.1408)				5.2760** (2.3046)
<i>OECD dum_j</i>	1.5349*** (0.5476)	2.0036*** (0.6000)	2.3798*** (0.6674)	2.2267*** (0.6702)	1.0801* (0.6379)	1.6544** (0.7930)	2.3161** (1.0030)	1.8287** (0.8650)
<i>Ln FDI</i> _{<i>ij,t-1</i>}	0.1026** (0.0490)	0.1070** (0.0480)	0.1067** (0.0494)	0.1077** (0.0491)	0.0998** (0.0488)	0.1057** (0.0478)	0.1077** (0.0495)	0.1051** (0.0489)
<i>Ln distance</i> _{<i>ij,t-1</i>}	-1.1832*** (0.1430)	-1.1335*** (0.1393)	-1.0737*** (0.1400)	-1.1571*** (0.1378)	-1.1687*** (0.1469)	-1.1137*** (0.1435)	-1.0611*** (0.1440)	-1.1340*** (0.1414)
<i>Common border</i> _{<i>ij,t-1</i>}	-0.4733*** (0.1526)	-0.4400*** (0.1494)	-0.4142*** (0.1567)	-0.4733*** (0.1551)	-0.4526*** (0.1550)	-0.4156*** (0.1515)	-0.3966** (0.1590)	-0.4446*** (0.1570)
<i>Common lang</i> _{<i>ij,t-1</i>}	0.2537* (0.1538)	0.2883* (0.1510)	0.2719* (0.1519)	0.2625* (0.1552)	0.2329 (0.1556)	0.2697* (0.1519)	0.2560* (0.1531)	0.2371 (0.1569)
<i>Colonial links</i> _{<i>ij,t-1</i>}	0.3724** (0.1588)	0.3730** (0.1550)	0.4156*** (0.1501)	0.3885** (0.1604)	0.3738** (0.1588)	0.3744** (0.1545)	0.4166*** (0.1512)	0.3907** (0.1597)
<i>BIT</i> _{<i>ij,t-1</i>}	-0.3312** (0.1688)	-0.3560** (0.1741)	-0.3306* (0.1696)	-0.3217* (0.1695)	-0.3219* (0.1728)	-0.3519** (0.1785)	-0.3287* (0.1738)	-0.3019* (0.1733)
<i>RTA</i> _{<i>ij,t-1</i>}	0.2911** (0.1433)	0.3343** (0.1491)	0.3615** (0.1501)	0.3038** (0.1444)	0.2882* (0.1476)	0.3359** (0.1541)	0.3557** (0.1557)	0.3034** (0.1481)
<i>Ln GDP</i> _{<i>i,t-1</i>}	-0.1292* (0.0669)	-0.1278* (0.0689)	-0.1340* (0.0738)	-0.1491** (0.0742)	-0.1078 (0.0786)	-0.1060 (0.0880)	-0.1224 (0.1027)	-0.1381 (0.0936)
<i>Ln GDP</i> _{<i>j,t-1</i>}	2.3949*** (0.1319)	2.3809*** (0.1268)	2.3437*** (0.1248)	2.4117*** (0.1286)	2.4014*** (0.1382)	2.3799*** (0.1321)	2.3381*** (0.1315)	2.4161*** (0.1318)
<i>Trade openness</i> _{<i>j,t-1</i>}	1.4541*** (0.1152)	1.3993*** (0.1149)	1.3733*** (0.1144)	1.4183*** (0.1157)	1.4759*** (0.1164)	1.4139*** (0.1164)	1.3789*** (0.1185)	1.4358*** (0.1171)
<i>Regulatory quality</i> _{<i>j,t-1</i>}	0.1719*** (0.0638)	0.1715*** (0.0649)	0.1537** (0.0633)	0.1575** (0.0647)	0.1940*** (0.0663)	0.1941*** (0.0671)	0.1678*** (0.0645)	0.1796*** (0.0668)
<i>Ln productivity</i> _{<i>j,t-1</i>}	0.7376*** (0.1731)	0.7752*** (0.2013)	0.8211*** (0.2299)	0.8252*** (0.2218)	0.6636*** (0.2121)	0.7136*** (0.2701)	0.7924** (0.3378)	0.8001*** (0.2932)
<i>Ln tax burden</i> _{<i>j,t-1</i>}	-0.4863 (0.7052)	-0.2571 (0.6988)	-0.2734 (0.7175)	-0.3513 (0.7177)	-0.5505 (0.7124)	-0.2974 (0.7118)	-0.2948 (0.7441)	-0.3569 (0.7305)
<i>HCD</i> _{<i>ij,t-1</i>}	-0.4359 (1.1496)	-0.7512 (1.1487)	-0.5557 (1.1727)	-0.6742 (1.1729)	-0.4441 (1.2021)	-0.8780 (1.1987)	-0.6868 (1.2478)	-0.8459 (1.2232)
<i>Ln labor freedom</i> _{<i>j,t-1</i>}	2.3065*** (0.5141)	2.4131*** (0.5344)	2.1618*** (0.5327)	2.2691*** (0.5222)	2.4446*** (0.5204)	2.5430*** (0.5407)	2.2268*** (0.5405)	2.4126*** (0.5256)
<i>R</i> ²	0.7992	0.7989	0.7985	0.7982	0.7936	0.7932	0.7923	0.7928
<i>Observations</i>	19449	19449	19449	19449	16627	16627	16627	16627

Notes: The dependent variable is bilateral FDI stocks. Columns (1) to (4) represent the results of the impact on total emerging countries and (5) to (8) the results on BRICS countries. All regressions include both country and time fixed effects. Standard errors are reported in parentheses and clustered by country-pair level. *, **, *** denote significance at the 10% 5% and 1% level respectively.

Table B.10: The Impact of FDI restrictive measures in the agriculture and mining sectors on FDI stocks: OECD vs. African countries

Specification Dependant variable Years	PPML Estimate					
	$\frac{FDI_{i,j,t}}{GDP_{i,t} \text{ flator}_{i,j,t}}$					
	2010-2019					
	Baseline	Sectoral FDI RI		Baseline	Sectoral FDI RI	
Model	(1)	(2)	(3)	(4)	(5)	(6)
<i>FDI RI Primary</i> _{<i>j,t-1</i>}	-1.7933 (2.7210)			-1.4645 (2.6931)		
<i>FDI RI Agriculture</i> _{<i>j,t-1</i>}		-1.5426 (2.1777)			-1.3464 (2.1032)	
<i>FDI RI Mining Quarrying</i> _{<i>j,t-1</i>}			-35.3048** (13.7942)			-30.6203*** (11.6918)
<i>OECD dum_j * FDI RI Primary</i> _{<i>j,t-1</i>}	2.7402 (2.8935)			2.4152 (2.8643)		
<i>OECD dum_j * FDI RI Agriculture</i> _{<i>j,t-1</i>}		0.2821 (2.3552)			0.1228 (2.2759)	
<i>OECD dum_j * FDI RI Mining Quarrying</i> _{<i>j,t-1</i>}			33.8347** (13.9026)			29.0494** (11.7729)
<i>OECD dum_j</i>	1.8211* (1.0318)	1.7866 (1.0909)	1.6747 (1.0543)	1.0080** (0.4575)	1.0890** (0.4797)	0.8699* (0.4469)
<i>Ln FDI</i> _{<i>ij,t-1</i>}	0.0975* (0.0501)	0.0949* (0.0498)	0.0988** (0.0485)	0.1959*** (0.0471)	0.1947*** (0.0467)	0.1972*** (0.0455)
<i>Ln distance</i> _{<i>ij,t-1</i>}	-1.1746*** (0.1611)	-1.0699*** (0.1592)	-1.0983*** (0.1541)	-1.1498*** (0.1557)	-1.0455*** (0.1532)	-1.0729*** (0.1484)
<i>Common border</i> _{<i>ij,t-1</i>}	-0.4484*** (0.1631)	-0.4091** (0.1652)	-0.3844** (0.1570)	-0.4416*** (0.1636)	-0.3989** (0.1654)	-0.3743** (0.1551)
<i>Common lang</i> _{<i>ij,t-1</i>}	0.2143 (0.1590)	0.2463 (0.1557)	0.2411 (0.1537)	0.2302 (0.1591)	0.2601* (0.1559)	0.2597* (0.1528)
<i>Colonial links</i> _{<i>ij,t-1</i>}	0.3776** (0.1604)	0.4088*** (0.1520)	0.3821** (0.1559)	0.3767** (0.1622)	0.4088*** (0.1541)	0.3791** (0.1552)
<i>BIT</i> _{<i>ij,t-1</i>}	-0.3073 (0.1903)	-0.2894 (0.1928)	-0.3270* (0.1905)	-0.3237* (0.1890)	-0.3047 (0.1910)	-0.3433* (0.1876)
<i>RTA</i> _{<i>ij,t-1</i>}	0.3066** (0.1560)	0.3955** (0.1676)	0.3376** (0.1664)	0.3327** (0.1485)	0.4189*** (0.1580)	0.3613** (0.1592)
<i>Ln GDP</i> _{<i>i,t-1</i>}	0.1096 (0.1060)	0.1295 (0.1129)	0.1066 (0.1100)	0.2211*** (0.0309)	0.2236*** (0.0314)	0.2212*** (0.0309)
<i>Ln GDP</i> _{<i>j,t-1</i>}	2.4029*** (0.1544)	2.4414*** (0.1507)	2.4611*** (0.1605)	2.4308*** (0.1466)	2.4607*** (0.1442)	2.4935*** (0.1541)
<i>Trade openness</i> _{<i>j,t-1</i>}	1.4696*** (0.1237)	1.4521*** (0.1258)	1.4526*** (0.1270)	1.5170*** (0.1128)	1.4914*** (0.1144)	1.5015*** (0.1156)
<i>Regulatory quality</i> _{<i>j,t-1</i>}	0.1593** (0.0663)	0.1318** (0.0646)	0.1550** (0.0654)	0.1601** (0.0633)	0.1324** (0.0630)	0.1561** (0.0627)
<i>Ln productivity</i> _{<i>j,t-1</i>}	0.8586** (0.3456)	0.7436** (0.3786)	0.8481** (0.3641)	0.5842*** (0.1444)	0.5108*** (0.1577)	0.5630*** (0.1491)
<i>Ln tax burden</i> _{<i>j,t-1</i>}	-0.3721 (0.7968)	-0.3073 (0.8071)	-0.1461 (0.7641)	-0.4222 (0.7418)	-0.3260 (0.7493)	-0.1814 (0.7109)
<i>HCD</i> _{<i>ij,t-1</i>}	-0.1689 (1.5313)	0.1813 (1.5170)	-0.1272 (1.5073)	-0.6342 (1.5437)	-0.2537 (1.5211)	-0.5453 (1.5102)
<i>Ln labor freedom</i> _{<i>j,t-1</i>}	2.4726*** (0.5549)	2.3810*** (0.5712)	2.6912*** (0.5914)	2.3632*** (0.5301)	2.2692*** (0.5566)	2.5914*** (0.5638)
<i>Time – FE</i>	Yes	Yes	Yes	No	No	No
<i>Country – FE</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>R²</i>	0.8040	0.8044	0.8042	0.7956	0.7960	0.7958
<i>Observations</i>	15213	15213	15213	15213	15213	15213

Notes: The dependent variable is bilateral FDI stocks. Standard errors are reported respectively at the 10% in parentheses and clustered by country- pair level. *, **, *** denote significance at the 10% 5% and 1% level respectively.

Appendix of Chapter 3

C.1 GTAP model: description

To evaluate the impact of AfCFTA on intra-Africa trade, we use a GTAP model. It is a multi-region, multi-sector, multifactor model, and a computable general equilibrium model with the assumptions of perfect competition and Constant Returns to Scale (CRS) of production. Production in each sector and each region is represented by a nested Constant Elasticity of Substitution (CES) function. The model incorporates the Armington assumptions that each firm uses a CES composite of domestically produced and imported intermediate goods in fixed proportions with a value-added CES composite, based on five endowed factors of production (land, natural resources, unskilled-skilled labor, and capital).

In detail, production generates income accruing to the regional household and then spent on three sources of final demand: private expenditures, government spending, and savings, which subsequently translate into investment spending. Each source of spending, as well as purchases of intermediate goods, comprises both domestic and imported purchases, thereby generating both domestic and export sales by firms (see Figure C.1). On the demand side, total income is allocated using fixed value shares across government household and savings expenditures. The household maximizes a Constant Difference Elasticity (CDE) objective function, which is calibrated to differing income and price elasticities of demand in each region and allows a detailed description of final demand. In each case, consumption is a CES composite of locally produced and imported goods. The production (a) combines a set of intermediate goods and factors to produce output. Similar to many CGE models, the production structure is based on a sequence of nested Constant Elasticity of Substitution (CES) functions that aim to reproduce the substitution possibilities across the full set of inputs. Figure C.2 describes this process and identifies 3 nests. The first top-level nest is composed of two aggregate composite bundles - intermediate demand and value added (the key substitution elasticity is $ESUBT$, typically assumed to be zero). The second-level nests decompose each of the two aggregate nests into their components - the demand for individual intermediate goods c (at the Arming-

ton level, key substitution elasticity is ESUBC whose default value is 0) and the demand for individual factors.¹ A final nest decomposes the demand for the composite good into domestic and imported components. The key substitution elasticity is ESUBD the so-called (top-level) Armington elasticity that determines the degree of substitutability between domestic and imported goods.

Innovative aspects of this model include: the treatment of private household preferences using the non-homothetic Constant Difference of Elasticities (CDE) functional form, an explicit treatment of international trade and transport margins, and global banking sector which intermediates between global savings and consumption. The GTAP Model also gives users a wide range of closure options, including unemployment, tax revenue replacement and fixed trade balance closures, and a selection of partial equilibrium closures (which facilitate comparison of results to studies based on partial equilibrium assumptions (Hertel and Tsigas, 1998).

In the GTAP model, a fundamental element is the closure of the model, i.e., defining the endogenous and exogenous variables of the model. We decide to use two microeconomic closures: first, a closure based on the neoclassical approach - fixing the capital stock (exogenous) and allowing the rate of return on capital to adjust (endogenous factors). This type of closure is interpreted as representing the short term (John .P , 2001).² Indeed in all of the small countries regions (i.e., developing countries), the inputs to capital creation are import-intensive and subject to large tariffs. Therefore, in these regions, the removal of tariffs due to AfCFTA tends to reduce the capital costs, and thus the capital rent, relative to the general price of output (Adams et al., 1997). The second is a model for an analysis of long-run effects (see, Walmsley, 1998). Here, the rate of return on capital is fixed exogenously and the level of the capital stock is adjusted (Francois et al., 1996, see Table C.13). In this closure, percentage changes in capital stocks are equated to percentage changes in investment (where $EXPAND("capital", r)$ ³ is exogenously equal to 0).

$$EXPAND(i, r) = qcgds(r) - qo(i, r) \quad (C.1)$$

¹The key substitution elasticity is ESUBVA which is differentiated by activity a and region r (although the default is that this is region generic).

²The period considered is not long enough for new investments to come online as productive capital.

³Note that although written in upper case, $EXPAND("capital", r)$ is a percentage change variable.

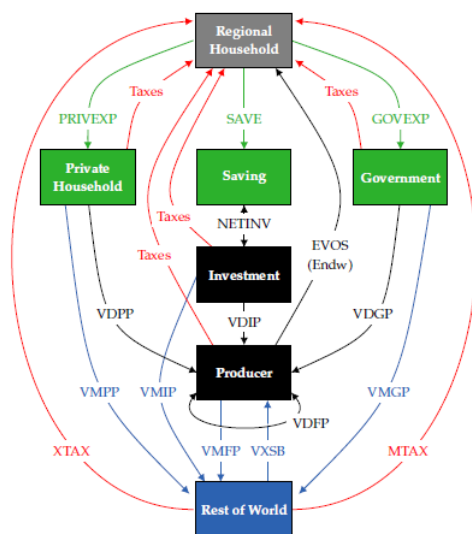
Where: i = "capital", r =country

As a result, investment ($qcgds(r)$) and capital stocks ($kb(r)$) change by the same amount. Thus the percentage change, in the solution period, of the growth rate of capital equals zero and the growth rate of capital in each region returns to that rate which prevailed prior to the shock. When the initial database is a grow-less steady state, the growth rate of capital returns to a rate of zero percent. The result is a change in the steady state levels of capital and income (Walmsley, 1998). The long run approach is defined as that period of time long enough for capital stocks to have adjusted to the shock and be available for production in the region.

For the macroclosure, we apply the methodology developed by Walmsley (1998) consisting in adjusting the trade balance (endogenous) and fixing the savings rate (exogenous). The fixed assumption of the saving rate is the default macroclosure in the GTAP model, i.e., the savings rate (percentage of income that is saved) is assumed to be exogenous and constant, so the quantity of the saving changes whenever income changes. Investment spending then changes to accommodate the change in supply of savings. A model with this closure is called "savings-driven" because changes in savings drive changes in investment. An advantage of this closure is that a nation's savings rate remains the same as the rate observed in the base year (Burfisher, M, 2017). By adjusting the trade balance variable, capital moves across regions and regions' trade balances change accordingly, thus the percentage changes in the expected rates of return do equate across regions (Yuan and Burfisher, 2021; Walmsley, 1998).⁴

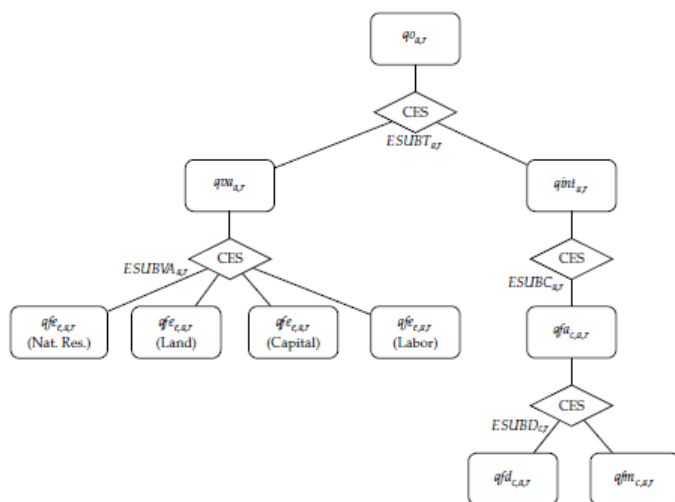
⁴Bekkers et al. (2020) explore the trade balance closures in detail.

Figure C.1: Circular flows in a regional economy



Source: GTAP

Figure C.2: Production structure



Source: GTAP

C.1.1 Sets and trade variables in GTAP

Sets define relevant groupings of entities over which we will be performing operations in the model. At the aggregated model "AfcFTA36*8" has eight sectors and 36 regions, the set

of traded commodities consists of agriculture, fossil fuels, processed foods, wood and paper products, textiles and wearing apparel, energy-intensive manufacturing, manufactures, services and they can be traded between regions. The set of produced commodities contains capital goods (CGDS) in addition to the traded commodities. Capital goods refers to the investment column of the national input-output tables and represents purchases of goods and equipment designated for investment. Land, labour (unskilled and skilled), capital, natural resources are endowment commodities, whereas labor and capital are mobile (perfectly mobile across industries within each region) and land and natural resources are immobile. A detailed list of the sets defined is presented in the Table C1.

Table C.1: Sets escription

<i>GTAP code</i>	<i>Description</i>	<i>Members</i>
CGDS-COMM	capital goods commodities	Capital
DEMD-COMM	demanded commodities	Land, Unskilled labour, Skilled labour, Capital, Natural resources, Agriculture, Fossil fuels Processed foods, Wood and paper products, Textiles and wearing apparel, Energy-intensive manufacturing, Manufactures, Services
ENDW-COMM	endowment commodities	Land, Unskilled labour, Skilled labour, Capital, Natural resources
ENDWC-COMM	capital endowment commodity	Capital
ENDWM-COMM	mobile endowment commodities	Unskilled labour, Skilled labour, Capital
ENDWS-COMM	sluggish endowment commodities	Land, Natural resources
MARG-COMM	margin commodities	Services
NMRG-COMM	non-margin commodities	Agriculture, Fossil fuels, Processed foods, Wood and paper products, Textiles and wearing apparel Energy-intensive manufacturing
NSAV-COMM	non-savings commodities	Land, Unskilled labour, Skilled labour, Capital, Natural resources, Agriculture, Fossil fuels Processed foods, Wood and paper products, Textiles and wearing apparel, Energy-intensive manufacturing, Manufactures, Services, CGDS
PROD-COMM	produced commodities	Agriculture, Fossil fuels, Processed foods, Wood and paper products, Textiles and wearing apparel Energy-intensive manufacturing, Manufactures, Services, CGDS
REG	regions in the model	Benin, Botswana, Burkina Faso, Cameroon, Egypt, Ethiopia, Ghana, Guinea, Ivory Coast, Kenya Madagascar, Malawi, Mauritius, Morocco, Mozambique, Namibia, Nigeria, Rest of Central Africa, Rest of Eastern Africa, Rest of North Africa, Rest of South African Customs, Rest of West Africa Rwanda, Senegal, South Africa, South central Africa, Tanzania, Togo Tunisia, Uganda, Zambia, Zimbabwe China, EU-EFTA, USA, Rest of World
TRAD-COMM	traded commodities	Agriculture, Fossil fuels, Processed foods, Wood and paper products, Textiles and wearing apparel Energy-intensive, manufacturing, Manufactures, Services

Source: GTAP model, GTAP v10, AfCFTA database

The Table above presents the trade policy variables through the taxation variables included in the GTAP model. The shocked interest variable is *RTMS*.

Table C.2: Trade policy variables in GTAP: Tax rates description

<i>Variables</i>	<i>GTAP Dimension</i>	<i>Name</i>
RTO	NSAV-COMM*REG	% ad valorem rate, output (or income) tax in region r
RTF	ENDW-COMM*PROD-COMM*REG	% ad valorem rate, taxes on primary factors
RTPD	TRAD-COMM*REG	% ad valorem rate, private domestic consumption taxes
RTPI	TRAD-COMM*REG	% ad valorem rate, private import consumption taxes
RTGD	TRAD-COMM*REG	% ad valorem rate, government domestic purchases taxes
RTGI	TRAD-COMM*REG	% ad valorem rate, government import purchases taxes
RTFD	TRAD-COMM*PROD-COMM*REG	% ad valorem rate, taxes on firms' domestic purchases
RTFI	TRAD-COMM*PROD-COMM*REG	% ad valorem rate, taxes on firms' imports purchases
RTXS	TRAD-COMM*REG*REG	% ad valorem rate, export taxes, by destination
RTMS	TRAD-COMM*REG*REG	% ad valorem rate, import taxes, by source (variable of interest)

Source: GTAP model, GTAP v10, AfCFTA database

C.1.2 Technical details code: International trade and transport variables in GTAP

This section highlights the variables related to international trade and transport in GTAP model.

Table C.3: International trade and transport variables

<i>Variables</i>	<i>Description</i>
pms(i,r,s)	domestic price for good <i>i</i> supplied from <i>r</i> (source countries) to region <i>s</i> (destination countries)
qxs(i,r,s)	export sales of commodity <i>i</i> from <i>r</i> to region <i>s</i> (variable of interest)
VIMS(i,r,s)	imports of <i>i</i> from <i>r</i> to <i>s</i> valued at domestic market prices $VIMS(i,r,s) = pms(i,r,s) * qxs(i,r,s)$
pcif(i,r,s)	CIF world price of commodity <i>i</i> supplied from <i>r</i> to <i>s</i>
VIWS(i,r,s)	imports of <i>i</i> from <i>r</i> to <i>s</i> valued CIF (tradeables only)
VIWS(i,r,s)	$pcif(i,r,s) * qxs(i,r,s)$
pfob(i,r,s)	FOB world price of commodity <i>i</i> supplied from <i>r</i> to <i>s</i>
VXWD(i,r,s)	exports of <i>i</i> from <i>r</i> to <i>s</i> valued FOB (tradeables only) $VXWD(i,r,s) = pfob(i,r,s) * qxs(i,r,s)$
VXMD(i,r,s)	exports of <i>i</i> from <i>r</i> to <i>s</i> valued at market prices (tradeables only) $VXMD(i,r,s) = pm(i,r) * qxs(i,r,s)$
qst(m,r)	sales of <i>m</i> from <i>r</i> to international transport
VST(m,r)	exports of <i>m</i> (margin commodities) from <i>r</i> for international transport valued at market prices (tradeables only) $VST(m,r) = pm(m,r) * qst(m,r)$

Source: GTAP model, GTAP v10, AfCFTA database

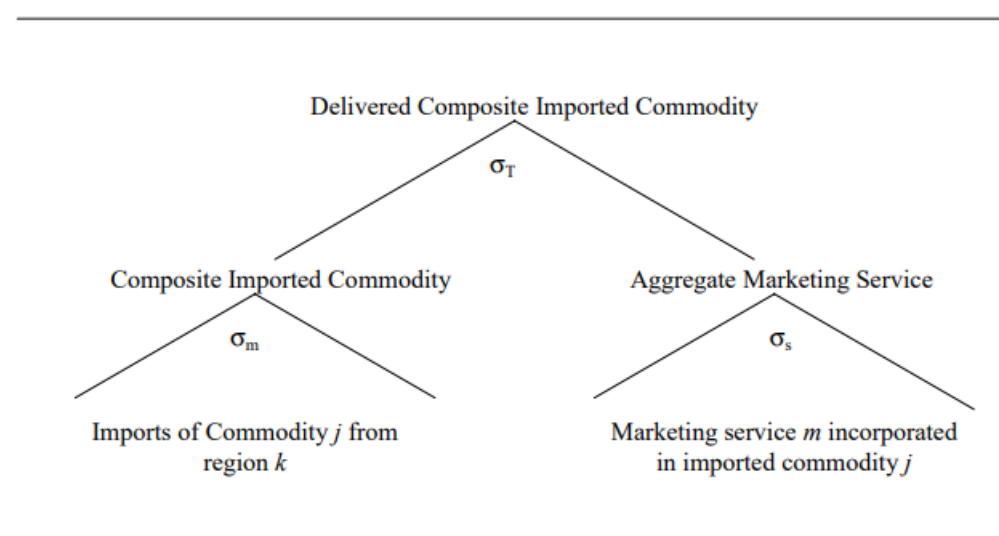
C.1.3 Introduction of margin activities: domestic trade and transport margins

Margin activities (transport and distribution called "marketing services") plays an important role in most economies.⁵ Indeed, the demands for the marketing services are associated with the following uses: intermediate or firm purchases of imported goods; firm purchases of domestic goods; private household purchases of imported goods; private household purchases of domestic goods; government purchases of imported goods; government purchases of domestic goods; and exports of all commodities. The incorporation of these activities changes the structure of the GTAP model. The main modifications to the standard GTAP model occur in the preference structure for the private household and the government, the production structure for firms, determining the FOB value of exports, the market clearing conditions, the computation of taxes, and the decomposition of welfare changes (Peterson, 2006). We consider only changes in the value of exports in our analysis.

To allow some generality in the modeling of domestic marketing margins, substitution possibilities are allowed between the commodity and an aggregate marketing service as well as between marketing services (Peterson, 2006). To illustrate this, consider the nested CES structure of domestic marketing margins for imported commodities in Figure C.3.

⁵Margin activities in GTAP v10 are wholesale and retail trade, other transport, air transport and water transport. This is one of the innovative aspect of the GTAP model.

Figure C.3: Marketing margins for imported commodities



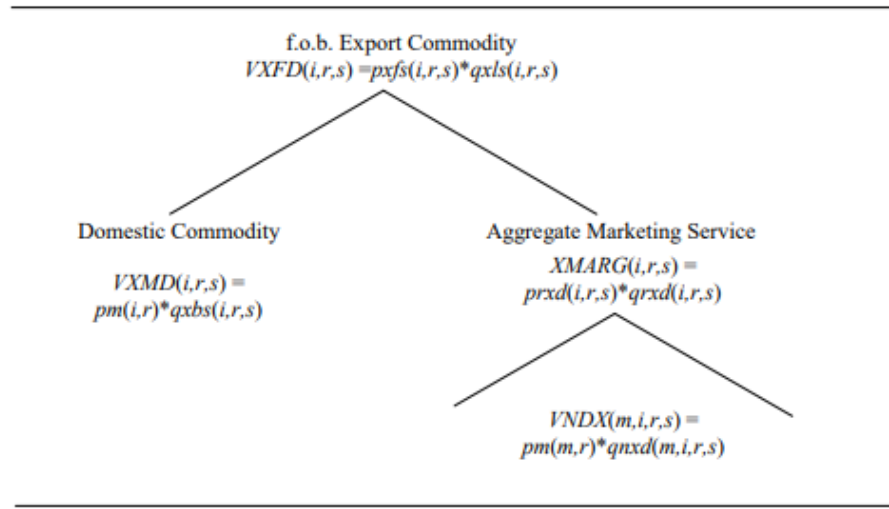
Source: Peterson (2006)

The individual marketing services are also combined in the second level of the nested CES structure in figure C.3 to create a composite marketing service. The constant elasticity of substitution σ_s governs the degree of substitutability between individual marketing services, such as land and air transport, as relative prices change. At the top-level of Figure C.3, the composite imported commodity and composite marketing service are combined to form a "retail" good purchased by domestic users with σ_T as constant elasticity of substitution.

C.1.3.1 Incorporating domestic margins on exports

This section presents the modifications resulting from the incorporation of the margins on exports. The Figure C.4 illustrates the structure of domestic margins for all exported commodities. Each commodity that is exported is combined with trade and transportation services to form an fob commodity ready for export.

Figure C.4: Structure of Domestic Margins on Exported Commodities



Source: Peterson (2006)

Incorporating domestic margins on exports requires four new quantity and two new price variables and equations be added to the standard GTAP model. Beginning at the bottom of the Figure C.4, the quantity of the m th individual marketing service associated with the export of commodity i from region r to region s is defined as:

$$qnxd(m, i, r, s) = qrx(i, r, s) - anxd(m, i, r, s) + ESUBXL(i) * \{prxd(i, r, s) + anxd(m, i, r, s) - pm(m, r)\} \quad (C.2)$$

Where $prxd(i, r, s)$ and $qrx(i, r, s)$ are the aggregate price and quantity of marketing services associated with the export of commodity i from region r to region s , $ESUBXL(i)$ is the elasticity of substitution among marketing services, $anxd(m, i, r, s)$ is the biased technical change variable for the m th marketing service and $pm(m, r)$ market price of m th individual marketing service in region r . The value of the m th individual marketing service associated with the export of commodity i is defined as:

$$VNDX(m, i, r, s) = pm(m, r) * qnxd(m, i, r, s) \quad (C.3)$$

The aggregate price and quantity of marketing services associated with the export of commodity i are defined as:

$$qrx(i, r, s) = qxls(i, r, s) - arxd(i, r, s) + ESUBXR(i) * \{pxfs(i, r, s) + arxd(i, r, s) - prxd(i, r, s)\} \quad (C.4)$$

$$\text{and}$$

$$prxd(i, r, s) = \sum_m XRSHR(m, i, r, s) * [pm(m, r) - anxd(m, i, r, s)] \quad (C.5)$$

Where $qxls(i, r, s)$ is the delivered quantity of commodity i exported from region r to region s , $arxd(i, r, s)$ is a neutral technical change variable, $ESUBXR(i)$ is the elasticity of substitution between the composite marketing service and the export commodity, and $XRSHR(m, i, r, s)$ is the cost share of the m th marketing service. The value of all marketing services associated with the export of commodity i from region r to region s is defined as:

$$VMARG(i, r, s) = prxd(i, r, s) * qrx(i, r, s) \quad (C.6)$$

The final new export quantity and price variables are $qxs(i, r, s)$ and $qxls(i, r, s)$, the basic and delivered quantities of commodity i exported from region r to region s , and $pxfs(i, r, s)$, the export-tax-free price of commodity i exported from region r to region s . The formal definitions of these variables are as follows:

$$qxs(i, r, s) = qxls(i, r, s) + ESUBXR(i) * \{pxfs(i, r, s) - pm(i, r)\} \quad (C.7)$$

$$\text{and}$$

$$pxfs(i, r, s) = \sum_m [XFRSHR(i, r, s) * prxd(i, r, s) + (1 - XFRSHR(i, r, s)) * pm(i, r)] \quad (C.8)$$

Where $XFRSHR(i, r, s)$ is the cost share of all marketing services in the delivered cost of commodity i that is being exported, $pm(i, r)$ is market price of commodity i in region r . Note that $pxfs(i, r, s)$ is not the FOB price, which is redefined to equal:

$$pfob(i, r, s) = pxfs(i, r, s) - tx(i, r) - txs(i, r, s) \quad (C.9)$$

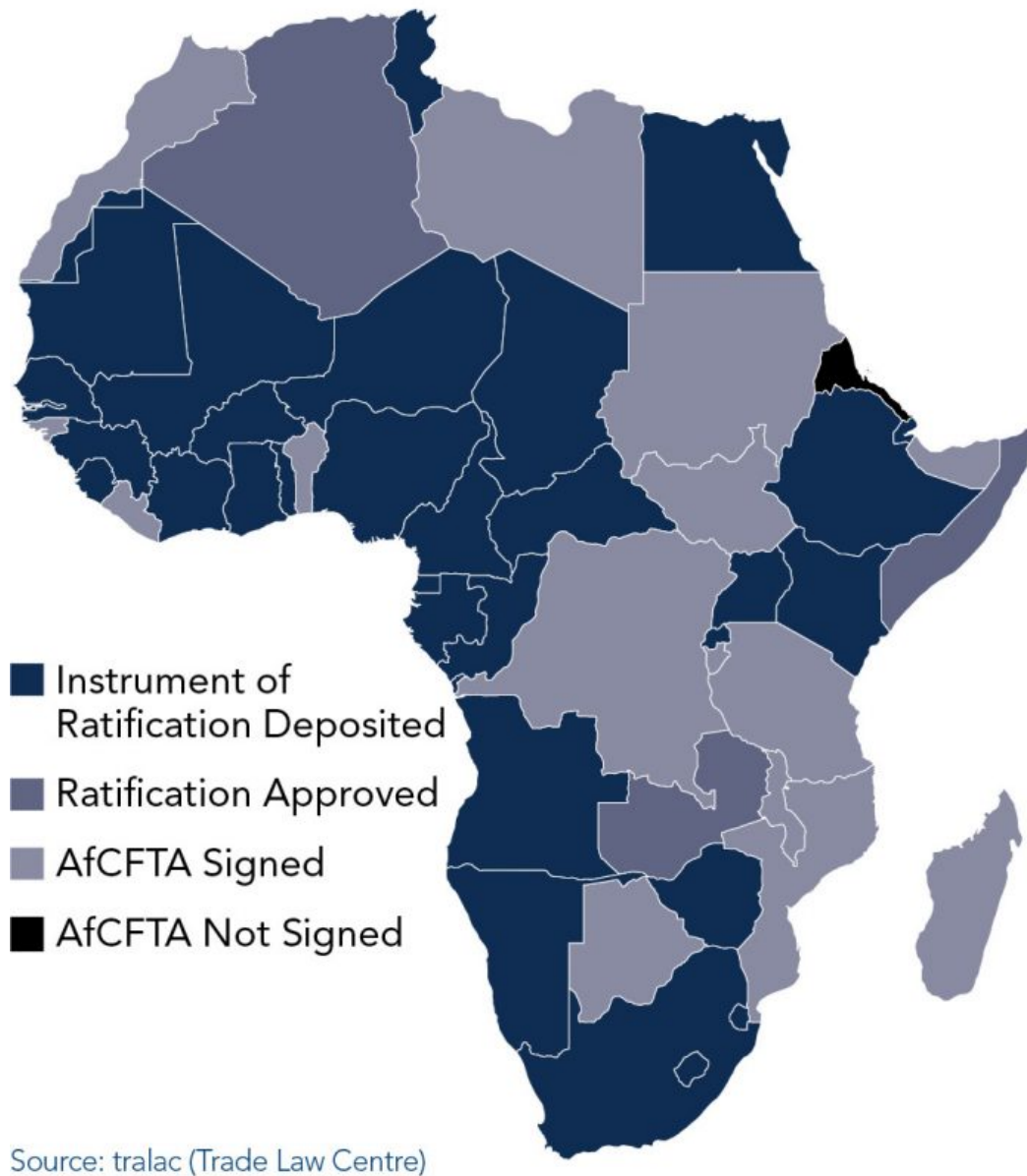
Where $tx(i, r)$ is power of the variable export tax on exports of tradable commodity i from region r (destination generic) and $txs(i, r, s)$ power of the tax on exports of tradable commodity i from source r to destination s . The value of commodity i exported from region r to region s at market prices [$VXMD(i, r, s)$] and the margin inclusive value of exports of commodity i [$VXFD(i, r, s)$] are defined as:

$$VXMD(i, r, s) = pm(i, r) * qxs(i, r) \quad (C.10)$$

and

$$VXFD(i, r, s) = pxfs(i, r, s) * qxls(i, r, s) \quad (C.11)$$

Figure C.5: Status of AfCFTA Ratification in 2021

COUNTRIES THAT HAVE RATIFIED AFCFTA AGREEMENT

Source: TRALAC

C.2 Data sources

The main source of data for this analysis is the Global Trade Analysis Project (GTAP) database coordinated by the Center for Global Trade Analysis in the department of agricultural economics at Purdue University. This analysis uses the latest GTAP version (10). In addition two modifications of the standard GTAP aggregate are introduced as changes to the baseline data:

1. Introduction of AVE estimates of non-tariff barriers (NTBs) to traded goods, based on estimates from Kee, Nicita, and Olarreaga (2009).
2. Incorporation of estimates of the quantification of barriers in services trade based on estimates from Jafari and Tarr (2017).

C.2.0.1 Quantification of non-tariff barriers in goods

AVE estimates of non-tariff barriers for goods are taken from the World Bank's World Integrated Trade Solution (WITS) database, based on the methodology developed by Kee, Nicita and Olarreaga (2009). They transform the quantity impact of NTBs into price-equivalents. The original data cover 78 developing and developed countries and goods at the Harmonized System 6 (HS6) level. These estimates are converted to the 7 aggregate goods sectors of the GTAP database (by simple average). The aggregated NTB database is in a CSV format (AVE-GTAP-Data.csv) with three fields: the country's ISO (International Organization for Standardization) code, the GTAP sector code, and the value of the NTB estimates. The coverage of African countries in this database is limited to Algeria (DZA), Burkina Faso (BFA), Cameroon (CMR), Ivory Coast (CIV), Arab Republic of Egypt (EGY), Ethiopia (ETH), Gabon (GAB) Ghana (GHA), Kenya (KEN), Madagascar (MDG), Malawi (MWI), Mali (MLI), Mauritius (MUS), Morocco (MAR), Nigeria (NGA), Rwanda (RWA), Senegal (SEN), South Africa (ZAF), Sudan (SDN), Tanzania (TZA), Tunisia (TUN), Uganda (UGA) and Zambia (ZMB). For the missing countries and regions (individual and aggregate regions), we use simple averages of the available country estimates.

C.2.0.2 Quantification of non-tariff barriers in services

Services have a specific characteristic contrary to goods. They are intangible and restrictions are qualitative information. The authors that estimated tariff equivalents of services restrictions use information's from the OECD and World Bank's Services Trade Restrictiveness Index

(STRI) database. The most recent is the tariff equivalent estimated by Benz and Jaax (2020). They include only OECD and emerging countries, not African countries except South Africa. The estimate by Jafari and Tarr (2017) is the most complete as it covers Africa countries. The country coverage for Africa consists of Algeria (DZA), Botswana (BWA), Burundi (BDI), Cameroon (CMR), Ivory Coast (CIV), the Democratic Republic of Congo (COD), the Arab Republic of Egypt (EGY), Ethiopia (ETH), Ghana (GHA), Kenya (KEN), Lesotho (LSO), Madagascar (MDG), Malawi (MWI), Mali (MLI), Mauritius (MUS), Morocco (MAR), Mozambique (MOZ), Namibia (NAM), Nigeria (NGA), Rwanda (RWA), Senegal (SEN), South Africa (ZAF), Tanzania (TZA), Tunisia (TUN), Uganda (UGA), Zambia (ZMB), and Zimbabwe (ZWE). The missing data include rest of North Africa (XNF), which is mapped to North Africa (NAF) as shown in table F.1. Benin, Burkina Faso, Guinea, Togo, rest of West Africa, rest of Central Africa (XCF), rest of South-Central Africa (XAC), rest of East Africa (XEC), and rest of SACU (South African Customs Union) are all mapped to the Sub-Saharan (SSA). They estimate the ad valorem equivalents of the discriminatory barriers against foreign suppliers of services in 11 service sectors in 103 countries. The estimates are based on recent available data on discriminatory regulatory barriers against foreign suppliers of services in these sectors and countries, produced by the World Bank (Brochert et al., 2014).

The World Bank's STRI database focuses exclusively on discriminatory barriers faced by foreign suppliers of services. However, Jafari and Tarr (2017) reconstruct STRI indices from the World Bank database based on a series of studies supported by the Australian Productivity Commission. This modification ignores, except for EU countries, preferential commitments and focuses exclusively on MFN barriers. Indeed, in the case of EU countries, the transformation of the World Bank database includes the weighting of intra-EU and extra-EU services regulatory regimes.

The authors regress a measure of the price or costs of services against their STRIs and other relevant variables in a cross-country regression at a point in time to determine the impact the regulatory barriers on the price of services. Through these regressions, the authors finally estimate the ad valorem equivalents of regulatory barriers in the countries in their sample. The simple average of the AVEs of the 11 sectors constitutes the overall AVE of the service sector.

C.3 Tables

Table C.4: Regional aggregation: GTAP concordance

<i>Region</i>	<i>GTAP concordance</i>
1 Egypt, Arab Rep. (EGY)	Egypt, Arab Rep. (EGY)
2 Morocco (MAR)	Morocco (MAR)
3 Tunisia (TUN)	Tunisia (TUN)
4 Rest of North Africa (XNF)	Algeria (DZA), Libya (LBY), Western Sahara (ESH)
5 Benin (BEN)	Benin (BEN)
6 Burkina Faso (BFA)	Burkina Faso (BFA)
7 Cameroon (CMR)	Cameroon (CMR)
8 Ivory Coast (CIV)	Ivory Coast (CIV)
9 Ghana (GHA)	Ghana (GHA)
10 Guinea (GIN)	Guinea (GIN)
11 Nigeria (NGA)	Nigeria (NGA)
12 Senegal (SEN)	Senegal (SEN)
13 Togo (TGO)	Togo (TGO)
14 Rest of West Africa (XWF)	Cape Verde (CPV), Gambia, Guinea-Bissau (GNB), Liberia (LBR), Mali (MLI) Mauritania (MRT), Niger (NER), Saint Helena (SHN), Sierra Leone (SLE)
15 Rest of Central Africa (XCF)	Central African Republic (CAF), Chad (TCD), Congo (COG), Equatorial Guinea (GNQ), Gabon (GAB), Sao Tome and Principe (STP)
16 South Central Africa	Angola (AGO), Democratic Republic of the Congo (COD)
17 Ethiopia (ETH)	Ethiopia (ETH)
18 Kenya (KEN)	Kenya (KEN)
19 Madagascar (MDG)	Madagascar (MDG)
20 Malawi (MWI)	Malawi (MWI)
21 Mauritius (MUS)	Mauritius (MUS)
22 Mozambique (MOZ)	Mozambique (MOZ)
23 Rwanda (RWA)	Rwanda (RWA)
24 Tanzania (TZA)	Tanzania (TZA)
25 Uganda (UGA)	Uganda (UGA)
26 Zambia (ZMB)	Zambia (ZMB)
27 Zimbabwe (ZWE)	Zimbabwe (ZWE)
28 Rest of East Africa (XEC)	Burundi (BDI), Comoros (COM), Djibouti (DJI), Eritrea (ERI), Mayotte(MYT), Seychelles(SYC), Somalia (SOM), Sudan (SDN)
29 Botswana (BWA)	Botswana (BWA)
30 Namibia (NAM)	Namibia (NAM)
31 South Africa (ZAF)	South Africa (ZAF)
32 Rest of South African Customs Union (XSC)	Eswatini (SWZ), Lesotho (LSO)

Table C.5: Continued

<i>Region</i>	<i>GTAP concordance</i>
33 China (CHN)	China (CHN)
34 United States (USA)	United States of America (USA)
35 European Union + EFTA (weu)	Austria (AUT), Belgium (BEL), Cyprus (CYP), Czech Republic (CZE), Denmark (DNK), Estonia (EST), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Hungary (HUN), Ireland (IRL), Italy (ITA), Latvia (LVA), Lithuania (LTU), Luxembourg (LUX), Malta (MLT), Netherlands (NLD), Poland (POL), Portugal (PRT), Slovakia (SVK), Slovenia (SVN), Spain (ESP), Sweden (SWE), United Kingdom (GBR), Switzerland (CHE), Norway (NOR), rest of EFTA (XEF), Bulgaria (BGR), Croatia (HRV), Romania (ROU)
36 Rest of the world (row)	Australia (AUS), New Zealand (NZL), rest of Oceania (XOC), Bangladesh (BGD), India (IND), Nepal (NPL), Pakistan (PAK), Sri Lanka (LKA), rest of South Asia (XSA), Canada (CAN), Mexico (MEX), rest of North America (XNA), Argentina (ARG), Bolivia (BOL), Brazil (BRA), Chile (CHL), Colombia (COL), Ecuador (ECU), Paraguay (PRY), Peru (PER), Uruguay (URY), Venezuela (VEN), rest of South America (XSM), Costa Rica (CRI), Guatemala (GTM), Honduras (HND), Nicaragua (NIC), Panama (PAN), El Salvador (SLV), rest of Central America (XCA), Dominican Republic (DOM), Jamaica (JAM), Puerto Rico (PRI), Trinidad and Tobago (TTO), rest of Caribbean (XCB), Albania (ALB), Belarus (BLR), Russian Federation (RUS), Ukraine (UKR), rest of East Europe (XEE), rest of Europe (XER), Kazakhstan (KAZ), Kyrgyzstan (KGZ), Tajikistan (TJK), rest of former Soviet Union (XSU), Armenia (ARM), Azerbaijan (AZE), Georgia (GEO), Bahrain (BHR), Iran, Islamic Rep. (IRN), Israel (ISR), Jordan (JOR), Kuwait (KWT), Oman (OMN), Qatar (QAT), Saudi Arabia (SAU), Turkey (TUR), United Arab Emirates (ARE), rest of Western Asia (XWS), Rest of East Asia (XEA), Hong Kong, SAR, China (HKG), Japan (JPN), Mongolia (MNG), Republic of Korea (KOR), Taiwan, China (TWN), rest of East Asia (XEA), Brunei Darussalam (BRN), Cambodia (KHM), Indonesia (IDN), Lao PDR (LAO), Malaysia (MYS), Philippines (PHL), Singapore (SGP), Thailand (THA), Vietnam (VNM), rest of Southeast Asia (XSE), Antarctica, Bouvet Island, British Indian Ocean Territory, French Southern Territories.

Note: EFTA = European Free Trade Association.

Source: GTAP model, GTAP v10, AfCFTA database.

Source: GTAP model, GTAP v10, AfCFTA database

Table C.6: GTAP sector concordance

<i>Sector name (aggregated)</i>	<i>GTAP concordance</i>
1 Agriculture (AGR)	Paddy rice (PDR); wheat (WHT); cereal grains, NEC (GRO); vegetables, fruit, nuts (V-F); oilseeds (OSD); sugar cane, sugar beet (C-B); plant-based fibers (PFB); crops, NEC (OCR); bovine cattle, sheep and goats, horses (CTL); animal products, NEC (OAP); raw milk (RMK); wool, silkworm, cocoons (WOL); forestry (FRS)
2 Fossil fuels (FFL)	Coal (COA); oil (OIL); gas (GAS); petroleum, coal products (P-C)
3 Energy-intensive manufacturing (KE5)	Mineral products, NEC (NMM); ferrous metals (I-S); metals, NEC (NFM); Other extraction (formerly other manufacturing (omn), minerals, NEC) (OXT)
4 Processed foods (PFD)	Bovine meat products (CMT); meat products, NEC (OMT); vegetable oils and fats (VOL); dairy products (MIL); processed rice (PCR); sugar (SGR); food products, NEC (OFD); beverages and tobacco products (B-T)
5 Textiles and wearing apparel (TWP)	Textiles (TEX); wearing apparel (WAP); leather products (LEA)
6 Wood and paper products (WPP)	Wood products (LUM); paper products, publishing (PPP)
7 Manufactures, NES (XMN)	Chemical, rubber, and plastic products (CRP); Chemical products (CHM); basic pharmaceutical products (BPH); rubber and plastic products (RPP); Metal products (FMP); computer, electronic, and optical products (ELE); electrical equipment (EEQ); machinery and equipment, NEC (OME); motor vehicles and parts (MVH); transport equipment, NEC (OTN); manufactures, NEC (OMF)
8 Services	Electricity (ELY); gas manufacture, distribution (GDT); construction (CNS); trade (TRD); accommodation, food, and service activities (AFS); warehousing and support activities (WHS); transport, NEC (OTP); water transport (WTP); air transport (ATP); communication (CMN) financial services, NEC (OFI); insurance (formerly ISR) (INS); real estate activities (RSA); business services, NEC (OBS); water (WTR); recreational and other service; public administration and defense (OSG); education (EDU); human health and social work activities (HHT); dwellings (DWE)

Source: GTAP model, GTAP v10, AfCFTA database

Table C.7: Intra-African agricultural and industrial tariffs

Countries	Agriculture	Manufacturing	Processed foods	Fossil fuels	Energy-intensive manufacturing	Wood and paper	Textiles and wearing apparel
Benin	4.3	7.9	6.6	2.5	5.7	4.5	10.8
Botswana	0.5	1.9	0.6	0.2	0.7	0.2	5.6
Burkina Faso	3.5	8.2	4.3	2.3	4.9	5.7	8.4
Cameroon	5.2	9.9	11	2.8	5	9.1	12.8
Egypt	1.4	2.7	2.9	0.1	2.4	0.8	3.8
Ethiopia	3.3	12	7.3	0.6	7.5	6.7	18.9
Ghana	2.5	6.5	6.4	2.1	6.3	8.2	7.4
Guinea	2.5	6.1	8.1	2.3	5.6	7.5	8.2
Ivory Coast	3.8	7.8	6.5	2	5.3	5.8	8.3
Kenya	3.6	4	6.3	0.9	2.5	3	6.3
Madagascar	0.9	2.3	3.5	0.2	1.4	2.7	4.1
Malawi	0.2	3.6	1.2	0.2	3.3	1.1	5.4
Mauritius	0	0.3	0.2	0	0.9	0.6	0.9
Morocco	3.5	4.4	3.9	0.1	1.8	4.5	4.8
Mozambique	2.2	4.7	4.8	0.7	1.3	1.6	5
Namibia	0.3	2.7	0.8	0.4	0.1	0.8	7
Nigeria	7.1	9.1	10.6	2.8	8.7	8.3	8.6
Rest of Central Africa	10.1	13	13.1	4.4	7.9	13.6	18.1
Rest of Eastern Africa	3.5	8.2	5	1.5	4.1	2.8	7.8
Rest of North Africa	5.6	4.5	6	0.3	1.6	3.9	5.5
Rest of South African Customs	1.3	1.4	1.9	0.2	1.2	1	3.3
Rest of West Africa	5.7	9.4	8.2	4.5	7.1	5.9	12.8
Rwanda	1.4	3.9	5.1	0.3	5.5	4.4	14.7
Senegal	4.7	8	7.3	1.7	7.6	5.9	7.3
South Africa	1.5	2.5	3.8	0.2	2.5	3.1	14.2
South central Africa	15.4	10	16.5	4.2	10.9	14.7	13
Tanzania	4.2	6.7	14	0.8	5.8	5.1	17.9
Togo	4.3	6.1	4.8	2.3	5.4	5.5	7.4
Tunisia	4.3	3.6	8.9	0	0.6	4.1	4.5
Uganda	3	6.3	6.7	0.8	4.4	3.6	13.9
Zambia	1.2	3.8	2.1	1.2	1.3	2.4	5.6
Zimbabwe	0.7	4.7	2.1	0.9	1.3	2.1	6.3

Source: GTAP model, GTAP v10, AfCFTA database

Table C.8: Non-tariff measures in Africa: number of notification

Countries	<i>CTPM</i>	<i>EXP</i>	<i>INSP</i>	<i>OTH</i>	<i>PC</i>	<i>QC</i>	<i>SPS</i>	<i>TBT</i>
Benin		20	12	3	5	20	27	34
Burkina Faso		14	3	2	1	8	39	5
Cabo Verde		3	1	3	8	4	31	28
Ivory Coast	3 14	1		4	8	69	7	
Ghana		35	7		7	26	20	25
Guinea		75	7	3	22	7	35	19
Liberia, Republic of		45	2	2	10	21	23	21
Mali		68 3	4	8	17	34	27	
Niger		12	3		4	9	14	21
Nigeria		3	1		1	15	51	26
Senegal		23	28		2	10	70	13
The Gambia		4		2	5	16	77	50
Togo		23		2	6	32	10	23
Total (West Africa)	3	339	68	21	83	193	500	299
Algeria		13	4	1	1	34	114	122
Tunisia		87	21	12	46	36	96	117
Morocco		42	4	1	6	35	208	91
Mauritania		42	4	7	4	23	98	55
Total (North Africa)		184	33	21	57	128	516	385
Cameroon		90			10	29	42	51
Ethiopia		139	1	7	3	32	103	213
Total (Central and East Africa)		229	1	7	13	61	145	264
Mauritius		40	12	2	7	40	318	358
Zimbabwe		75	6	1	21	31	169	407
Botswana		58	1	2	1	18	61	85
Total (Southern Africa)		173	19	5	29	89	548	850

Source: UNCTAD TRAINS database-Non-Tariff Measures. CTPM: Contingent trade protective measures; EXP: Export-related measures, INSP: Inspection and other formalities; OTH: Other measures; PC: Price control measures; QC: Quality control measures, SPS: Sanitary and phytosanitary, TBT: Technical barriers to trade.

Table C.9: Ad valorem equivalents of non-tariffs measures in Africa: agricultural and manufacturing products

<i>Sectors</i>	<i>SPS</i>	<i>TBT</i>	<i>Others</i>	<i>Total NTM</i>
Animals	9.5	4.2	4.6	18.3
Vegetables	14.2	2.7	2.3	19.2
Fats and oils	7.8	0.2	3.9	11.9
Beverages and tobacco	11.4	5.8	2.9	20.1
Minerals	4.6	8.2	1.8	14.6
Chemicals	5.6	5.8	2.9	14.3
Plastics	0.1	8.1	1.3	9.5
Leather	5.4	5.5	3.6	14.5
Wood product	4.3	6.7	0.6	11.6
Paper	0	9	0.8	9.8
Textile and clothing	0	6.4	2.5	8.9
Footwear	0	9.2	3.3	12.5
Stone and glass	0	8.3	4.3	12.6
Pearls	0	3.1	6.2	9.3
Metals	0	9.6	4.8	14.4
Machinery	0	11.3	10.4	21.7
Vehicles	0	9.2	4	13.2
Optical	0	11.1	6.1	17.2
Arms	0	5.9	9.5	15.4
Miscellaneous	0	12.6	3.9	16.5

Source: AVEs data compiled by Cadot et al. (2015)

Table C.10: Ad Valorem Equivalents (AVEs) by services sector and geographical region

Region	AVEs estimations						
	North America	Europe and Central Asia	East Asia and the Pacific	South Asia	Latin America and Caribbean	Middle East and North Africaf	sub-Saharan Africa
Accounting	36	26	38	34	27	45	33
Legal services	34	34	48	58	33	63	46
Air transport	10	24	31	58	37	59	23
Rail transport	28	49	45	67	41	66	53
Road transport	18	19	35	35	31	56	26
Banking	1	8	12	16	12	32	16
Insurance	18	22	21	29	27	34	28
Fixed line	16	7	90	388	60	30	545
Mobile line	0	0	1	2	1	1	3
Retail	2	2	3	4	3	5	3
Maritime transport	8	16	30	67	34	57	18
AVEs Average	15.55	18.82	32.18	68.91	27.82	40.73	72.18

Source: Jafari and Tarr (2017)

Table C.11: Estimated ad valorem equivalents of services restrictions: Individual countries

Countries	Accounting	Legal	Air transport	Rail transport	Road transport	Banking	Insurance	Fixed line	Mobile line	Retail	Maritime	Average
Botswana	21	35	75	65	65	18	23	64	1	2	n/a	36.9
Cameroon	26	34	0	56	37	1	25	29	0	2	0	19.09
Democratic of the Congo	29	36	0	84	62	3	104	915	1	2	58	117.64
Egypt	56	73	69	84	0	44	35	18	1	1	39	38.18
Ethiopia	19	73	84	62	84	106	105	915	37	14	82	143.73
Ghana	29	25	0	26	0	34	26	915	1	2	65	102.09
Ivory Coast	51	56	0	84	60	17	13			1	0	31.33
Kenya	26	73	0	84	0	2	38	915	1	1	0	103.64
Lesotho	16	13	0	84	0	1	16	109	1	2	n/a	24.2
Madagascar	25	40	0	62	70	18	23	915	2	1	n/a	115.6
Malawi	33	49	59	42	5	18	21	915	6	2	n/a	115
Mali	60	50	0	20	20	4	21	915	2	1	n/a	109.3
Mauritius	10	65	0	84	42	17	2	1	0	0	n/a	22.1
Morocco	27	47	0	0	0	2	26	13	1	1	73	17.27
Mozambique	20	20	0	37	20	1	2	915	2	1	0	92.55
Nambibia	41	55	0	68	56	18	27	63	2	1	0	30.09
Nigeria	30	27	37	84	0	2	48	35	0	3	0	24.18
Rwanda	21	15	0	84	5	14	27	915	3	7		109.1
Senegal	46	65	81	84	0	13	13	60	1	1	0	33.09
South Africa	32	73	70	0	0	6	29	23	1	1	0	21.36
Tanzania	44	52	54	72	0	13	33	915	1	1	61	113.27
Tunisia	79	69	69	68	60	10	29	12	1	6	75	43.45
Uganda	40	49	0	18	0	2	16	915	4	1	n/a	104.5
Zambia	26	27	0	0	53	5	24	915	2	1	n/a	105.3
Zimbabwe	39	48	69	77	75	23	31	267	2	11	n/a	64.2

Source: Jafari and Tarr (2017) AVEs estimated.

Table C.12: Estimated ad valorem equivalents of services restrictions: Regional area

	North Africa (NAF)	Sub-Saharan Africa (SSA)	Rest of East Asia	Western Europe	Rest of the world
Accounting	54	31	43	28	32
Legal	60	45	63	28	41
Air	55	23	46	16	38
Rail	59	57	18	50	
Road	36	31	45	24	33
Banking	17	15	17	2	16
Insurance	29	31	26	11	26
Fixed line	13	546	134	4	75
Mobile	1	3	1	1	1
Retail	5	2	4	1	3
Maritime	67	12	40	7	30
Average	36	72.55	43.27	12.73	31.36

Source: Jafari and Tarr (2017) AVEs estimated.

Table C.13: GTAP closures

	Short-run	Long-run
Exogenous	$qo(capital)$ or kb	$EXPAND$
Endogenous	$EXPAND$ $DTBAL$ is endogenous	$qo(capital)$ $DTBAL$ is endogenous

Source: Walmsley (1998)

$qo(capital)$ or kb : beginning-of-period capital stock

$EXPAND$: change in investment levels relative to endowment stock

$DTBAL$: change in trade balance

Barrières Non Tarifaires dans le commerce des services, Investissement Direct Étranger et commerce international

Résumé: Cette thèse de doctorat étudie les effets des Barrières Non Tarifaires (BNT) au commerce des services sur les échanges commerciaux mondiaux. Elle contribue à l'analyse empirique des effets des restrictions sectorielles au commerce des services sur les échanges commerciaux mondiaux. Dans le premier chapitre, nous examinons empiriquement les impacts des BNT dans les services et la disparité réglementaire (transports, logistiques, distribution, financiers et secteur du business) sur les échanges commerciaux de biens alimentaires entre les pays membres de l'OCDE. Les résultats suggèrent des effets négatifs des restrictions sectorielles sauf dans le secteur de la distribution sur le commerce des biens alimentaires. Cependant, la disparité réglementaire entre les pays a un impact négatif et significatif sur le commerce des produits alimentaires. Cet impact diminue lorsque le pays exportateur est fermé aux prestataires de services. Dans le deuxième chapitre, nous analysons empiriquement les impacts des restrictions dans le secteur des IDE (Investissements Direct à l'Étranger) sur les investissements transfrontaliers entre les pays développés (OCDE) et les pays émergents. Nous concluons que les restrictions dans le secteur des services des IDE sont des obstacles aux investissements transfrontaliers entre pays avancés et émergents. Plus loin, les restrictions dans les services entravent les investissements transfrontaliers entre pays développés et celles dans le secteur primaire, manufacturier et ressources naturelles constituent un frein aux IDE entrants dans les pays émergents. Dans le dernier chapitre, nous étudions à travers un modèle théorique les gains de la libéralisation des services sur le commerce intra-Africain dans le cadre de la Zone de Libre-Echange Continentale Africaine (ZLECA). Les résultats montrent des effets positifs de la libéralisation des services sur la croissance du PIB, du revenu, sur le bien-être et sur le commerce intra-africain plus précisément le commerce de biens manufacturiers et ressources naturelles. L'accord ZLECA crée à la fois des créations et des détournements de commerce, mais le gain en bien-être reste positif et significatif à long terme en Afrique.

Mots-clés : Barrières Non Tarifaires (BNT); Commerce des services; Commerce des biens alimentaires; Investissements Directs à l'Étranger (IDE); Zone de Libre-Echange Continentale Africaine (ZLECA)

Non-Tariff Barriers in services trade, Foreign Direct Investment and international trade

Abstract: This thesis studies the effects of Non-Tariff Barriers (NTBs) to trade in services on international trade. It contributes to the empirical analysis of the effects of sectoral restrictions in services trade on world trade. In the first chapter, we empirically examine the impacts of NTBs in services and regulatory disparity (transport, logistics, distribution, financial and business) on food trade among OECD countries. The results suggest negative effects of sectoral restrictions except in the distribution sector on trade in food products. However, the regulatory disparity between countries has a significant negative impact on food trade. This impact decreases when the exporter country is closed to service providers. In the second chapter, we empirically analyze the impacts of FDI restrictions on cross-border investment between advanced (OECD) and emerging countries. We conclude that restrictions in the services sector of FDI impede cross-border investment across advanced and emerging countries. Furthermore, restrictions in the services sector hinder cross border investment between advanced countries and restrictions in the primary, manufacturing and natural resources sector hamper inward FDI in emerging countries. In the last chapter, we use a theoretical model to study the gains of services liberalization on intra-African trade in the context of the African Continental Free Trade Area (AfCFTA). The results show positive effects of services liberalization on GDP growth, income, welfare and intra-African trade, particularly trade in manufacturing goods and natural resources. The AfCFTA agreement creates both long-term trade creation and diversion, but the welfare gain is still positive and significant over the long term in Africa.

Keywords: Non-Tariff Barriers (NTBs); Services trade; Food trade; Foreign Direct Investment (FDI); African Continental Free Trade Area (AfCFTA)