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Departamento de Economía

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***Cape Verde in the ECOWAS: from Free Trade
Agreement to a Customs Union***

A CGE analysis at the product level (HS6)

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“Cabo Verde en la CEDEAO: desde un Tratado de Libre Comercio hacia una Unión Aduanera. Análisis de equilibrio general a nivel producto (HS6)”

Resumen

El objetivo de esta tesis es evaluar el impacto en el comercio, el PIB y el bienestar agregado de la incorporación plena de Cabo Verde a la CEDEAO. En concreto, se pretende evaluar los efectos potenciales asociados tanto a la plena liberalización comercial dentro del bloque como a la adopción del arancel externo común (AEC) de la Unión Aduanera. Para la simulación se desarrolló un modelo de Equilibrio General Computado (EGC), cuya novedad radica en la desagregación del comercio bilateral entre Cabo Verde y sus socios comerciales a nivel de subpartida del Sistema Armonizado. La calibración del modelo requirió una Matriz de Contabilidad Social (MCS) para Cabo Verde en 2017 y esta información se complementa con los datos de comercio bilateral y protección del CEPII (BACI 2017, MacMap-HS6 2016). Se simularon dos escenarios progresivos, uno que implica la plena liberalización del comercio entre Cabo Verde y el resto de los miembros de la CEDEAO y otro en el que se añade la adopción del AEC de la CEDEAO. Además, para mostrar la importancia de los productos sensibles elegidos, se realiza un escenario intermedio en el que la liberalización comercial se aplica sólo a los productos no sensibles en la relación comercial con el resto de la CEDEAO. Todos los escenarios mejoran las relaciones comerciales entre Cabo Verde y el resto de la CEDEAO en detrimento del comercio con el resto del mundo, sobre todo en el escenario de la UA, en el que la aplicación del AEC implica incrementos arancelarios a algunos productos modificando la protección relativa entre productos y socios. Para el comercio total, mientras que el TLC mejora los TOT de Cabo Verde (0,34%), el escenario de la UA los deteriora (-0.08%) mostrando un mayor aumento en el valor de las importaciones totales que en el de las exportaciones. En cuanto al bienestar nacional, se alcanzan mejoras del 0.24% y 1.03% bajo el FTA y la CU, respectivamente.

Palabras clave: TLC, UA, CEDEAO, Cabo Verde, AEC, modelo EGC

“Cape Verde in the ECOWAS: from a Free Trade Agreement to a Customs Union. A CGE analysis at the product level (HS6).”

Abstract

The objective of this thesis is to assess the impact on trade, GDP, and aggregate welfare of Cape Verde's full incorporation into the ECOWAS. Specifically, it seeks to assess the potential effects associated with both full trade liberalization within the block and the adoption of the Customs Union's common external tariff (CET). For simulation purposes, a Computed General Equilibrium (CGE) model was developed, whose novelty lies in the disaggregation of bilateral trade between Cape Verde and its trading partners at the subheading level of the Harmonized System (HS).

The model calibration required a Social Accounting Matrix (SAM) for Cape Verde in 2017 and this information is complemented with bilateral trade and protection data from CEPII (BACI 2017, MacMap-HS6 2016). Two progressive scenarios were simulated, one involving full trade liberalization between Cape Verde and the rest of the ECOWAS members and another in which the adoption of the ECOWAS CET was added to the FTA. Also, to show the importance of the chosen sensitive products, an intermediate scenario in which trade liberalization applies only to non-sensitive products in the trade relationship with the rest of ECOWAS is performed. All scenarios improve trade relations between Cape Verde and the rest of ECOWAS to the detriment of trade with the rest of the world, particularly under the CU scenario where the implementation of the CET implies tariff increases to some products modifying relative protection across products and partners. For total trade, while the FTA improves the TOT to Cape Verde (0.34%), the CU scenario deteriorates them (-0.08%) showing a greater increase in total imports than exports in value. Concerning national welfare, improvements of 0.24% and 1.03% are reached under the FTA and the CU, respectively.

Keywords: FTA, CU, ECOWAS, Cape Verde, CET, CGE model

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Cape Verde in the ECOWAS: from Free Trade Agreement to Custom's Union

A CGE analysis at the product level (HS6)†*

Tomás Lisazo

October 17, 2022



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The objective of this thesis is to assess the impact on trade, GDP, and aggregate welfare of Cape Verde's full incorporation into the ECOWAS. Specifically, it seeks to assess the potential effects associated with both full trade liberalization within the block and the adoption of the Customs Union's common external tariff (CET). For simulation purposes, a Computed General Equilibrium (CGE) model was developed, whose novelty lies in the disaggregation of bilateral trade between Cape Verde and its trading partners at the subheading level of the Harmonized System (HS). The model calibration required a Social Accounting Matrix (SAM) for Cape Verde in 2017 and this information is complemented with bilateral trade and protection data from CEPII (BACI 2017, MacMap-HS6 2016). Two progressive scenarios were simulated, one involving full trade liberalization between Cape Verde and the rest of the ECOWAS members and another in which the adoption of the ECOWAS CET was added to the FTA. Also, to show the importance of the chosen sensitive products, an intermediate scenario in which trade liberalization applies only to non-sensitive products in the trade relationship with the rest of ECOWAS is performed. All scenarios improve trade relations between Cape Verde and the rest of ECOWAS to the detriment of trade with the rest of the world, particularly under the CU scenario where the implementation of the CET implies tariff increases to some products modifying relative protection across products and partners. For total trade, while the FTA improves the TOT to Cape Verde (0.34 %), the CU scenario deteriorates them (-0.08%) showing a greater increase in total imports than exports in value. Concerning national welfare, improvements of 0.24% and 1.03% are reached under the FTA and the CU, respectively.

*I thank María Priscila Ramos (IIEP, UBA-CONICET) for her support throughout this project and for allowing me to use the data employed in this research. The following research project will be extended to take into account certain methodological limitations mentioned in the conclusion, specifically, the definition of the list of sensitive products and the treatment of re-exports in the trade data. All errors and opinions are my own.

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1 Introduction

The Economic Community of West African States (ECOWAS) was created in 1975 as the result of a regional integration agreement among some West African countries. Its main objective was to promote the creation of intra-regional trade (it also sought to promote the free movement of people and capital) as a compensatory mechanism to counterbalance the fall in international trade with Asia and Europe (Hanink & Owusu, 1998). Cape Verde joined ECOWAS in 1976.

The idea behind the creation of ECOWAS was to create a Free Trade Agreement between member countries that would lay the foundations to then move towards higher types of regional integration, such as a Customs Union (Banik & Yoonus, 2012). ECOWAS authorities developed different trade policy initiatives to achieve this goal (Santos, Almeida, Sanches, & Duarte, 2018). Among the trade policy frameworks proposed by ECOWAS, the most relevant for this paper are, on the one hand, the Trade Liberalization Scheme (ETLS), which is the main tool to promote free trade within the region, and, on the other hand, the adoption of a Common External Tariff (CET) applicable to the trade relationship with the rest of the world.

The ECOWAS CET came into force on January 1st, 2015; however, some countries within the region, including Cape Verde, have not yet implemented it. According to Cape Verdean authorities, the lack of availability of manuals and other documentation with implementation instructions in Portuguese, which is the official national language, and the completion of transitional tariff measures constitute the main difficulties for the adoption of the CET (WTO, 2015).

The ECOWAS CET comprises 5,899 tariff lines at the ten-digit level, using the 2012 version of the Harmonized System nomenclature. The CET has five tariff bands (0%, 5%, 10%, 20%, and 35%). When the CET replaces the national tariff in Cape Verde, the tariff dispersion will be significantly reduced as the maximum rate is lowered from 50% to 35%, but also because the incidence of zero-duty applied MFN rates will fall from 44% to 1.4% (WTO, 2015).

Cape Verde presents a limited trade relationship with the rest of ECOWAS since its exports to these countries only represent 1% of the total and its imports from them only account for 3% of the total in 2017. According to Banik and Yoonus (2012), one of the main reasons for this phenomenon is the fact that the countries have similar export profiles, mainly oriented towards the production of primary commodities, which discourages intra-regional trade. Another important reason is the lack of infrastructure (such as internal rail and road networks) connecting

the countries of the region. Finally, the weakness in this trade link between Cape Verde and the rest of ECOWAS could also be attributed to the difficulty of this country in successfully applying the ECOWAS Trade Liberalization Scheme (ETLS), which should be gradually implemented for 10 years since 1990 (Jebuni, Iqbal, & s. Khan, 1998). The lack of solid administrative structures and also the lack of knowledge of the trade and customs rules of the region explain the delay in the implementation of the ETLS by Cape Verde (Santos et al., 2018).

The main objective of this work is to quantify the impact of the full implementation of ECOWAS TLS and particularly the Common External Tariff (CET) in Cape Verde over trade, production, consumption, welfare, and other macroeconomic variables. Particular focus will be put on trade at the very detailed level (HS6) to identify key tradable products for this country.

To achieve the general and specific objectives of this project, and inspired by the models of Gouel, Mitaritonna, and Ramos (2011), Jean, Mulder, and Ramos (2014), and Ramos (2017), we develop a multi-sector (28 sectors) and single-country (Cape Verde) Computable General Equilibrium (CGE) model. We assume a small country open to bilateral trade relations with its partners (the rest of ECOWAS, RDE, and the rest of the world, RDM). The novelty of this model is particularly the trade modeling of Cape Verde (imports and exports with their associated trade protection measures) at the 6-digit level of the Harmonized System, which allows identifying sensitive products to this country, on both the ECOWAS and the rest of the world trade relation.

The model is calibrated with the 2017 Social Accounting Matrix (SAM) of Cape Verde, which was balanced using the cross-entropy methodology proposed by Robinson, Cattaneo, and El-Said (2001), due to the imbalances inherent in the use of different sources of information for its elaboration. The calibration is completed with data at the subheading level (HS6) of Cape Verde bilateral trade from the BACI database (Gaulier & Zignago, 2010) and bilateral trade protection (applied tariffs) from MAcMap-HS6 (Guimbard, Jean, Mimouni, & Pichot, 2012). Both databases are from the *Centre d'Études Prospectives et d'Information Internationale* (CEPII). Other essential elements in the calibration are export and import elasticities of substitution between HS6 products, which follow the demand tree general scheme taken from other CGE models (Jean et al., 2014). For this particular case of study, trade elasticities are the same as those proposed by Ramos and Depetris Chauvin (2019) for a small open economy.

Three scenarios of the introduction of Cape Verde as a full member of ECOWAS are simulated: the first one simulates the full adoption of the ECOWAS TLS by Cape Verde. The second

scenario, which is a conservative version of the first one, simulates a partial trade liberalization limited only to those non-sensitive products for Cape Verde in its trade relationship with the ECOWAS partners. This intermediate scenario, when compared to the first one, aims to isolate the impact associated with the liberalization of trade in sensitive goods for Cape Verde. The last scenario simulates a Customs Union that not only contemplates the elimination of barriers to intra-ECOWAS trade, but also the adoption of the ECOWAS CET by Cape Verde. The lists of sensitive and export-interest products to Cape Verde are based on technical criteria such as the share of each HS6 product in total exports and imports and the level of their applied tariffs. The main results show that all scenarios improve trade relations between Cape Verde and the rest of the ECOWAS as well as national welfare. However, details in trade and the change in Cape Verde protection structure lead to a greater concentration in exports (non-metallic minerals which are derivatives of sodium). Imports are more diversified than exports (petroleum oil products, tobacco products, frozen tuna, etc.) but the increase is more concentrated in a few products under the CU scenario than on the FTA with the rest of ECOWAS. It is important to mention that the implementation of the CET in Cape Verde not only concerns tariff reduction (e.g., on tobacco products) but also increases in some particular products (i.e., agricultural and food products, such as rice, sugar cane, flour, pellets of fish; other intermediate goods such as portland cement, some tropical woods, petroleum oil products).

This document is organized as follows. Section 2 describes the current trade relations between Cape Verde and its trading partners of interest. It also identifies both import-sensitive products and products of export interest to Cape Verde. Section 3 presents the state of knowledge on the application of the ECOWAS common external tariff in other West African economies. Section 4 presents the calibrated CGE model for Cape Verde in 2017, both assumptions and data used: SAM, bilateral trade, and protection at the subheading level. Finally, the three alternative scenarios are described, specifically, the application of ETLs (both in its full and partial versions) and CET. Section 5 presents trade results at the subheading level, and also the sectoral and macroeconomic impact of simulations on Cape Verde. Section 6 synthesizes the relevant results for Cape Verde in this context and outlines future issues to be explored to improve the implementation conditions of the ECOWAS trade policy.

2 Cape Verde and its trade relationships: current situation

As mentioned in the introduction of this paper, the similar export profile of ECOWAS members, oriented to the production of primary commodities, largely discourages intra-regional trade between Cape Verde and its ECOWAS partners (Banik & Yoonus, 2012). Whereas, according to 2017 trade data, most of the export and import flows are explained by trade exchanges with the European Union. Both the construction of the CGE model and the correct interpretation of its results require understanding the detail of trade relations between Cape Verde and its trade partners of interest, i.e., the rest of ECOWAS and the rest of the world.

2.1 Trade and protection between Cape Verde and the rest of ECOWAS

Despite the efforts of ECOWAS authorities in terms of regional trade policy to strengthen trade between the member countries of the region, bilateral trade for Cape Verde with the rest of ECOWAS fails to be significant (WTO, 2015). According to trade data from 2017 (Gaulier and Zignago (2010)), exports from Cape Verde to the rest of the region represent only 1% of total exports, while imports from the rest of ECOWAS explain 3% of the total imported by Cape Verde in the same period. In nominal terms, exports to the rest of ECOWAS amounted to USD 1.2 million in 2017, while imports from the same destination added up to a total of USD 21.5 million, leading to a negative trade account balance.

The pattern of trade between the two trading partners is heavily concentrated in a few products detailed at the subheading level of the Harmonized System (HS6). 95% of exports to the rest of ECOWAS are explained by only five products (Figure 1a). Among these products, Sodium sulfites (HS 283210) and Petroleum oils and oils from bituminous minerals (HS 271000) are the most notable, with shares of 44% and 31%, respectively (Table 1). Imports, although less concentrated, can be explained in 86% by ten products detailed at the subheading level (Figure 1a), once again Petroleum oils and oils from bituminous minerals (HS 271000) stand out with a 48% share of the total, followed by Cigarettes containing tobacco (HS 240220) whose share is 11% (Table 2).

However, it is worth mentioning that exports of petroleum oils and oils from bituminous minerals (HS 271000) are not from Cape Verde's domestic production, but are initially imported and then re-exported to the rest of ECOWAS. In this sense, 48% of total Cape Verde imports from the rest of ECOWAS (Table 2) and 7% of imports from the rest of the world (Table 4) are explained

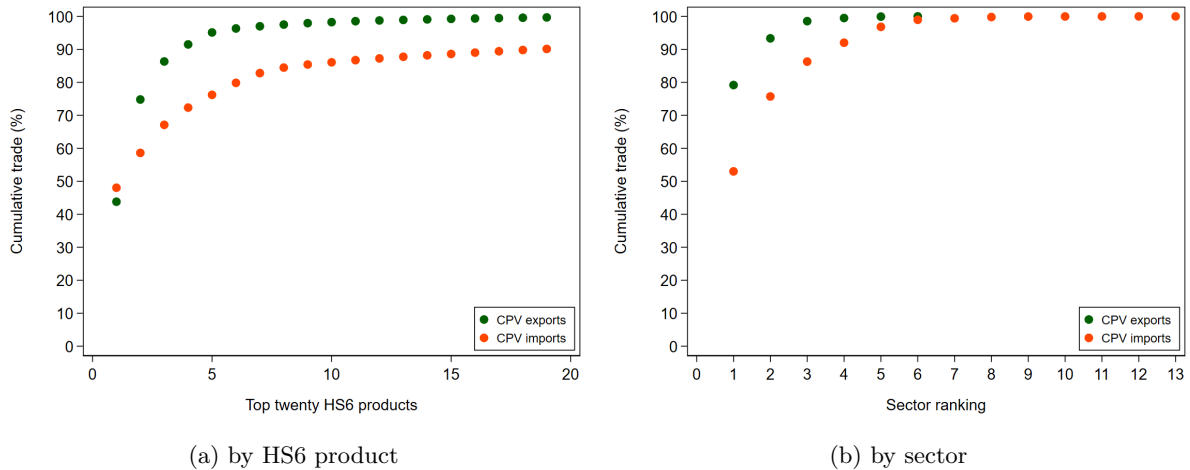


Figure 1: Cape Verde bilateral trade with the rest of ECOWAS at HS6 product and by sector (cumulative trade share).^{ab}

^aSource: Gaulier and Zignago (2010).

^bNote: number of HS6 products (x-axis) whose cumulative trade is equal to the proportion presented on the y-axis. On panel (a), the top three green markers correspond to subheadings “Sulphites of sodium” (HS 283210), “Petroleum oils and oils from bituminous minerals” (HS 271000), and “Cruise ships, excursion boats, and similar vessels” (HS 890110). The top three orange markers correspond to the subheadings “Petroleum oils and oils from bituminous minerals” (HS 271000), “Cigarettes: containing tobacco” (HS 240220), and “Automatic data processing machines: presented in the form of systems” (HS 847149). On panel (b), the top three green markers correspond to sectors “Manufacture of chemical products”, “Other manufacturing industries” and “Food and beverages”. The top three orange markers correspond to “Manufacture of chemical products”, “Other manufacturing industries” and “Tobacco industry”.

by this subheading. Although a 95.5% of HS 271000 total imports remains in Cape Verde, the remaining 0.05% is re-exported to the rest of ECOWAS members.

In sector terms (Figure 1b), shipments of Manufacture of chemical products manage to account for 79% of the total exported by Cape Verde to the rest of ECOWAS, while the remaining 21% is explained mainly by Other manufacturing industries (14%) and Food and beverage (5%). On the other hand, imports (Figure 1b) show a greater diversification among the different sectors of the National Accounts, being Manufacture of chemical products, Other manufacturing industries, and the Tobacco industry the most highlighted sectors, with respective import shares of 53%, 23%, and 11%.

Regarding the tariff structure applied by Cape Verde to its trading partners, over 40% of the products detailed at the subheading level (2012 Revision of the HS) are duty-free (Figure 2 - green line). As for positive values, the most frequent cases are tariffs of 5%, 10%, 20%, and 30%. However, we can also identify HS6 lines with applied tariffs in the range of 40% and 50%, although with considerably lower frequencies.

Finally, the tariffs applied by the rest of the ECOWAS to Cape Verde (Figure 2 - orange line)

Table 1: Ranking of Cape Verde exports to ECOWAS at the HS6 level (Mill- USD and % of the total, 2017)

HS6 code	Description	Value	Share
283210	Sulphites: of sodium	550	44%
271000	Petroleum oils and oils from bituminous minerals (by weight 70% or more) not crude	389	31%
890110	Cruise ships, excursion boats and similar vessels	145	12%
230120	Flours, meals and pellets: of fish or of crustaceans, molluscs or other aquatic invertebrates	65	5%
283319	Sodium sulphates: other than disodium sulphate	46	4%
860900	Containers: specially designed and equipped for carriage by one or more modes of transport	15	1%
630900	Clothing: worn, and other worn articles	8	1%
871150	Motorcycles and cycles: fitted with auxiliary motor, with reciprocating internal combustion piston engine of a cylinder capacity exceeding 800cc	7	1%
940360	Furniture: wooden, other than for office, kitchen or bedroom use	5	0,4%
401694	Rubber: vulcanised (other than hard rubber), boat or dock fenders, whether or not inflatable, of non-cellular rubber	4	0,3%
Top ten products		1,232	98%
Rest		22	2%
Total		1,254	100%

Source: own elaboration based on Gaulier & Zignago (2010)

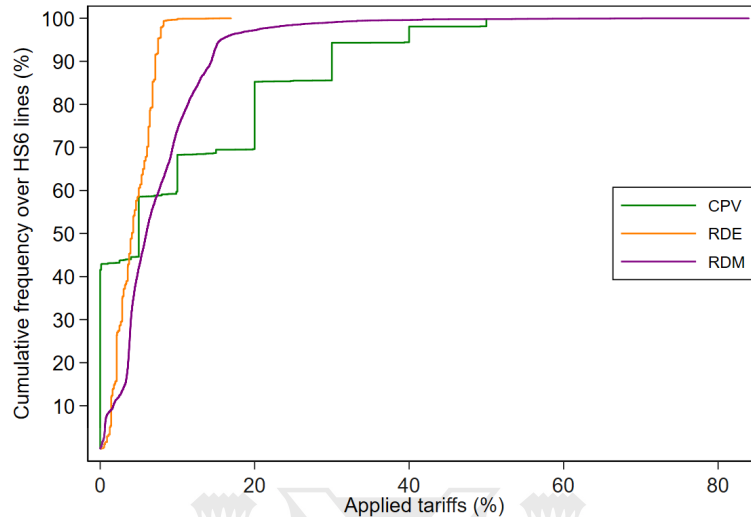
Table 2: Ranking of Cape Verde imports from ECOWAS at the HS6 level (Mill- USD and % of the total, 2017)

HS6 code	Description	Value	Share
271000	Petroleum oils and oils from bituminous minerals (by weight 70% or more), not crude	10,345	48%
240220	Cigarettes: containing tobacco	2,275	11%
847149	Automatic data processing machines: presented in the form of systems, n.e.c. in item no. 8471.30 or 8471.41	1,832	9%
851712	Telephones for cellular networks or for other wireless networks	1,125	5%
030349	Fish: frozen, tuna, n.e.c. in item no. 0303.4, excluding fillets, fish meat of 0304, and edible fish offal	834	4%
440729	Wood, tropical, of a thickness exceeding 6mm	781	4%
271113	Liquefied, butanes	638	3%
847130	Automatic data processing machines: portable, weighing not more than 10kg	359	2%
853110	Signalling apparatus: electric, sound or visual, burglar or fire alarms and similar	201	1%
550610	Fibres: synthetic staple fibres, of nylon or other polyamides, carded, combed or otherwise processed for spinning	146	1%
Top ten products		18,536	86%
Rest		2,997	14%
Total		21,533	100%

Source: own elaboration based on Gaulier & Zignago (2010)

are positive and mostly low. Even, for 99% of the HS6 lines, the applied tariffs are located below 10%. For the remaining 1%, on the other hand, the rates do not exceed 20%.

Figure 2: Tariff structures in Cape Verde, the rest of ECOWAS, and the rest of the World



Note: Proportion of HS6 lines (on the y-axis) for which applied tariffs are inferior to the level presented on the x-axis.

Source: own elaboration based on MacMap-HS6 (Rev. 12)

2.2 Trade and protection between Cape Verde and the rest of the world

Leaving aside the bilateral trade relationship between Cape Verde and the rest of ECOWAS, commercial exchanges with the rest of the world account for almost all of Cape Verde's trade -99% of exports (US\$ 109 million) and 97% of imports (US\$ 832 million)-, according to trade data from 2017 (Gaulier & Zignago, 2010). Furthermore, this relationship is strongly marked by trade with the European Union, the latter being the destination of 77% of exports (US\$ 85 million) and the origin of 66% of imports (US\$ 565 million) from Cape Verde.

At the same time, it is also worth mentioning that trade exchanges with the rest of the African continent managed to explain 6% of Cape Verde's exports in 2017 (US\$ 6 million), as well as 2% of its imports (US\$ 13 million).

Being an island economy with a small population, Cape Verde would be expected to specialize in a small set of products for export, while manufactures being imported. This structural characteristic, together with the climatic conditions of the country and the abundance of maritime resources, help to understand the fact that Cape Verde is constituted as a net importer economy of agricultural products intensive in the use of land while specializing in exports of products of maritime origin (WTO, 2015).

Table 3: Ranking of Cape Verde exports to the rest of the world at the HS6 level (Mill- USD and %of the total, 2017)

HS6 code	Description	Value	Share
160414	Fish preparations: tunas, skipjack and Atlantic bonito (sarda spp.), prepared or preserved, whole or in pieces (but not minced)	20,702	19%
160415	Fish preparations: mackerel, prepared or preserved, whole or in pieces (but not minced)	10,998	10%
030343	Fish: frozen, skipjack or stripe-bellied bonito, excluding fillets, fish meat of 0304, and edible fish offal	9,924	9%
030349	Fish: frozen, tuna, n.e.c. in item no. 0303.4, excluding fillets, fish meat of 0304, and edible fish offal	9,160	8%
880230	Aeroplanes and other aircraft: of an unladen weight exceeding 2000kg but not exceeding 15,000kg	5,865	5%
030749	Molluscs: cuttlefish and squid, whether in a shell or not, include flours, meals, and pellets of mollusks, fit for human consumption, dried, salted, in brine, or smoked, cooked or not before or during the smoking process	4,793	4%
030342	Fish: frozen, yellowfin tunas, excluding fillets, fish meat of 0304, and edible fish offal	4,636	4%
030487	Fish fillets: frozen, tunas, skipjack or stripe-bellied bonito	4,158	4%
160419	Fish preparations: fish prepared or preserved, whole or in pieces (but not minced), n.e.c. in heading no. 1604	3,834	4%
640610	Footwear: parts, uppers and parts thereof, other than stiffeners	3,802	3%
	Top ten products	77,871	71%
	Rest	31,394	29%
	Total	109,265	100%

Source: own elaboration based on Gaulier & Zignago (2010)

Table 4: Ranking of Cape Verde imports from the rest of the world at the HS6 level (Mill- USD and % of the total, 2017)

HS6 code	Description	Value	Share
271000	Petroleum oils and oils from bituminous minerals (containing by weight 70% or more), not crude	58,621	7%
880230	Aeroplanes and other aircraft: of an unladen weight exceeding 2000kg but not exceeding 15,000kg	27,550	3%
100630	Cereals: rice, semi-milled or wholly milled, whether or not polished or glazed	21,885	3%
252329	Cement: portland, other than white, whether or not artificially coloured	19,147	2%
020714	Meat and edible offal: of fowls of the species Gallus domesticus, cuts and offal, frozen	11,058	1%
870421	Vehicles: compression-ignition internal combustion piston engine (diesel or semi-diesel), for transport of goods, (of a gvw not exceeding 5 tonnes)	10,805	1%
170199	Sucrose, chemically pure, in solid form, not containing added flavouring or colouring matter	10,714	1%
721420	Iron or non-alloy steel bars and rods, hot-rolled, hot-drawn or hot-extruded, containing deformations produced during the rolling process or twisted after rolling	9,873	1%
030343	Fish: frozen, skipjack or stripe-bellied bonito, excluding fillets, fish meat of 0304, and edible fish offal	9,621	1%
220300	Beer: made from malt	9,526	1%
	Top ten products	188,800	23%
	Rest	643,554	77%
	Total	832,353	100%

Source: own elaboration based on Gaulier & Zignago (2010)

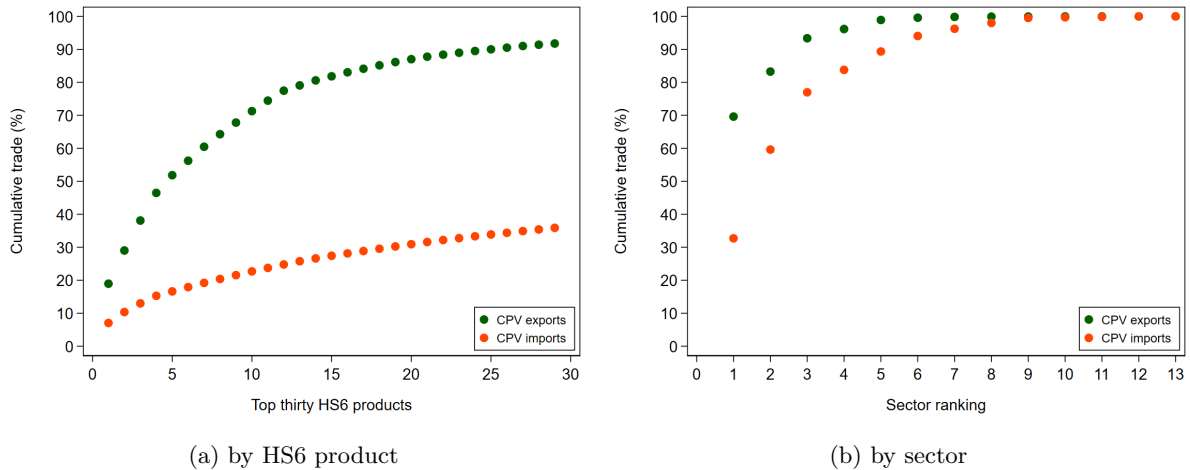


Figure 3: Cape Verde bilateral trade with the rest of the world at HS6 product and by sector (cumulative trade share).^{ab}

^aSource: Gaulier and Zignago (2010).

^bNote: number of HS6 products (x-axis) whose cumulative trade is equal to the proportion presented on the y-axis. On panel (a), the top three green markers correspond to subheadings “Tunas, skipjack, and Atlantic bonito, prepared or preserved” (HS 160414), “Mackerel, prepared or preserved” (HS 160415), and “Skipjack or stripebellied bonito, frozen” (HS 030343). The top three orange markers correspond to subheadings “Petroleum oils and oils from bituminous minerals” (HS 271000), “Airplanes of an unladen weight between 2,000 and 15,000 kg” (HS 880230), and “Rice, semi-milled or wholly milled” (HS 100630). On the panel (b), the top three green markers correspond to sectors “Food and beverages”, “Other manufacturing industries” and “Textiles and footwear”. The top three orange markers correspond to “Other manufacturing industries”, “Food and beverages” and “Manufacture of chemical products”.

In this sense, 71% (US\$ 77 million) of exports to the rest of the world is reduced to ten products detailed at the subheading level (Figure 3a), and eight of them are maritime products (Table 3) belonging to the chapters of the HS “Preparations of Meat, Fish or Crustaceans, Molluscs, and Other Aquatic Invertebrates” (ch. 16) and “Fish and Crustaceans, Molluscs, and Other Aquatic Invertebrates” (ch. 03). The specialization in food products of maritime origin can also be seen in (Figure 3b), where 70% of shipments to the rest of the world are represented by the Food and beverage industries sector.

Likewise, imports show a lower concentration than exports. Thus, the top 30 imported products help to explain only 30% of Cape Verde’s imports from the rest of the world (Figure 3a). Among them, the most prominent subheading is Petroleum oils and oils of bituminous minerals (HS 271000), whose share is 7% (US\$ 59 million) over total imports. Followed by Aeroplanes of an unladen weight between 2,000 and 15,000 kg. (HS 880230), which accounts for 3% (US\$28 million) of Cape Verde’s imports in 2017 (Table 4). In sector terms, however, more than 80% of imports originating in the rest of the world are explained by only four sectors: Other manufacturing industries, Food and beverages, Manufacture of chemical products, and Metal industries

(Figure 3b).

Regarding the tariff structure in this bilateral relationship, the tariffs applied by Cape Verde to the rest of the world follow a cumulative frequency distribution identical to that of the tariffs applied to the rest of ECOWAS (Figure 2 - green line). On the other hand, the tariffs applied by the rest of the world to Cape Verde, despite always being positive, do not exceed the 15% rate in 95% of the cases. While, for the remaining 5% of HS6 lines, the rates applied range between 15% and 80% (Figure 2 - purple line).

2.3 Sensitive products selection for Cape Verde

To identify sensitive products for Cape Verde in the framework of the application of ECOWAS TLS and ECOWAS CET, a selection criterion based on both trade data (BACI) and trade protection data (MacMap-HS6) was taken into account. Furthermore, the creation of this list required a detailed and exhaustive analysis of both bilateral relationships individually (CPV-RDE and CPV-RDM), to obtain a consolidated list of detailed products at the subheading level.

For the identification of sensitive products in the trade relationship with the rest of ECOWAS, all those products whose import value was above US\$ 10 thousand (2017), with an applied tariff equal to or higher than 14% (2016) were considered. In addition, subheadings HS 271000, HS 440729, and HS 271113 were incorporated despite not meeting the aforementioned criteria. These last subheadings, although facing low applied tariffs, are of great relative importance in imports from RDE (62%, 5%, and 4%, respectively).

As far as exports are concerned, all products above the threshold of US\$ 40 thousand (2017) exported with applied tariffs higher than 1% (2016) are considered sensitive. In general, the tariffs applied by RDE to Cape Verde do not exceed 15%, which is why the selection criterion, in this case, was guided only by the relative share of each product over the total exported.

In total, imports of sensitive products from RDE explain 77% of the total imported by Cape Verde in 2017, while this same indicator amounts to 95% for exports.

As for sensitive products related to the trade relationship with the rest of the world, similar criteria to those mentioned above were adopted. Thus, all those goods whose imports exceed US\$ 1 million (2017), with tariffs above 12% (2016), are considered sensitive. Also, subheadings with lower applied tariffs but of significant relative importance over the total imported were included: HS 100590, HS 851762, HS 100630, HS 252329, HS 170199, HS 040120, HS 040221,

HS 271000. The final selection manages to explain 35% of imports from the rest of the world in 2017.

In turn, all those export products whose value is above US\$ 10 thousand (2017), with applied tariffs above 1% (2016), are also considered sensitive (or of particular export interest) in the relationship with the rest of the world. In this case, four subheadings belonging to HS Chapter 03 (Fish and Crustaceans, Mollusks, and Other Aquatic Invertebrates) and two subheadings belonging to HS Chapter 16 (Preparations of meat, of fish or crustaceans, mollusks, and other aquatic invertebrates) were added to the list, as these are products of export interest to Cape Verde given its productive structure. In total, export-interest products account for 55% of exports to the rest of the world in 2017.

It is important to mention that the consolidated list includes a total of 102 sensitive products (Tables A2 and A6 in Annex B). They represent 38% of Cape Verde's imports and 74% of its exports in 2017. Specifically, 76 products are import sensitive, while only 18 are of exporter interest and 8 of them are both sensitive to imports and exports.

This list will be used to zoom in on Cape Verde's trade impacts under the alternative simulation scenarios (EWFTA, EWFTA1, and EWCU). For this reason, the products belonging to the sensitive and export-interest lists will be incorporated into the CGE model in a disaggregated manner (at the 6-digit level from the HS).

3 Common External Tariffs in West African economies: literature review

To the best of our knowledge, there is a gap in the literature on the full incorporation of Cape Verde into the ECOWAS. Much of the available research concentrates on ex-post studies, both from a partial and a general equilibrium perspective, of the application of the ECOWAS common external tariff in countries where the policy is already effective, which is not the case in Cape Verde.

From a partial equilibrium perspective, Diop et al. (2015) study the impact of the adoption of the ECOWAS CET on Senegal's public finances. Specifically, different simulations are carried out to assess the impact on a set of macroeconomic variables of interest. On the one hand, they find a negative result on tax revenue associated with the fall in the collection of customs duties. However, this drop in revenue collection is more than offset by a positive effect on consumption

and value-added taxes, resulting in a positive effect of the adoption of the CET on Senegal's tax collection.

Kareem (2015), on the other hand, uses micro and macroeconomic data from Nigeria to explore the distributional effects of the adoption of the ECOWAS CET in this country. However, it is worth mentioning that the study is conducted from a microeconomic perspective, i.e., the effects on households as producers and consumers are assessed. Specifically, the author adopted a two-stage methodology where she first estimates the pass-through of CET adoption to domestic prices and then assesses the impact of this price variation on household welfare. However, this approach does not take into account the macroeconomic impact and the aggregate welfare of Nigerian society. The main results indicate an improvement in the welfare of Nigerian households as a result of the adoption of the ECOWAS CET, this improvement is explained by the reduction in domestic prices associated with a high pass-through from tariffs to domestic prices (the estimated fall in prices is larger for those states located near ports and borders since they face lower transportation costs).

Moreover, Nwafor, Adenikinju, Ogujiuba, et al. (2007) use a dynamic computed general equilibrium model to assess the impact of the ETLs in Nigeria, specifically seeking to understand the impact of import tariff reduction on poverty and income distribution. The simulations, which involved dynamic changes in Nigeria's import tariffs for 15 years, yielded negative results for rural and urban household income in the first year (short run), however, this negative effect is reversed by the second year and is sustained over time with the application of the ECOWAS tariff regime (long run). In any case, the literature still does not cover the macroeconomic aspects of the ECOWAS trade policy.

Following up on the microeconomic approach, Wonyra, Ametoglo, and Guo (2017) estimate welfare changes associated with the adoption of the ECOWAS CET in Togo from a gender perspective using non-parametric regressions. Among the main results, they highlight the reduction in the welfare of Togo's consumer households, which is accentuated by distance to port cities.

Finally, other studies focus on the evaluation of the adoption of the CET for other economic areas of the African continent. Such is the case of Bahta and Groenewald (2015), who calibrate a computed general equilibrium model to assess the micro and macroeconomic effects of the CET of the Southern African Customs Union on the economy of Lesotho. The main input of this study is a Social Accounting Matrix for Lesotho in the year 2000, which also constitutes the baseline scenario. For this purpose, the authors calculated an aggregate common external tariff

that arises as a weighted average of all tariffs (both within and outside the Customs Union) under the Common External Tariff regime. The weights used were the respective shares of SACU and non-SACU imports in total imports. On a net basis, the results of the simulations show negative welfare effects for Lesotho. In sectoral terms, the textile industry shows the greatest deterioration in its export quantities, while the pharmaceutical industry finds its domestic supply and demand prices exposed to large increases. In this sense, the authors argue that the adoption of CET can lead to negative net results in fragile economies such as Lesotho.

None of the above mentioned researches covers the dimensions proposed by this paper, i.e., a computed general equilibrium model where trade is modeled at the six-digit level, as well as the trade elasticities considered. It is also worth mentioning that the studies cited above perform ex-post analyses of the application of the ECOWAS CET in different African economies. However, this is not the case for Cape Verde. More specifically, Cape Verde's economic authorities have not yet carried out the necessary reforms for the adoption of the ECOWAS CET, which justifies the absence of ex-post studies on the economic effects of this type of policy. Moreover, despite the wide range of analysis in the literature on the macroeconomic impacts of regional integration, there is a gap in the literature regarding the ex-ante evaluation of the macroeconomic effects of both the adoption of ECOWAS CET and TLS in Cape Verde.

In this sense, this paper proposes an ex-ante analysis of the potential macroeconomic effects of the ECOWAS trade policy on Cape Verde's economy. It aims to contribute to the evident gap in the literature on this subject and also to the reduction of the institutional obstacles that function as an impediment to the regional integration process between Cape Verde and its ECOWAS partners.

4 A market access simulation approach for a small open economy

4.1 A Computable General Equilibrium Model to Cape Verde

The Computable General Equilibrium model used for this study is a single-country open economy (Cape Verde), multi-sector, multi-agent, multi-factor, and comparative statics model.

The novelty of this CGE model in comparison with other CGE models on the Cape Verde economy lies in the detailed modeling of bilateral trade (imports, exports, and tariff protection measures), at the subheading level of the Harmonized System (HS6). The detail at the product

level is very useful in a trade negotiation process, given that in the current international context, both the opportunities and the costs of an agreement depend on the detail of the products involved and the means of trade opening. This product-level modeling is inspired by Gouel et al. (2011) and Jean et al. (2014).

The CGE model is calibrated from Cape Verde's 2017 Social Accounting Matrix (SAM), which reaches a disaggregation of 28 productive sectors of goods and services (firms), has a representative private agent (households), the public agent (the government) and the rest of the world with which Cape Verde trades. In this particular model, Cape Verde's trade relationship with the world is split into two regional partners: the rest of ECOWAS (RDE) and the rest of the world outside ECOWAS (RDM).

In turn, the calibration of bilateral trade relations between Cape Verde and each regional partner (on the one hand, the rest of ECOWAS countries as a regional aggregate and, on the other hand, the rest of the world as another regional aggregate) is completed with bilateral import and export data from BACI, Gaulier and Zignago (2010) and their respective applied tariffs and ad-valorem equivalents of tariff quotas from MAcMaps-HS6 Guimbard et al. (2012) at the product level (HS6 of 2012). Additionally, a correspondence matrix between the 28 SAM sectors and each HS6 subheading (rev. 2012) of the trade and trade protection databases was elaborated for a suitable calibration of the parameters (proportions) of the bilateral trade and bilateral trade policy equations of the model.

The model has been developed in the GAMS (General Algebraic Modeling System) environment.

4.1.1 CGE model assumptions

The CGE model comprises the following dimensions:

- multi-sectoral;
- multi-product at HS6 level for trade relationships;
- multi-agent: firms, households, government, and rest of the world disaggregated by trading partners of interest (rest of ECOWAS and rest of the world);
- multi-factor: capital and labor;
- single-country: details the complete economy of a single country (macroeconomy, sectors, agents, and international trade);

- comparative statics: this allows for the evaluation of scenarios compared to the baseline situation, which does not consider long-term projections or progressive reductions over time within the framework of a trade agreement.

On the side of the productive sectors, the production of each sector has technologies that combine intermediate input consumption and value-added in fixed proportions (Leontief function). In turn, the sectoral value-added function combines the use of two factors (labor and capital) according to a CES function with an ad-hoc elasticity of substitution of 0.5 which denotes factor complementarity for all sectors equally. There is no specificity of these factors to productive sectors, and they are all mobile across sectors. The supply of productive factors is fixed and is considered fully employed. Consequently, any change in prices of goods (e.g. tariffs) produced by the sectors will generate a reallocation of factors between sectors. All sectors have constant returns to scale, so if the factor use doubles, total output will adjust by the same amount.

The change in the composition of the supply of goods in each sector is explained according to the behavior of a constant elasticity of transformation (CET) function. Each sector produces goods for both the domestic and foreign markets according to a nested CET function. The export supply is disaggregated by good according to the sectoral disaggregation of the SAM, which is associated with detailed products at the subheading level of the Harmonized System of Trade Classification.

The modeled economy is considered small concerning its relative weight in international markets compared to the rest of the world. For this reason, it is an international price taker, and therefore, in the face of changes in the trade policy of the rest of the world, international prices will change, impacting the supply decisions (although also the demand decisions) of this small economy.

On the demand side, it is also composed of nested constant elasticity of substitution (CES) demand functions. The demand for each product comprises different uses: domestic final uses (representative household and government), intermediate (firms in the same sector or other sectors), investment, and export. After allocating a fixed proportion of income to savings, agents spend on goods and services. Assuming that the share of each sector in total expenditure remains constant in value, the cross-sector nesting behaves like a Cobb-Douglas function, except for the demand for intermediate inputs by each domestic sector which has fixed coefficients (Leontief function). At the next level of the demand tree, the relationship between domestic and imported goods is given by a CES function. The import demand of each sector is composed of several HS6 products, among which the relationship is also a CES function. Finally, each

HS6 product also corresponds to another CES-type function for the substitution between equal products of different origins. The elasticities considered for each level of this nested demand function are related to each other by a 4/5 factor and will be initially taken from the CGE model implemented by Ramos and Depetris Chauvin (2019). These trade elasticities at the product level are within the parameters estimated by the literature in general for small and open economies, as is the case of Jean et al. (2014) in Chile, Romalis (2007) in Mexico and also those proposed by Fontagné, Guimbard, and Orefice (2019) who estimate the trade elasticities by exploiting the variability in bilateral tariffs for each product category and for all available country pairs. Finally, the elasticities considered for this paper are also in line with the long-run elasticities obtained by Boehm, Levchenko, and Pandalai-Nayar (2020), who use a novel empirical strategy to address potential problems such as reverse causality and omitted variable bias.

Following Fontagné, Gourdon, Jean, et al. (2013) and Jean et al. (2014), Figure 4 schematizes the demand tree composed of nested CES functions as explained in the previous paragraph. YD_i corresponds to the total demand for good i , which is made up of domestic demand and import demand. The elasticity of substitution between domestic and imported goods corresponds to σ_{i2} which is constant according to the functional form we are considering. Formally speaking, equation 1 is the domestic demand for good i , while equation 2 accounts for the import demand of good i :

$$YDD_i = \left(YD_i acex_i^{\frac{\rho_{cex_i}}{1-\rho_{cex_i}}} \left(\frac{PD_i}{P_i \delta_{ex_i}} \right)^{\frac{1}{\rho_{cex_i}-1}} \right) \quad (1)$$

Where YD_i is the total demand for good i ; $acex_i$ is an Armington CES constant parameter belonging to the first level of the CES demand tree; ρ_{cex_i} is an Armington CES substitution parameter also belonging to the first level of the CES demand tree. For its part, PD_i is the domestic price for good i while P_i represents the price index and δ_{ex_i} is an Armington CES share parameter.

$$M_i = \frac{XC_i}{ac_i} \left(ac_i PC_i \frac{1 - \delta_i}{PM_i} \right)^{\frac{1}{1+\rho_c}} \quad (2)$$

In this case, XC_i accounts for total domestic consumption of good i weighted by the inverse of ac_i , which is an Armington CES constant parameter at the first level of the CES demand tree. Also, PC_i is the index of total consumer prices in the domestic market net of taxes, while δ_i is an Armington CES constant parameter; PM_i is the price of domestic imports of good i and ρ_c

is an Armington CES substitution parameter at the first level of the CES demand tree.

As shown Figure 4, for each aggregate good i , the import demand is composed of several HS6 products (the ihs) associated with good i which are substituted with an elasticity of σ_{i1} , giving rise to import demand at the six-digit level, which is the highest level of disaggregation and one of the main contributions of the model. These import functions are modeled as follows:

$$MD_{ihs} = \frac{M_i}{acd_i} \left(acd_i PM_i * \frac{\delta d_{i,ihs}}{PMD_{ihs}} \right)^{\frac{1}{1+\rho_{cdi}}}, \forall ihs \in i \quad (3)$$

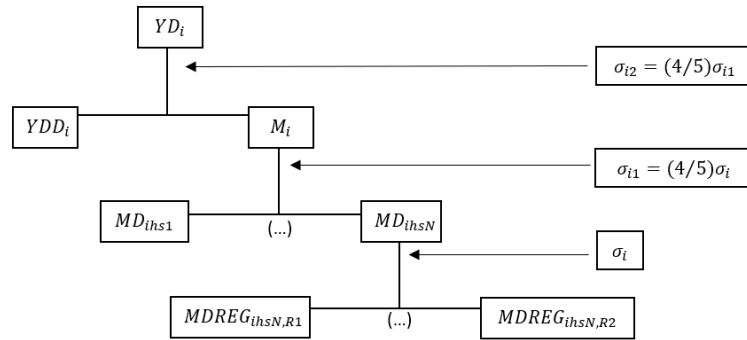
Where M_i are imports of good i as defined by equation (1), acd_i is an Armington CES constant parameter at the second level of the CES demand tree, $\delta d_{i,ihs}$ is an Armington CES share parameter, PMD_{ihs} is the import price for each ihs product and ρ_{cdi} is an Armington CES substitution parameter.

Finally, the last branch of the tree represents imports at the ihs level by regional origin¹, as shown by equation 4:

$$MD_{reg_{ihs,reg}} = \frac{MD_{ihs}}{acd_{reg_{ihs}}} \left(acd_{reg_{ihs}} PMD_{ihs} \frac{\delta d_{reg_{ihs,reg}}}{PMD_{reg_{ihs,reg}}} \right)^{\frac{1}{1+\rho_{cdreg_{ihs}}}} \quad (4)$$

Where MD_{ihs} is the imports demand of each ihs , PMD_{ihs} is the import price by ihs product, and $PMD_{reg_{ihs}}$ is the import price by ihs and region of origin. For their part, acd_{reg} is an Armington CES constant parameter, δd_{reg} is an Armington CES share parameter and ρ_{cdreg} is a substitution CES parameter, the three of them at the third level of the CES demand tree.

Figure 4: Nested CES demand scheme.



Source: own elaboration based on Fontagné et al. (2013) and Jean et al. (2014).

¹In this particular case, imports at the ihs level will be disaggregated according to the only two regions of interest, i.e., rest of Ecowas and rest of the world.

Foreign demand for Cape Verde's exports in each sector has a constant direct price elasticity. The composition of this demand at the subheading level, and then by destination, follows the same nested scheme described above for domestic demand. The export substitution elasticities will also be identical to those implemented by Ramos and Depetris Chauvin (2019) and are within the parameters set by the international trade literature (Romalis (2007), Jean et al. (2014), Fontagné et al. (2019) and Boehm et al. (2020)). All the equations belonging to the scheme that determines the demand for exports from Cape Verde can be found in the appendix of the paper, here we will concentrate only on the demand for exports at both the ihs and $ihs - region$ levels, being the main novelty of the model. Exports at ihs level are modeled according to the following equation:

$$ED_{ihs} = E_i * acexd_i^{\frac{\rho_{cexd_i}}{1-\rho_{cexd_i}}} * \left(\frac{PED_{ihs}}{PE_i * \delta_{exd(i,ihs)}} \right)^{\frac{1}{\rho_{cexd_i}-1}}, \forall ihs \in i \quad (5)$$

In equation (5), E_i represents total exports of good i , PED_{ihs} corresponds to product ihs export price and PE_i is product i export price. Regarding parameters, $acexd_i$ is an Armington CET constant parameter, $\delta_{exd(i,ihs)}$ is an Armington share parameter and ρ_{cexd_i} is a substitution Armington parameter, all of them at the second level of the CET supply tree.

Demand for exports at ihs level and by region of destiny are modeled as follows:

$$ED_{reg_{ihs,reg}} = ED_{ihs} * acexd_{reg_{ihs}}^{\frac{\rho_{cexd_{reg_{ihs}}}}{1-\rho_{cexd_{reg_{ihs}}}}} * \gamma \quad \forall ihs \in i \quad (6)$$

With $\gamma = \left(\frac{COMPWED_{regEXO_{ihs,reg}}}{EXCHG} * (1 + TTARDCHLEXO_{ihs,reg}) * \frac{PD_i}{PED_{ihs} * \delta_{exd_{reg_{ihs,reg}}}} \right)^{\frac{1}{\rho_{cexd_{reg_{ihs}}}-1}} * ED_{ihs}$ is for exports demand for each ihs and $acexd_{reg_{ihs}}$ and $\rho_{cexd_{reg_{ihs}}}$ are constant and substitution Armington CET parameters at the third level of the CET tree.

The rest of the world as a region is considered as a whole, given the characteristics of the negotiations. Only the rest of ECOWAS is disaggregated as a bilateral relationship of interest, this being one of the main focuses of interest of the study.

Consumption, production, factor, and household income taxes, as well as Cape Verde's import tariffs, have been appropriately introduced into the model, and correspond to the government's main revenue. Government outlays also include transfers to agents (e.g., social transfers from government to households, government borrowing from the rest of the world, and the domestic private sector).

As for the closures of the model, which determine its equilibrium, it is assumed that:

- the supply of factors of production is fully occupied;
- goods and services markets are emptied according to competitive behavior, where firms are price takers and perceive zero profits;
- households consume goods and services and save according to their factorial incomes;
- the government consumes goods and services, saves, and makes transfers to domestic agents (social transfers) and external agents (interest payments on debt) according to its factor and tax revenues from sales, factor, household, and international trade taxes;
- investment is determined by savings (domestic and current account deficit);
- the real exchange rate adjusts (appreciates or depreciates) to keep the current account balance constant (default closure).

The formal definition of equilibrium proposed in this paper is inspired by the one proposed by Jean et al. (2014), which takes equation (7) as a starting point.

$$F(\sigma, \theta, x, y) = 0 \quad (7)$$

Equation (7) defines the base situation of the model and all its arguments are vectors. The vector x includes all the exogenous variables of the model, which are described in section A.2 of the appendix and, in general, are policy variables, such as the tariffs applied by Cape Verde to its trading partners. The vector y incorporates all the endogenous variables described in section A.3 of the appendix. Both x and y contain known information from the SAM and trade and protection data. The σ and θ vectors contain only parameters. While those included in σ are known behavioral parameters incorporated into the model from external information sources, those included in θ contain information related to both agents' preferences and production technology and are unknown. Equation (7) is considered the initial equilibrium of the model, from which the calibration process is executed and the unknown parameters of the θ vector are estimated.

$$\hat{\theta}_0 : F(\sigma, \hat{\theta}_0, x_0, y_0) = 0 \quad (8)$$

The simulation scenarios imply a trade policy shock that in both cases modify the exogenous variable $TTARDREGEXO_{ihs,reg}$ which accounts for tariff rates applied by Cape Verde over

imports both from RDE and RDM. These trade policy shocks will be reflected in the change between x_0 and x_1 , giving rise to a new static equilibrium defined by:

$$\hat{y}_1 : F(\sigma, \hat{\theta}_0, x_1, \hat{y}_1) = 0 \quad (9)$$

where \hat{y}_1 represents the response of the endogenous variables of the model to the trade policy shock.

4.1.2 Cape Verde 2017 Social Accounting Matrix

For the calibration of the CGE model, a Social Accounting Matrix for Cape Verde in 2017 (INE, 2021) was used. This matrix was elaborated by the National Institute of Statistics of Cape Verde (INE), using as sources of information the Resources and Employment Table (TRE) and the Institutional Sectors Accounts (CSI) which include, on the one hand, the Who to Who matrix and, on the other hand, the Table of Integrated Economic Accounts (TCEI), being all data corresponding to the year 2017. The micro-SAM proposed by the INE has a disaggregation in 75 products of the National Accounts of Cape Verde which, in turn, belong to 45 sectors, according to revision 1 of the Classification of Economic Activities (CAE).

The calibration of the present CGE model requires as input a squared SAM, for this reason, a re-categorization of goods and sectors is proposed using as input the original SAM and keeping the original sectoral shares of intermediate consumption, final consumption, supply, taxes, etc., to disaggregate the macroeconomic data. In this sense, the micro-SAM used for model calibration and scenarios simulation has a disaggregation of 28 goods and sectors (See Table A7 in Annex C). After the definition of these new categories, the data treatment process was finalized with a rebalancing of the final micro-SAM through a cross-entropy process programmed in GAMS.

A summary of the macroeconomic values of the SAM used is presented in Table 5.

The detailed SAM comprises 28 sectors and goods, 2 productive factors (both fully employed), a representative household of the private domestic agent, the general government as the public agent, and the rest of the world. It is worth remembering that the productive sectors do not produce a single good, but are multi-product.

Table 5: Macro Social Accounting Matrix for Cape Verde, 2017, Mill. Escudos

	AA	CC	L	K	H	G	I	S	RM	Total
AA		320,805,070								320,805,070
CC	171,651,332				112,947,047	31,146,452	66,146,348		79,491,197	461,382,375
L	61,879,323								1,897,846	63,777,169
K	85,951,744									85,951,744
H			62,526,654	81,108,348	19,142,861	10,892,406			28,801,108	202,471,377
G	1,322,671	23,943,666		4,843,396	25,408,867	36,642,361			6,628,040	98,789,001
I								66,146,348		66,146,348
S					34,896,595	17,823,035			13,426,718	66,146,348
RM		116,633,639	1,250,515		10,076,007	2,284,747				130,244,909
Total	320,805,070	461,382,375	63,777,169	85,951,744	202,471,377	98,789,001	66,146,348	66,146,348	130,244,909	130,244,909

Source: own elaboration based on data from INE.

Note: The accounts in this matrix are: AA set of sectors; CC set of goods; K capital, L labor; H households; G government; I investment; S savings; RM rest of the world.

4.1.3 Trade and trade protection

To calibrate Cape Verde's bilateral trade relations (with the Rest of ECOWAS and the Rest of the World) at the detailed subheading level, it has been necessary to complete the SAM data with trade and trade protection information consistently.

The greatest level of detail of the SAM is at the level of 28 sectors and 28 goods, so it has been necessary to construct a correspondence matrix between the sectors/goods of the SAM and the HS6 products (2012 Rev.).

To process this additional information, needed for the calibration of the model at the product level, two mutually consistent databases prepared by the *Centre d'Etudes Prospectives et d'Information Internationales* (CEPII) were used.

The first of these databases is BACI (International Trade Database at the Product-Level) Gaulier and Zignago (2010), which provides data on trade flows in thousands of current dollars, volumes in tons, and unit values of bilateral exports and imports at the subheading level of the 2012 Harmonized Commodity Classification System (it also provides the information in both older and more recent revisions). For consistency with the 2017 SAM information in millions of escudos, we considered trade data for the same year. The 2017 trade shares in value (imports and exports) were calculated to disaggregate, at the subheading level and by trading partner, the values of imports and exports by sector/goods of Cape Verde with the world. In this way, we will be able to construct Cape Verde's bilateral trade values at the subheading level consistent with the 2017 SAM values in millions of escudos.

The second database used is MAcMap-HS6 (Guimbard et al., 2012), which provides tariff protection data. In particular, the tariffs applied by countries in 2016 in their bilateral relationship with their partners and at the subheading level of 2012 (same revision as for trade data). In this case, Cape Verde's applied tariffs were considered as well as the tariffs applied by the rest of ECOWAS and the rest of the world on Cape Verde's exports at the subheading level. Both trading partners of interest are constituted as regional aggregates (ECOWAS countries excluding Cape Verde on the one hand, and countries of the rest of the world excluding ECOWAS, on the other). In this case, the applied tariffs on each HS6 product correspond to the weighted average of the tariffs of all the countries that make up the regional aggregate using the group of country reference (regional) weights scheme provided by MAcMap-HS6 (Guimbard et al., 2012).

This treatment of trade data and ad valorem applied tariffs at the subheading level (2012 rev.), consistent with Cape Verde's 2017 SAM sectors and goods, allowed the calibration of bilateral

trade equations for those sensitive products in Cape Verde. The list of detailed products at the HS6 level reaches 128 products, including the sectoral aggregates of those subheadings of minor relative interest. For those products that are not detailed at the subheading level in the model but that we do calibrate Cape Verde's bilateral trade relationship with each of its partners, we aggregate all the subheadings. Specifically, the aggregation was made at the level of each associated good according to the SAM information into a 'rest of good...' category with different codes, e.g., RDC01 for each subheading belonging to good C01 in the SAM.

Consequently, we will be able to have a calibrated model with 28 detailed SAM sectors -for which input-output, production, and demand relationships are fully modeled- and only a set of products detailed at the subheading level -for which trade and trade protection relationships are modeled following the work of Gouel et al. (2011), Jean et al. (2014) and Ramos (2017). Thus, each of the SAM sectors/goods was modeled as a tradable bundle made up of products detailed at the subheading level.

4.2 Description of simulation scenarios

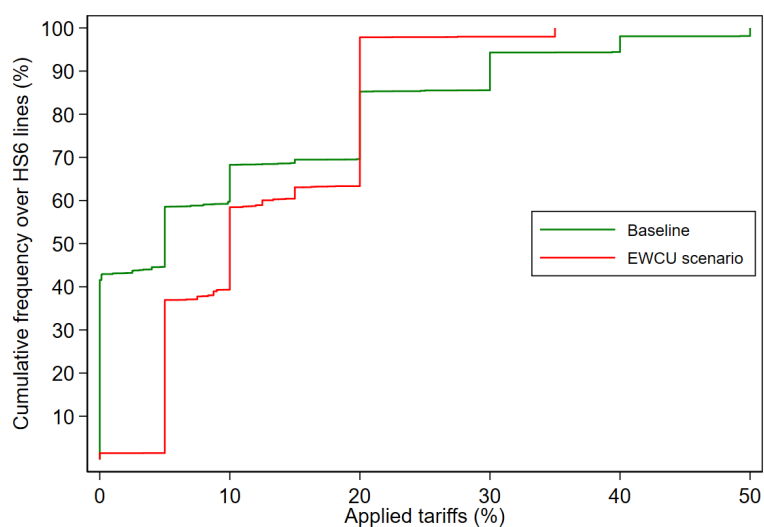
Three scenarios of the introduction of Cape Verde as a full member of ECOWAS are simulated: the first one (EWFTA) simulates the full adoption of the ETLS by Cape Verde. Then, an intermediate and more conservative version of the first scenario (EWFTA1) whose main purpose is to show the relative importance of the sensitive products. Specifically, this scenario consists of liberalizing trade only for those non-sensitive products in the trade relationship between Cape Verde and the rest of ECOWAS. Finally, the last scenario (EWCU) simulates a Customs Union in which the adoption of the CET by Cape Verde is added to the full implementation of the FTA.

The adoption of the ECOWAS Trade Liberalization Scheme (ETLS) implies full liberalization of trade between Cape Verde and the rest of the ECOWAS countries. In other words, 100% of the HS6 lines involved in the bilateral trade relationship between the two partners have their tariffs reduced to 0%.

For its part, the EWCU scenario implies taking a step further in terms of regional integration. In this sense, in addition to full trade liberalization, Cape Verde would adopt the ECOWAS common external tariff (CET), giving rise to a Customs Union.

The ECOWAS CET implies the adoption of five tariff bands (0%, 5%, 10%, 20%, and 35%). When the CET replaces the national tariff in Cape Verde, on the one hand, the maximum rate

Figure 5: Tariff structures in Cape Verde under baseline and EWCU scenario



Note: proportion of HS6 lines (on the y-axis) for which applied tariffs are inferior to the level presented on the x-axis.

Source: own elaboration based on MacMap-HS6 (Rev. 2012) and data from INE.

is lowered from 50% to 35%, and, on the other hand, the incidence of zero-duty applied MFN rates fall from 44% of the HS6 lines to 1.4% (Figure 5 - red line), according to data from the WTO (2015). So, the adoption of ECOWAS CET not only implies the reduction of certain tariffs but also the increase of other ones, depending on the specific case at the HS6 level.

Table A8 in annex D shows the detailed change in applied tariffs following the adoption of the CET for import-sensitive products, products of export interest, and RDCs.

5 Simulation results

To analyze the results of the simulated scenarios, it is important to start the analysis with the variables that are directly impacted by the shocks. In this particular case, the three scenarios imply changes in import tariffs, both on the side of Cape Verde and its ECOWAS partners. Such tariff changes will be made at the HS6 product level as detailed above in the description of the methodological approach. The magnitude of the tariff cuts will be 100% in the case of the FTA between Cape Verde and the rest of ECOWAS, whereas under the scenario of implementation of the ECOWAS CET by Cape Verde (the CU scenario) the tariff changes vary, upwards and downwards, depending on the tariffs currently applied by Cape Verde to the rest of the world, and those agreed in ECOWAS as CET (Table A8 - Annex D). Also, the intermediate scenario implies tariff cuts of 100% for all products excluding a set of fifty-two products that are sensitive

to imports in the trade relationship with the rest of ECOWAS.

After analyzing the trade consequences at the HS6 product and the good level of the SAM, we will analyze the impact at the sectoral production level, and finally, the macroeconomic variables of Cape Verde.

5.1 Trade impact

5.1.1 At the subheading level

Let us begin by analyzing the results of the EWFTA scenario on Cape Verde exports. Orange dots in the figure 6a show the contribution of each HS6 product (or rest of sector - RDC) to the total increase of Cape Verde's exports. This increase in Cape Verde's exports comes from the elimination of tariffs in the rest of ECOWAS countries. In this figure we can observe that Cape Verde's export increase is very concentrated in a few products: 70% of this increase is due to non-metallic mineral products (RDC09) exports. Even if this is an aggregate in the SAM it mainly refers to sulfites and sulfates of sodium which currently concentrates 45% of Cape Verde's exports to the ECOWAS (Table 1). An additional 20% increase in Cape Verde's exports is from flour and pellets of fish and crustaceans (HS 230120), and a supplementary 5% increase is explained by ships and boats for tourism excursions (HS 890110).

On the other hand, the change in Cape Verde's total imports is more diversified in terms of HS products (Figure 6b). Almost 25% of imports increase in Cape Verde are due to petroleum oil & oils from bituminous minerals, not crude (HS 271000) and a 20% additional increase is contributed to imported cigarettes with tobacco (HS 240220). Imported cell phones (HS 851712) and frozen tuna (HS 030349) jointly add a 15% increase in Cape Verde's imports. The latter, as part of the fishing sector, appears as a sensitive product to Cape Verde. Other manufacturing goods (RCD12) and textiles and clothing (RDC6) also contribute to explaining a 10% of Cape Verde's imports increase.

The blue dots of the same figure (6a) lead to a similar analysis for the intermediate scenario (EWFTA1). In this case, almost the total variation in exports is explained by a 97% increase in exports of non-metallic mineral products (RDC09). For its part, the change in imports (6b) is explained mostly by purchases of Other manufacturing goods (RDC12), with a cumulative contribution of 46%. Also, textiles and clothing (RDC06) contribute an additional 34% to total import changes. The remaining 20% is mainly explained by changes in imports of Wood (RDC07), Chemical products (RDC08) and Fishing and aquaculture products (RDC02).

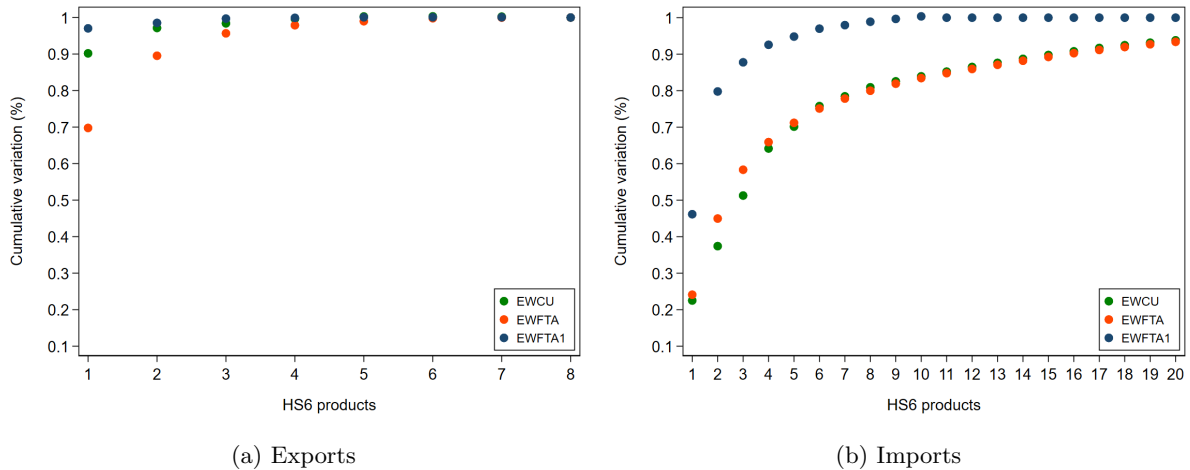


Figure 6: Contribution of the main HS6 products to changes in Cape Verde exports and imports under each simulation scenario. ^{ab}

^aSource: own elaboration based on simulation results.

^bNote: panel (a) shows the contribution of the top eight HS6 products whose cumulative contribution to the total variation in exports is equal to that presented on the y-axis. Panel (b) shows the contribution of the top twenty HS6 products whose cumulative contribution to the total variation in imports is equal to that presented on the y-axis.

Finally, we are going to analyze the results of the EWCU scenario (green dots in figures 6a and 6b), where not only the reduction of the intra-ECOWAS tariffs are playing but also the implementation of the ECOWAS-CET by Cape Verde vis-à-vis the rest of the world outside the ECOWAS. In this particular scenario, the products whose exports increase are concentrated in the first exported item (RCD09) which explains the 90% of this exports' increase and which refers to non-metallic minerals (mainly derivatives of sodium), which is a similar result of that observed under the EWFTA1 scenario. An additional 10% increase is due to exports of ships and boats for tourism excursions (HS 890110), worn clothing (HS 630900), textiles and clothing (RDC06), and other manufacturing goods (RDC12), whose contribution to exports is minor. In terms of Cape Verde imports under the EWCU scenario, are again more diversified than exports at the product level. The fifth first imported products in the ranking to total imports' contribution are the same as under the EWFTA scenario. However, within their ranking the order changes, except for the first one that continues to be the petroleum oil and oils non-crude (HS 271000), which explains more than 20% of Cape Verde imports increase under this scenario. Regarding imports of petroleum oils and oils from bituminous minerals, under the EWCU scenario, we can identify both an increase in imports and its applied tariff (from 6% to 8%) (Table 7). Although this result may seem counterintuitive, an explanation can be found that this subheading belongs to fossil fuels, which is an intermediate input for some of the domestic pro-

ductive sectors. So, even if the tariff rises, demand will grow with the level of activity of other sectors of the local economy.

On the other hand, imports of cigarettes containing tobacco also rise despite having a higher applied tariff. However, this increase in imports is a result that comes from the full liberalization of trade with the rest of ECOWAS and that remains valid even with the adoption of a higher tariff.

Table 6: Tariff change of export subheadings with the greatest variation in trade under the EWCU scenario

HS6 code	Applied tariff	CET	Var. (%)
RDC09	10%	14%	38%
890110	5%	10%	100%
630900	5%	5%	0%
RDC12	10%	20%	100%
RDC06	23%	17%	-28%
851712	5%	10%	84%
RDC04	14%	17%	26%
230120	7%	10%	40%

Source: own elaboration based on MacMap-HS6 and data from INE

Table 7: Tariff change of import subheadings with the greatest variation in trade under the EWCU scenario

HS6 code	Applied tariff	CET	Var. (%)
271000	6%	8%	41%
851712	25%	20%	-20%
240220	7%	10%	40%
RDC12	20%	15%	-25%
030349	5%	10%	84%
RDC06	23%	17%	-28%
440729	5%	0%	-100%
330499	5%	10%	100%
640411	30%	15%	-50%

Source: own elaboration based on MacMap-HS6 and data from INE

5.1.2 Good level

Any impact on tariffs at the HS6 level generates changes in relative prices between goods because each HS6 product corresponds to one of the 28 goods in the SAM. From a technical point of view, this is due to the nesting of CES functions as we showed above in Figure 4.

Table 8 presents the changes in Cape Verde's exports to the rest of ECOWAS by good as percentage changes from the 2017 baseline. Comparing the results under each scenario, we can see that the EWFTA increases exports in the four goods on which Cape Verde traditionally exports to the continent: food and beverages (2.8%); textile and footwear (5.8%); non-metallic minerals (5.2%) and other manufacturing products (2.9%). This result is consistent with the

results presented at the HS6 level, always very concentrated on a few products. Regarding the intermediate scenario, the more conservative strategy leads to almost null changes in exports of both Food and beverages and Other manufacturing industries compared to the baseline scenario; while exports of non-metallic minerals increase in a similar proportion than under the EWFTA scenario (5.1%). Finally, under the EWCU scenario, results differ since exports for food and beverage from Cape Verde to the rest of ECOWAS fall (-0.1%), which is a sensitive result since they represent 30% of total exports to this region in the baseline situation. This result introduces a reflection on the implementation of the ECOWAS CET on food and beverages in the sense that RDE partners now prefer imports from other destinies rather than for Cape Verde. Thus, Cape Verdean providers are replaced by more competitive ones from the rest of the world. Nevertheless, exports to this region increase mainly guided by non-metallic minerals (12.4%) which are the most important good aggregate exported to the continent (57% of total exports to ECOWAS).

Table 8: Exports to the rest of ECOWAS by sector (% change compared to the reference baseline)

	Level 2017 (% of total exports to RDE)	EWFTA	EWFTA1	EWCU
C04 - Food and beverages	30%	2.8%	0.0%	-0.1%
C06 - Textiles and footwear	2%	5.8%	1.8%	6.1%
C09 - Non-metallic minerals	57%	5.2%	5.1%	12.4%
C12 - Other manufacturing industries	10%	2.9%	0.3%	6.4%

Source: own elaboration.

Table 9: Imports from the rest of ECOWAS by sector (% change compared to the reference baseline)

	Level 2017 (% of total Imports from RDE)	EWFTA	EWFTA1	EWCU
C01 - Agriculture and livestock	0%	8.0%	7.6%	11.0%
C02 - Fishing and aquaculture	0%	57.2%	56.7%	57.0%
C04 - Food and beverages	4%	49.2%	1.1%	37.2%
C05 - Tobacco industry	11%	34.9%	0.0%	22.3%
C06 - Textiles and footwear	4%	41.2%	19.9%	48.8%
C07 - Wood industry	5%	16.6%	3.6%	20.4%
C08 - Manufacture of chemical products	57%	10.3%	0.2%	8.9%
C09 - Non-metallic minerals	0%	45.3%	45.2%	63.3%
C10 - Metals industries	0%	9.2%	5.1%	24.7%
C11 - Furniture and mattresses	0%	158.2%	157.9%	97.7%
C12 - Other manufacturing industries	19%	21.2%	5.2%	29.1%
C26 - Artistic, performing, sporting and recreational activities	0%	0.2%	0.0%	17.2%

Source: own elaboration.

Concerning Cape Verde's imports from the rest of ECOWAS, each scenario leads to increases in many products/sectors. Nevertheless, comparing the EWFTA and EWCU results in Table

9 we can see that the implementation of the ECOWAS CET by Cape Verde leads to a lower percentage increase of some imports coming from the rest of ECOWAS. Even more, if we focus on the intermediate scenario, these results are more attenuated by keeping the trade protection over the sensitive products. This is the case for imports of food & beverages, whose increase slightly exceeds 1% under the EWFTA1 scenario, while under EWFTA and EWCU scenarios such increases are 49.2% and 37.2%, respectively. For its part, imports of products from the tobacco industry, chemicals, furniture wood products follow a similar pattern to that mentioned above i.e. marked improvements under the EWFTA scenario, which attenuates under EWCU and even more under EWFTA1. For the rest of the goods, Cape Verde- ECOWAS bilateral imports increase under the EWCU scenario relative to EWFTA due to the change in the relative protection between products from ECOWAS and the rest of the world, favoring the former.

Among Cape Verde's exports of goods and services to the world, the three scenarios are favorable or even neutral (particularly EWFTA1) for those goods which are traditionally exported by this country, except foods and beverages (15% of total Cape Verde exports) which fall (-2.7%) under the EWCU scenario. Sectoral production under the EWFTA scenario follows the impact on exports, with slight reductions in sectors such as agriculture and livestock (-0.1%) which in 2017 represents 3.3% of the total value of production in Cape Verde. In other sectors such as the industry of tobacco, wood, and other manufacturing, the production also falls, although these are minor sectors in Cape Verde. Both exports and production remain mainly unchanged under the EWFTA1 scenario, being products of wood the most affected aggregate with a slight decrease of 0.1% both in exports and domestic production. However, greater negative impacts appear under the EWCU scenario, both in the same sectors in which exports decrease but also in Electricity (-13.9%), Transport (-1%), and Accommodations (-0.1%); on the other hand, a great positive impact is concentrated in activities related to leisure and recreation (Table 10).

Concerning total imports, the EWFTA lead to an increase diversified across all products. The greatest increase in Cape Verde imports in percentage change is due to tobacco products (13.7%); however, compared to initial imports and even analyzing the consumption share in 2017, its importance is relatively minor compared to food products, which only accounts for an increase of 0.3% but whose share over initial imports is around 20%. If the FTA is only limited to those products which are not sensitive to Cape Verde (EWFTA1), import increases are almost null for the great majority of goods, with the exception of fishing and aquaculture products (1.5%) and textiles and footwear (0.2%). However, it is worth mentioning that the suggested increase in

Table 10: Production and Exports by sector (% change compared to the reference baseline)

	Production				Exports			
	Level 2017 (% of total)	EWFTA	EWFTA1	EWCU	Level 2017 (% of total)	EWFTA	EWFTA1	EWCU
C01 - Agriculture and livestock	3.3%	-0.1%	0.0%	0.6%	0.0%	0.0%	0.0%	0.9%
C02 - Fishing and aquaculture	0.7%	0.1%	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%
C03 - Extractive industries	0.2%	0.0%	0.0%	0.4%	0.0%	0.1%	0.0%	0.7%
C04 - Food and beverages	7.8%	0.1%	0.0%	-2.9%	0.0%	0.1%	0.0%	-2.7%
C05 - Tobacco industry	0.2%	-2.9%	0.0%	-6.0%	0.0%	-2.8%	0.0%	-5.8%
C06 - Textiles and footwear	0.5%	0.2%	0.0%	0.5%	0.0%	0.3%	0.0%	0.6%
C07 - Wood industry	0.3%	-0.6%	-0.1%	0.0%	0.0%	-0.5%	-0.1%	0.3%
C09 - Non-metallic minerals	0.5%	0.2%	0.1%	-1.1%	0.0%	0.2%	0.1%	7.1%
C10 - Metals industries	0.7%	0.0%	0.0%	7.1%	0.0%	0.1%	0.0%	2.9%
C12 - Other manufacturing industries	1.0%	-0.1%	0.0%	2.7%	0.0%	0.0%	0.0%	3.4%
C13 - Electricity	3.5%	0.1%	0.0%	-13.9%	0.0%	0.2%	0.0%	0.5%
C14 - Water collection, treatment and distribution	1.3%	0.1%	0.0%	3.1%	0.0%	0.3%	0.0%	0.5%
C15 - Construction	14.4%	0.0%	0.0%	0.2%	0.0%	0.2%	0.0%	-0.7%
C16 - Wholesale and retail trade	6.0%	0.2%	0.0%	0.2%	0.0%	0.2%	0.0%	0.4%
C17 - Transport and auxiliary activities	13.0%	0.1%	0.0%	-1.0%	0.0%	0.2%	0.0%	0.1%
C19 - Communication and information technologies	4.2%	0.0%	0.0%	0.3%	0.0%	0.1%	0.0%	0.1%
C20 - Accommodation, rental and real estate activities, and tourism operators	13.4%	0.1%	0.0%	-0.1%	0.0%	0.2%	0.0%	0.4%
C21 - Restaurants and drinking establishments	5.7%	0.2%	0.0%	-0.3%	0.0%	0.3%	0.0%	2.0%
C22 - Business, professional, financial and insurance services	9.1%	0.0%	0.0%	-0.1%	0.0%	0.1%	0.0%	0.2%
C26 - Artistic, performing, sporting and recreational activities	0.4%	100.2%	0.0%	100.2%	0.0%	0.3%	0.0%	0.4%

Source: own elaboration.

Table 11: Consumption and Imports by sector (% change compared to the reference baseline)

	Consumption				Imports			
	Level 2017 (% of total)	EWFTA	EWFTA1	EWCU	Level 2017 (% of total)	EWFTA	EWFTA1	EWCU
C01 - Agriculture and livestock	7.4%	0.0%	0.0%	-0.4%	3.0%	0.4%	0.0%	-4.7%
C02 - Fishing and aquaculture	1.4%	0.1%	0.0%	0.1%	0.0%	1.8%	1.5%	-0.2%
C03 - Extractive industries	0.1%	0.0%	0.0%	0.1%	0.1%	0.4%	0.1%	-0.4%
C04 - Food and beverages	19.6%	0.3%	0.0%	4.1%	20.0%	0.3%	0.0%	5.3%
C05 - Tobacco industry	1.0%	6.2%	0.0%	13.3%	0.5%	13.7%	0.0%	30.2%
C06 - Textiles and footwear	3.9%	0.6%	0.2%	-3.7%	3.3%	0.5%	0.2%	-3.6%
C07 - Wood industry	-0.1%	0.6%	0.1%	-1.5%	1.4%	0.2%	0.0%	-2.1%
C08 - Manufacture of chemical products	0.0%	0.5%	0.0%	1.2%	19.0%	0.1%	0.0%	0.0%
C09 - Non-metallic minerals	0.4%	0.2%	0.0%	-5.9%	5.6%	0.1%	0.0%	-0.8%
C10 - Metals industries	-0.2%	0.2%	0.0%	-5.3%	5.5%	0.0%	0.0%	-1.6%
C11 - Furniture and mattresses	0.8%	0.2%	0.0%	13.2%	1.5%	0.1%	0.0%	12.5%
C12 - Other manufacturing industries	0.8%	0.4%	0.1%	-3.1%	24.6%	0.1%	0.0%	-1.1%
C13 - Electricity	2.5%	0.3%	0.0%	0.4%	0.0%	0.1%	0.0%	-7.8%
C14 - Water collection, treatment and distribution	1.2%	0.3%	0.0%	0.1%	0.0%	0.0%	0.0%	-0.3%
C15 - Construction	-1.2%	0.1%	0.0%	-1.3%	0.2%	0.2%	0.0%	0.5%
C16 - Wholesale and retail trade	2.7%	0.1%	0.0%	0.1%	0.0%	0.3%	0.0%	-0.7%
C17 - Transport and auxiliary activities	9.7%	0.2%	0.0%	-0.1%	2.9%	0.2%	0.0%	-0.5%
C19 - Communication and information technologies	25.3%	0.1%	0.0%	0.2%	1.9%	0.2%	0.0%	-0.5%
C20 - Accommodation, rental and real estate activities, and tourism operators	10.6%	0.2%	0.0%	1.5%	0.9%	0.3%	0.0%	-0.7%
C21 - Restaurants and drinking establishments	2.4%	0.1%	0.0%	-0.1%	1.7%	0.2%	0.0%	-1.5%
C22 - Business, professional, financial and insurance services	1.6%	0.1%	0.0%	-0.3%	7.9%	0.1%	0.0%	-0.4%
C26 - Artistic, performing, sporting and recreational activities	1.1%	100.2%	0.0%	99.4%	0.0%	0.2%	0.0%	-21.7%

Source: own elaboration.

imports of fishing and aquaculture products would not be significant, considering that its share of total imports is less than 0.5%. This result is mainly explained by the fact of keeping the currently applied import tariffs on those goods which are more representative (i.e have a higher share) of Cape Verde's total imports.

Finally, the implementation of the CET introduces strong changes in the tariff structure of Cape Verde intensifying the increase in imports of tobacco products, food and beverages and furniture. For the rest of the goods and services, Cape Verde imports fall under the CU scenario. Consumption also follows a similar pattern to that of import changes, particularly for those products and services which are the relatively most important in the 2017 consumption basket of Cape Verde (Table 11).

5.2 Sector impact

Regarding the impact on the value-added of Cape Verde's productive sectors, it is worth mentioning that the activities do not have a one-to-one correspondence with the goods of the SAM, but rather the activities are multi-product. Consequently, the impact on production and sectoral value-added will be the result of the changes generated at the level of the goods produced by each activity. To understand what happens at a sector level, it is worth keeping in mind the nested relationship between activities, goods, and HS6 products on the supply side (i.e., changes in relative tariffs at the HS6 level generate changes in relative prices at the HS6 level, which are transferred to goods in the SAM and then impact on the price of the activity that produces those goods).

Table 12 shows the variation in the value-added of each activity in Cape Verde for each simulated scenario. Under full trade liberalization between Cape Verde and the rest of ECOWAS (EWFTA scenario), no improvements exceeding 1% are observed in the value-added of the sectors. Among the most notable increases are restaurants and drinking establishments (A21) and activities of households employing domestic staff and household production activities for their own use (A26). On the other hand, a 2.7% decrease in the value-added of the tobacco industry is observed, which is consistent with an increase in consumption and imports of this industry's products and, at the same time, with a decline in domestic production under the same scenario. In any case, it is important to note that this sector only represents 0.3% of Cape Verde's total value added in 2017. It is also worth mentioning that the most representative sectors of Cape Verde's value-added in 2017, such as accommodation, rental, and real estate activities (A20); wholesale

Table 12: Value added by sector (% change compared to the reference baseline)

	Level 2017 (% of total)	EWFTA	EWFTA1	EWCU
A01 - Agriculture and livestock	7.3%	0.1%	0.0%	-0.1%
A02 - Fishing and aquaculture	0.8%	0.3%	0.0%	-0.7%
A03 - Extractive industries	0.4%	0.2%	0.0%	-0.2%
A04 - Food and beverages	4.0%	0.3%	0.0%	-4.5%
A05 - Tobacco industry	0.3%	-2.7%	0.0%	-6.6%
A06 - Textiles and footwear	0.3%	0.3%	0.0%	0.2%
A07 - Wood	0.4%	-0.4%	-0.1%	-0.4%
A08 - Chemical products	0.5%	-0.3%	0.0%	-3.0%
A09 - Non-metallic minerals	0.4%	0.3%	0.1%	7.1%
A10 - Metals industries	0.4%	0.1%	0.0%	2.5%
A11 - Furniture and mattresses	0.3%	0.1%	0.0%	-14.2%
A12 - Other manufacturing industries	0.4%	-0.1%	0.0%	5.7%
A13 - Electricity	2.4%	0.3%	0.0%	-0.3%
A14 - Water collection, treatment and distribution	0.4%	0.3%	0.0%	-0.2%
A15 - Construction	11.0%	0.2%	0.0%	-1.5%
A16 - Wholesale and retail trade	12.4%	0.4%	0.0%	-0.2%
A17 - Transport and auxiliary activities	11.1%	0.3%	0.0%	-0.6%
A18 - Storage	0.0%	0.2%	0.0%	-0.6%
A19 - Communication and information technologies	3.9%	0.2%	0.0%	-0.5%
A20 - Accommodation, rental and real estate activities, and tourism operators	13.7%	0.3%	0.0%	-0.3%
A21 - Restaurants and drinking establishments	1.3%	0.5%	0.0%	4.1%
A22 - Business, professional, financial and insurance services	7.8%	0.2%	0.0%	-0.6%
A23 - Public administration services	10.0%	-0.3%	0.0%	0.7%
A24 - Education	6.5%	-0.3%	0.0%	0.6%
A25 - Human health and social action	2.7%	-0.2%	0.0%	0.4%
A26 - Artistic, performing, sporting and recreational activities	0.2%	0.4%	0.0%	-0.2%
A27 - Other services	0.7%	0.2%	0.0%	-0.1%
A28 - Activities of households employing domestic staff and household production activities for their own use	0.5%	0.9%	0.1%	-3.5%

Source: own elaboration.

and retail trade (A16); transport and auxiliary activities (A17); and construction (A15) evidence slight improvements in sectoral value-added, although all below 0.4%.

Regarding the partial trade liberalization (EWFTA1 scenario), and in line with the very slight increases in domestic production, consumption, and exports, no remarkable results are observed on sectoral value-added. Only non-metallic industries (A09) and household production for their own use (A28) improve their sectoral value-added by 0.1%, while a decrease of 0.1% is observed in the sector of wood (A07).

Finally, with the adoption of the ECOWAS CET (EWCU scenario) marked improvements in value-added were observed in the non-metallic minerals (A09); other manufacturing industries (A12), and restaurant and drinking establishments (A21) sectors. Although none of them helps to explain a high share of the total 2017 value-added.

The decline in the food and beverages sector is noteworthy, considering that part of the goods that make up this sector are of export interest to Cape Verde. At the same time, the 4.5% decrease in its value-added is consistent with deteriorations in both domestic production and total exports.

For their part, under this same scenario, the sectors with the highest share over the 2017 level show declines in their value-added, being the construction sector (A15) and transport with its auxiliary activities (A18) the most affected, with decreases of 1.5% and 0.6%, respectively.

5.3 Macroeconomic impact

After having understood the trade effects at the HS6 level, at the good level, and the impact on the value-added of the productive sectors in Cape Verde, we will focus on the macroeconomic aggregates and analyze the performance of the three simulation alternatives (Table 13). All this analysis will help us to fully understand the sensitiveness of Cape Verde under each scenario, specifically based on the macroeconomic and welfare impacts of Cape Verde's adoption of the ECOWAS CET.

In terms of GDP, the variation against the baseline is positive for both full trade liberalization (0.15%) and partial trade liberalization (0.02%), but negative when moving towards the adoption of the CET (-0.42%). In other words, gains associated with free trade between Cape Verde and the rest of ECOWAS are somewhat offset by losses associated with the implementation of the CET vis-à-vis the rest of the world, which, for several products, implies an increase in trade protection (i.e., agro-food products such as rice, sugar cane, flour pellets of fish; other

intermediate goods such as portland cement, other tropical wood, petroleum oil products).

Table 13: Cape Verde - Macroeconomic variables (% change compared to the reference baseline)

	EWFTA	EWFTA1	EWCU
GDP (value)	0.15%	0.02%	-0.42%
Total exports	0.26%	0.03%	-0.35%
Total imports	-0.03%	0.00%	0.17%
Exports of goods	0.17%	0.03%	-1.83%
Exports of services	0.28%	0.03%	-0.01%
Imports of goods	-0.05%	-0.01%	0.31%
Imports of services	0.09%	0.01%	-0.61%
Exports to RDE	6.03%	4.23%	10.23%
Exports to RDM	0.26%	0.03%	-0.34%
Imports from RDE	8.92%	1.22%	8.41%
Imports from RDM	-0.24%	-0.03%	-0.02%
Consumption	0.02%	0.00%	-0.14%
Investment	-0.03%	0.00%	-0.03%
Welfare	0.24%	0.02%	1.03%
Terms of trade	0.34%	0.04%	-0.08%
Real Exchange Rate	-0.07%	-0.01%	-0.17%

Source: own elaboration

Under the EWFTA scenario, we can observe improvements in aggregate variables such as consumption, and also in Cape Verde's trade performance. The latter is reflected not only in an increase in exports but also in a reduction in imports.

In terms of exports, sales to the rest of ECOWAS improved (6%), mainly concentrated in non-metallic products and food and beverages. Regarding shipments to the rest of the world, they also increased (0.2%), and, in this case, goods such as food and beverages and services such as wholesale and retail trade and transport and auxiliary activities stand out.

Imports, on the other hand, show an increase of 8.9% in the bilateral relationship with the rest of ECOWAS, mainly guided by purchases of tobacco industry products, and also chemical products. However, the decrease in imports from the rest of the world makes total imports adjust downwards in the aggregate.

The EWFTA scenario intensifies the bilateral trade relation between Cape Verde and the rest of ECOWAS, also improving Cape Verde's terms of trade.

Although under the EWFTA1 scenario aggregate variables go in the same direction as in the aforementioned results, the magnitude of these changes is very slight compared to the EWFTA scenario. In the trade relationship with the rest of ECOWAS, exports show an increase of 4.23%, mainly explained by shipments of non-metallic minerals. However, considering that trade liberalization is only limited to those products which are not sensitive to Cape Verde, imports only rise 1.22%, especially concentrated in textiles and footwear and goods from other manufacturing industries. This result is due to keeping currently applied tariffs under a substantial share of

trade between Cape Verde and its ECOWAS partners, which operate as an obstacle against regional trade. If we also take into consideration trade with the rest of the world, total exports show a very smooth increase of 0.03%, while total imports remain mostly unchanged. These results lead to a positive, though almost imperceptible, improvement on terms of trade (0.04%). In this regard, it is of interest to focus on the comparison of both trade liberalization scenarios, i.e. EWFTA and EWFTA1. The more conservative results associated with partial trade liberalization with the rest of the ECOWAS members shed light on the importance of liberalizing trade in sensitive products for Cape Verde. If free trade were confined to only non-sensitive products, the gains in GDP, welfare and trade volume would be negligible for this economy (Table 13). Conversely, the intensification in trade volume associated with full trade integration with the rest of the countries in the region (resulting from full trade liberalization) is reflected in a 0.34% improvement in the terms of trade for Cape Verde, as well as better performances for GDP and aggregate welfare.

In the case of the EWCU scenario, the deterioration in the value of the GDP could be explained by declines in macroeconomic aggregates such as consumption (especially of those goods belonging to the agriculture and livestock and textiles and footwear aggregates) and investment. As for trade aggregates, there is a deterioration in total exports, which is complemented by an increase in imports, contributing to the worsening of the GDP. Specifically, the decline in exports is driven by a decrease in total exports of goods. Although exports to the rest of ECOWAS register a substantial improvement of 10.2%, this is not enough to offset the drop in shipments to the rest of the world (-0.34%).

It is worth remembering that, on many occasions, the adoption of ECOWAS CET by Cape Verde implies an increase in the trade protection of certain subheadings, discouraging trade outside the ECOWAS.

In terms of national welfare (equivalent variation), the three scenarios yield positive results for the Cape Verdean economy. The free trade agreement (EWFTA) implies a 0.34% improvement in the welfare of Cape Verdean society, a result that is amplified if we incorporate the adoption of the ECOWAS CET into this scenario, resulting in a 1% improvement in this measure of national welfare. Finally, the most conservative trade policy that defines the EWFTA1 scenario leads to a very small improvement in Cape Verde's welfare (0.02%).

The improvement in welfare under full trade liberalization scenarios runs in the opposite direction to the findings of Nwafor et al. (2007), who focus on the Nigerian economy and find that the

ETLS yields negative results for the welfare of Nigerian households. Regarding the application of the ECOWAS CET, Wonyra et al. (2017) estimate a reduction in Togo's welfare after its full incorporation to the Customs Union, a result that also opposes those found in this paper. Something similar happens if a comparison is made with the findings of Bahta and Groenewald (2015), who argue that the adoption of SACU CET in Lesotho led to losses in aggregate national welfare. However, it is important to note that the heterogeneity in the results can be attributed not only to the different methodological approaches of the aforementioned papers but also to the diverse production and consumption structures specific to each one of the economies that has been analyzed.

6 Concluding remarks

The current policy debate suggest that Cape Verde, as a member of the ECOWAS, should modify its tariff protection structure, vis-a-vis the rest of the ECOWAS by fully liberalizing bilateral trade with its partners, and also implementing the ECOWAS CET to the rest of the world outside the ECOWAS, which came into force on January 1, 2015. The main purpose of this thesis was to evaluate the impact of three alternative scenarios on the Cape Verdean economy: the ECOWAS FTA with a bilateral tariff elimination between Cape Verde and the rest of ECOWAS; the EWFTA1 scenario, which liberalizes bilateral trade between Cape Verde and its ECOWAS partners only for those products that are not sensitive in this relationship; and finally, the implementation of the ECOWAS CET that in the case of Cape Verde implies both an increase in the protection of some particular products (agro-food and intermediate goods) and a decrease in other ones.

For this objective, we have developed a CGE model where trade and protection are modeled at the HS6 product level to better simulate the change in the Cape Verde tariff protection scheme. The main results from the CGE model suggest that all scenarios lead to national welfare increases and intensify Cape Verde and the rest of ECOWAS trade relations. On the one hand, it is worth mentioning that although the intensity of these trade relationships seems moderate under partial trade liberalization, the fully implementation of ETLS would strengthen the exchanges with the rest of ECOWAS, improving not only its export status but also its GDP and terms of trade performance (total exports would increase more than proportionally to imports). However, on the other hand, the additional implementation of the CET deteriorates trade both for some

sectors and also with the ECOWAS partners. The implementation of the CET by Cape Verde implies greater protection over some agro-food products (rice, sugar cane, flour pellets from fish and crustaceans) and some intermediate goods (portland cement, petroleum oil products, some tropical woods) negatively impacting on sectoral value added and GDP. The CU scenario intensifies the concentration of exports (e.g., sulfites and sulfate of sodium), while imports (e.g., tobacco products) increase in fewer products compared to the FTA one.

ECOWAS CET application scheme does not propose a homogeneous tariff reduction across HS6 products, leading to changes in trade patterns that do not seem favorable in all cases to both local consumption (agro-food products) and production (intermediate goods). As a conclusion, the results of the ex-ante analysis developed in this study suggest that the full incorporation of Cape Verde in the ECOWAS should be carried out taken the aforementioned results in consideration, especially for those sectors where domestic production and consumption would be adversely affected.

We must make an additional remark regarding the external validity of both the results obtained and the general equilibrium model developed in this paper. The results are based on the changes in the baseline scenario resulting from a trade policy shock. The base scenario is programmed taking as input the social accounting matrix of Cape Verde, as well as trade and trade protection data for this country. For this reason, the results obtained could only be extended to small and open island economies that are net importers of a substantial part of the products they consume domestically and that, at the same time, are immersed in a regional integration process that implies changes in their tariff structure. In this sense, this paper falls short in terms of the possibility of extending its results to a large part of the world's countries. However, on the other hand, the general equilibrium model used in this paper could well be implemented as an analytical tool in the face of different trade policy shocks or international price changes affecting other economies. The only requirement for a successful implementation of this CGE is the construction of a social accounting matrix for the country of interest and the correct processing of trade and trade protection data for this country.

Finally, one of the main limitations of this paper lies in the structure of the BACI trade data. This database does not allow a correct distinction to be made between genuine exports, i.e., exports of domestically produced goods, and re-exports from Cape Verde. This, coupled with the selection criteria for sensitive products (based on trade volume and applied tariffs), could lead to the inclusion of products irrelevant to Cape Verde in the sensitive list. More specifically,

the inclusion of re-exports data could prevent to correctly identifying the domestic consumption and production structure in this small open economy. Thus, a potential solution could be addressed from two different approaches: (i) combining BACI with another trade database that allows to identify and set aside those trade flows belonging to re-exports; (ii) combining the actual selection criteria with a ranking to understand the relative importance of each HS6 product in the domestic consumption and production structure of Cape Verde; although for this last purpose a matching between national account consumption and production data and HS6 products would be needed.



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A Computed General Equilibrium Model for Cape Verde 2017

This section details the indexes, parameters and equations of the CGE model for Cape Verde.

A.1 Indexes

Table A1: Model sets

Indexes	Description	Elements
i	Goods	C1*C28
H_{is}	Products at HS6 level	[HS6List.gms]
j	Sectors/Activities	A1*A28
f	Factors	K, L
Reg	Trade partner	RDE, RDM

A.2 Parameters and exogenous variables

- $io_{i,j}$: input output coefficient
- $gamma_{i,j}$: multi product parameter
- a_j : value added CES constant parameter
- $\alpha_{f,j}$: value added CES share parameter
- rho_{v_j} : value added CES substitution parameter
- $denv_{a_j}$: value added CES temporary parameter
- $betahh_i$: final consumption parameter
- $betagov_i$: government final consumption parameter
- $betainv_i$: investment parameter

First level of the CES demand tree

- ac_i : armington CES constant parameter
- $delta_i$: armington CES share parameter
- rho_{oc_i} : armington CES substitution parameter
- $dences_i$: armington CES temporary parameter

- $numces_i$: armington CES temporary parameter

First level of the CET supply tree

- $acex_i$: armington CET constant parameter
- $deltaex_i$: armington CET share parameter
- $rhoce_x_i$: armington CET substitution parameter
- $dencesex_i$: armington CET temporary parameter
- $numcesex_i$: armington CET temporary parameter

Second level of the CES demand tree (relation between goods i and products ihs)

- acd_i : armington CES constant parameter
- $deltad_{I,ihs}$: armington CES share parameter
- $rhocd_i$: armington CES substitution parameter
- $dencesd_i$: armington CES temporary parameter
- $numcesd_i$: armington CES temporary parameter

Second level of the CET supply tree (relation between goods i and products ihs)

- $acexd_i$: armington CET constant parameter
- $deltaexd_{I,ihs}$: armington CET share parameter
- $rhocexd_i$: armington CET substitution parameter
- $dencesexd_i$: armington CET temporary parameter
- $numcesexd_i$: armington CET temporary parameter

Third level of the CES demand tree (relation between products ihs and its reg origin)

- $acdreg_{ihs}$: armington CES constant parameter
- $deltadreg_{ihs,reg}$: armington CES share parameter
- $rhocdreg_{ihs}$: armington CES substitution parameter

- $dencesdreg_{ihs}$: armington CES temporary parameter
- $numcesdreg_{ihs}$: armington CES temporary parameter

Third level of the CET supply tree (relation between ihs products and its reg origin)

- $acexdreg_{ihs}$ armington CET constant parameter
- $deltaexdreg_{ihs,reg}$: armington CET share parameter
- $rhocexdreg_{ihs}$: armington CET substitution parameter
- $dencesexdreg_{ihs}$: armington CET temporary parameter
- $numcesexdreg_{ihs}$: armington CET temporary parameter

Taxes

- $TIMPEXO_j$: production taxes
- $TTARDREGEXO_{ihs,reg}$: tariff rate over imports from REG
- $TTARDCHLEXO_{ihs,reg}$: tariff rate by REG over imports from CPV
- $TTVAEXO_i$: consumption tax
- $TTVIEXO_i$: investment tax

Factor endowments (fixed exogenous supply)

- $XTHHEXO_f$: household factor endowments
- $XTGOVEXO_f$: government factor endowments

Transfers

- $TRHHGOVEXO$: net transferts from household to governments
- $TRHHRMEXO$: net transferts from household to rest of the world
- $TRGOVRMEXO$: net transferts from government to rest of the world

Saving

- $SAVGOVEXO$: government saving rate

- *SAVHHEXO*: household saving rate

International prices (fixed according to small country assumption)

- *PWMDREGEXO*_{*ihs,reg*}: foreign import price
- *COMPWEDREGEXO*_{*ihs,reg*}: ratio export price over domestic price

Numeraire

- *numer*: numeraire

Initial trade balance (fixed under flexible exchange rate closing assumption)

- *TRADEBALO*: Initial trade balance

Elasticities

- *ARGMINIMP*_{*i*}: Import elasticity (CES function) at good *i* level
- *ARGMINEXP*_{*i*}: Export elasticity (CET function) at good *i* level
- *ARGMINIMPD*_{*i*}: Import elasticity (CES function) at good *i* level
- *ARGMINEXPD*_{*i*}: Export elasticity (CET function) at good *i* level
- *ARGMINIMPDREG*_{*ihs*}: Import elasticity (CES function) at product *ihs* level
- *ARGMINEXPDREG*_{*ihs*}: Export elasticity (CET function) at product *ihs* level
- *ELASKL*_{*j*}: Substitution elasticity across factors at the sector *j* level

A.3 Endogenous variables

- *Y*(*J*): Production by economic activity
- *YS*(*I,J*): Matrix of domestic supply of goods and services by activity
- *X*(*J,F*): Value added of each activity per factor
- *IC*(*I,J*): Intermediate consumption matrix
- *TIC*(*I*): Total intermediate consumption by goods and services
- *VAFC*(*J*): Value added volume

- PJ(J): Output deflator for sector j
- PVA(J): Value added price for sector j
- YD(I): Demand for product i
- YDD(I): Domestic demand for product i
- P(I): Price index
- PE(I): Exports price
- PD(I): Domestic price
- XC(I): Total domestic consumption of product i
- M(I): Imports of product i
- PC(I): Index of total consumer prices (domestic and imported) in the domestic market net of taxes
- PM(I): Domestic imports price
- IMP(J): Production taxes
- W(F): Factor f prices
- E(I): Exports of product i
- PMD(IHS): Import price
- PED(IHS): Export price
- PMDREG(IHS,REG): Regional imports price including taxes
- RDHH: Household disposable income
- RDGOV: Government disposable income
- QDHH(I): Household final consumption
- QDGOV(I): Government final consumption
- HHSAVINGS: Household saving



- GOVSAVINGS: Government saving
- INV(I): Sector i investment
- IT: Total investment
- TVA(I): Value added tax
- TVI(I): Tax on investment in sector i
- TARDREG(IHS,REG): Tariff reception
- MD(IHS): World imports
- ED(IHS): World exports
- MDREG(IHS,REG): Regional imports
- EDREG(IHS,REG): Regional exports
- TRADEBAL: Trade balance
- EXCHG: Real exchange rate
- U(F): Unemployment for $F=\{L\}$ and idle capacity for $F=\{K\}$.

A.4 Equations

EQTIC(I): Total intermediate consumption by good/service i .

$$TIC_i = \sum_j IC_{ij} \quad (10)$$

EQIC(I,J): Intermediate consumption by sector j of good/service i .

$$IC_{ij} = io_{ij}Y_j \quad (11)$$

EQPVA(J): Price of value added by sector j .

$$PVA_j a_j = \left(\sum_f \alpha_{fj} \frac{1}{1+\rho_{vaj}} (W_f)^{\frac{\rho_{vaj}}{1+\rho_{vaj}}} \right)^{1+\frac{1}{\rho_{vaj}}} \quad (12)$$

EQX(J,F): Value added by sector j generated by factor f .

$$X_{jf} = V AFC_j a_j^{-\frac{\rho_{vaj}}{\rho_{vaj}+1}} \left(\alpha_{fj} \frac{PVA_j}{W_f} \right)^{\frac{1}{1+\rho_{vaj}}} \quad (13)$$

EQVAFC(J): Value added by sector j (volume).

$$V AFC_j = Y_j \quad (14)$$

EQYD(I): Market equilibrium for good i

$$YD_i = \sum_j (YS_{ij}) \quad (15)$$

EQYS(I,J): Domestic supply of good/service i by sector j .

$$YS_{i,j} - \gamma_{ij}Y_j = 0 \quad (16)$$

EQPJ(J): Price of activity j .

$$PJ_j Y_j = \sum_i p_i YS_{ij} \quad (17)$$

EQY(J): Production by sector j .

$$PVA_j = PJ_j (1 - TIMPEXO_j) - \sum_i io_{ij} PC_i \quad (18)$$

EQP(I) Price index of good/service i .

$$P_i = \frac{1}{acex_i} \left(deltaex_i^{\frac{1}{1-\rho_{ce}x_i}} PD_i^{\frac{\rho_{ce}x_i}{\rho_{ce}x_i-1}} + (1 - deltaex_i)^{\frac{1}{1-\rho_{ce}x_i}} PE_i^{\frac{\rho_{ce}x_i}{\rho_{ce}x_i-1}} \right)^{1-\frac{1}{\rho_{ce}x_i}} \quad (19)$$

EQYDD(I): Domestic demand of good/service i .

$$YDD_i = \left(YD_i acex_i^{\frac{\rho_{ce}x_i}{1-\rho_{ce}x_i}} \left(\frac{PD_i}{P_i deltaex_i} \right)^{\frac{1}{\rho_{ce}x_i-1}} \right) \quad (20)$$

EQE(I): Exports of good/service i .

$$E_i = \left(YD_i acex_i^{\frac{\rho_{ce}x_i}{1-\rho_{ce}x_i}} \left(\frac{PE_i}{P_i (1 - deltaex_i)} \right)^{\frac{1}{\rho_{ce}x_i-1}} \right) \quad (21)$$

EQM(I): Imports of good/service i

$$M_i = \frac{XC_i}{ac_i} \left(ac_i PC_i \frac{1 - \delta_i}{PM_i} \right)^{\frac{1}{1+\rho_{ci}}} \quad (22)$$

EQPC(I): Index of total consumer prices (domestic and imported) of the good/service i in the domestic market net of taxes

$$PC_i = \frac{1}{ac_i} \left((1 - \delta_i)^{\frac{1}{\rho_{ci}+1}} PM_i^{\frac{\rho_{ci}}{\rho_{ci}+1}} + \delta_i^{\frac{1}{\rho_{ci}+1}} PD_i^{\frac{\rho_{ci}}{\rho_{ci}+1}} \right)^{1+\frac{1}{\rho_{ci}}} \quad (23)$$

EQPD(I): Domestic price of good/service i .

$$YDD_i = \frac{XC_i}{ac_i} \left(ac_i \delta_i \frac{PC_i}{PD_i} \right)^{\frac{1}{\rho_{ci}+1}} \quad (24)$$

EQPMDREG(IHS,REG): Import price of product ihs by origin reg including import tariffs

$$PMDreg_{ihs,reg} = EXCHG * PWMDregEXO_{ihs,reg} * numer * (1 + TTARDregEXO_{ihs,reg}) \quad (25)$$

EQTARDREG(IHS,REG): Tariff collection by product *ihs* and origin *reg*.

$$TARDreg_{ihs,reg} = TTARDregEXO_{ihs,reg} * EXCHG * PWM DregEXO_{ihs,reg} * numer * MDreg_{ihs,reg} \quad (26)$$

EQMD(IHS): Imports by *ihs* product

$$MD_{ihs} = \frac{M_i}{acd_i} \left(acd_i PM_i * \frac{deltad_{i,ihs}}{PMD_{ihs}} \right)^{\frac{1}{1+\rho_{cdi}}}, \forall ihs \in i \quad (27)$$

EQPM(I): Price of domestic imports by good/service *i*.

$$PM_i M_i = \sum_{ihs \in i} PMD_{ihs} MD_{ihs} \quad (28)$$

EQMDREG(IHS,REG): Imports of *ihs* products by origin *reg*.

$$MDreg_{ihs,reg} = \frac{MD_{ihs}}{acdreg_{ihs}} \left(acdreg_{ihs} PMD_{ihs} \frac{deltadreg_{ihs,reg}}{PMDreg_{ihs,reg}} \right)^{\frac{1}{1+\rho_{cdreg_{ihs}}}} \quad (29)$$

EQPMD(IHS): Import price by *ihs* product

$$PMD_{ihs} MD_{ihs} = \sum_{reg} PMDreg_{ihs,reg} MDreg_{ihs,reg} \quad (30)$$

EQEDREG(IHS,REG): Exports of *ihs* product by destination *reg*.

$$EDreg_{ihs,reg} = ED_{ihs} * acedreg_{ihs}^{\frac{\rho_{cedreg_{ihs}}}{1-\rho_{cedreg_{ihs}}}} * \left(\frac{COMPWEDregEXO_{ihs,reg}}{EXCHG} * (1 + TTARDCHLEXO_{ihs,reg}) * \frac{PD_i}{PED_{ihs} * deltaexdreg_{ihs,reg}} \right)^{\frac{1}{\rho_{cedreg_{ihs}} - 1}} \quad (31)$$

EQPED(IHS): Export price by *ihs* product.

$$PED_{ihs} ED_{ihs} = \sum_{reg} \frac{COMPWEDregEXO_{ihs,reg}}{EXCHG} PD_i EDreg_{ihs,reg}, \forall ihs \in i \quad (32)$$

EQED(IHS): Exports by *ihs* product.

$$ED_{ihs} = E_i * acexd_i^{\frac{\rho_{cexdi}}{1-\rho_{cexdi}}} * \left(\frac{PED_{ihs}}{PE_i * deltaexd_{(i,ihs)}} \right)^{\frac{1}{\rho_{cexdi} - 1}}, \forall ihs \in i \quad (33)$$

EQPE(I): Export price by good/service i .

$$PE_i E_i = \sum_{ihs \in i} PED_{ihs} ED_{ihs} \quad (34)$$

EQIMP(J): Collection of production taxes by sector j .

$$IMP_j = PJ_j * TIMPEXO_j * Y_j \quad (35)$$

EQTVA(I): Collection of value added tax by good/service i .

$$TVA_i = TTV AEXO_i * PC_i * QDHH_i \quad (36)$$

EQHHSAVINGS: Private national saving.

$$HHSAVINGS = SAVHHEXO * RDHH \quad (37)$$

EQGOVSAVINGS: Government saving.

$$GOVSAVINGS = SAVGOVEXO * RDGOV \quad (38)$$

EQINV(I): Investment in capital goods i

$$INV_i = betainv_i * IT \left[\sum_{i1} betainv_{i1} * PC_{i1} * (1 + TTVIEXO_{i1}) \right] \quad (39)$$

EQTVI(I): Tax collection on investment in capital goods i

$$TVI_i = TTVIEXO_i * PC_i * INV_i \quad (40)$$

EQXC(I): Total domestic consumption of good/service i .

$$XC_i = TIC_i + QDHH_i + QDGOV_i + INV_i \quad (41)$$

EQQDHH(I): Private final consumption per good/service i .

$$QDHH_i * PC_i * (1 + TTV AEXO_i) = betahh_i * (1 - SAVHHEXO) * RDHH \quad (42)$$

EQQDGOV(I): Government final consumption per good/service i .

$$QDGOV_i = betagov_i * (1 - SAVGOVEXO) * \frac{RDGOV}{\sum_{i1} betagov_{i1} * PC_i} \quad (43)$$

EQRDHH: Household disposable income.

$$RDHH = \sum_f (W_f * XTHHEXO_f) - TRHHRMEXO * numer - TRHHGOVEXO * numer \quad (44)$$

EQRDGOV: Government disposable income.

$$RDGOV = \sum_f (W_f * XTGOVEXO_f) + \sum_i (TV A_i + TV I_i) + \sum_{ihs, reg} (TARDreg_{ihs, reg}) + \sum_j (imp_j) - TRGOVRMEXO * numer + TRHHGOVEXO * numer \quad (45)$$

EQTRADEBAL: Trade balance.

$$\sum_{ihs, reg} (EXCHG * PWMDregEXO_{ihs, reg} * numer * MDreg_{ihs, reg}) + TRHHRMEXO * numer + TRGOVRMEXO * numer - \sum_{ihs, reg} (COMPWEDregEXO_{ihs, reg} / EXCHG * PD_i * EDreg_{ihs, reg}) + TRADEBAL_{ini} = 0 \quad (46)$$

EQW(F): Closing of the factor f market (idle capacity is allowed)

$$U_f = XTHHEXO_f + XTGOVEXO_f - \sum_j X_{(j, f)} \quad (47)$$

EQU(F): Nominal rigidity in the remuneration of the factor f .

$$W_f = g = Wmin_f \quad (48)$$

EQPINDEX: Numerarie

$$PD_{(C28)} = numer \quad (49)$$

B Sensitive and export interest products list

Table A2: Cape Verde's import sensitive products

HS6 code	Description
020230	Meat: of bovine animals, boneless cuts, frozen
020329	Meat: of swine, n.e.c. in item no. 0203.2, frozen
020714	Meat and edible offal: of fowls of the species <i>Gallus domesticus</i> , cuts and offal, frozen
030342	Fish: frozen, yellowfin tunas (<i>Thunnus albacares</i>), excluding fillets, livers, roes, and other fish meat of heading 0304
030343	Fish: frozen, skipjack or stripe-bellied bonito, excluding fillets, livers, roes, and other fish meat of heading 0304
030344	Fish: frozen, bigeye tunas (<i>Thunnus obesus</i>), excluding fillets, livers, roes, and other fish meat of heading 0304
030349	Fish: frozen, tuna, n.e.c. in item no. 0303.4, excluding fillets, livers, roes, and other fish meat of heading 0304
030489	Fish fillets: frozen, of fish n.e.c. in heading 0304.8
030617	Crustaceans: frozen, shrimps and prawns, excluding cold-water varieties, in shell or not, smoked, cooked or not before or during smoking: in shell, cooked by steaming or by boiling in water
030749	Molluscs: cuttle fish and squid, whether in shell or not, frozen, dried, salted, in brine, or smoked, cooked or not before or during the smoking process
030759	Molluscs: octopus (<i>Octopus</i> spp.), frozen, dried, salted, in brine, or smoked, cooked or not before or during the smoking process
040120	Dairy produce: milk and cream, not concentrated, not containing added sugar or other sweetening matter, of a fat content, by weight, exceeding 1% but not exceeding 6%
040221	Dairy produce: milk and cream, concentrated, not containing added sugar or other sweetening matter, in powder, granules or other solid forms, of a fat content exceeding 1.5% (by weight)
040310	Dairy produce: yoghurt, whether or not concentrated or containing added sugar or other sweetening matter or flavoured or containing added fruit or cocoa
040390	Dairy produce: buttermilk, curdled milk or cream, kephir, fermented or acidified milk or cream, whether or not concentrated or containing added sweetening, flavouring, fruit or cocoa (excluding yoghurt)
070190	Vegetables: potatoes (other than seed), fresh or chilled
100590	Cereals: maize (corn), other than seed
100630	Cereals: rice, semi-milled or wholly milled, whether or not polished or glazed
160100	Meat preparations: sausages and similar products, of meat, meat offal or blood, and food preparations based on these products

Table A3: Continued from previous page

160232	Meat preparations: of the poultry of heading no. 0105, (i.e. of fowls of the species <i>Gallus domesticus</i>)
160415	Fish preparations: mackerel, prepared or preserved, whole or in pieces (but not minced)
170199	Sugars: sucrose, chemically pure, in solid form, not containing added flavouring or colouring matter
170490	Sugar confectionery: (excluding chewing gum, including white chocolate), not containing cocoa
190219	Food preparations: pasta, uncooked (excluding that containing eggs), not stuffed or otherwise prepared
190410	Food preparations: obtained by the swelling or roasting of cereals or cereal products
190490	Food preparations: cereal or cereal products (excluding maize), in grain form, pre-cooked or otherwise prepared
190531	Food preparations: sweet biscuits, whether or not containing cocoa
200410	Vegetable preparations: potatoes, prepared or preserved otherwise than by vinegar or acetic acid, frozen
200520	Vegetable preparations: potatoes, prepared or preserved otherwise than by vinegar or acetic acid, not frozen
200599	Vegetable preparations: vegetables and mixtures of vegetables n.e.c. in heading no. 2005, prepared or preserved otherwise than by vinegar or acetic acid, not frozen
200919	Juice: orange, not frozen, of a Brix value exceeding 20, unfermented, not containing added spirit, whether or not containing added sugar or other sweetening matter
200989	Juice: of any single fruit or vegetable n.e.c. in heading no. 2009, unfermented, not containing added spirit, whether or not containing added sugar or other sweetening matter
200990	Juices: mixtures of fruits or vegetables, unfermented, not containing added spirit, whether or not containing added sugar or other sweetening matter
210390	Sauces and preparations therefor: mixed condiments and mixed seasonings
210690	Food preparations: n.e.c. in item no. 2106.10
220300	Beer: made from malt
220421	Wine: still, in containers holding 2 litres or less
220429	Wine: still, in containers holding more than 2 litres
240220	Cigarettes: containing tobacco
240319	Tobacco: smoking, other than water pipe tobacco, whether or not containing tobacco substitutes in any proportion
252329	Cement: portland, other than white, whether or not artificially coloured
271000	Petroleum oils and oils from bituminous minerals, not crude: preparations n.e.c. containing by weight 70% or more of petroleum oils or oils from bituminous minerals: these being the basic constituents of the preparations: waste oils

Table A4: Continued from previous page

271113	Petroleum gases and other gaseous hydrocarbons: liquefied, butanes
330300	Perfumes and toilet waters
330499	Cosmetic and toilet preparations: n.e.c. in heading no. 3304, for the care of the skin (excluding medicaments, including sunscreen or sun tan preparations)
340111	Soap and organic surface-active products: in the form of bars, cakes, moulded shapes, and paper, wadding, felt and nonwovens, impregnated, coated or covered with soap or detergent, for toilet use (including medicated products)
340220	Washing and cleaning preparations: surface-active, whether or not containing soap (excluding those of heading no. 3401), put up for retail sale
392410	Plastics: tableware and kitchenware
401110	Rubber: new pneumatic tyres, of a kind used on motor cars (including station wagons and racing cars)
401693	Rubber: vulcanised (other than hard rubber), gaskets, washers and other seals, of non-cellular rubber
401699	Rubber: vulcanised (other than hard rubber), articles n.e.c. in heading no. 4016, of non-cellular rubber
440729	Wood, tropical: as specified in Subheading Note 2 to this Chapter, n.e.c. in item no. 4407.2, sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or end-jointed, thicker than 6mm
441820	Wood: doors and their frames and thresholds
442010	Wood: statuettes and other ornaments of wood
610342	Trousers, bib and brace overalls, breeches and shorts: men's or boys', of cotton, knitted or crocheted
620342	Trousers, bib and brace overalls, breeches and shorts: men's or boys', of cotton (not knitted or crocheted)
620442	Dresses: women's or girls', of cotton (not knitted or crocheted)
640411	Sports footwear: tennis shoes, basketball shoes, gym shoes, training shoes and the like, with outer soles of rubber or plastics and uppers of textile materials
670419	False beards, eyebrows and eyelashes, switches and the like: of synthetic textile materials
732690	Iron or steel: articles n.e.c. in heading 7326
761010	Aluminium: structures (excluding prefabricated buildings of heading no. 9406) and parts of structures, doors, windows and their frames and thresholds for doors
761090	Aluminium: structures (excluding prefabricated buildings of heading no. 9406) and parts of structures, n.e.c. in heading no. 7610, plates, rods, profiles, tubes and the like
841490	Pumps and compressors: parts, of air or vacuum pumps, air or other gas compressors and fans, ventilating or recycling hoods incorporating a fan

Table A5: Continued from previous page

841510	Air conditioning machines: comprising a motor-driven fan and elements for changing the temperature and humidity, window or wall types, self-contained or split-system
841582	Air conditioning machines: containing a motor driven fan, other than window or wall types, incorporating a refrigerating unit
851712	Telephones for cellular networks or for other wireless networks
851762	Communication apparatus (excluding telephone sets or base stations): machines for the reception, conversion and transmission or regeneration of voice, images or other data, including switching and routing apparatus
851830	Headphones and earphones, whether or not combined with a microphone, and sets consisting of a microphone and one or more loudspeakers
870321	Vehicles: spark-ignition internal combustion reciprocating piston engine, cylinder capacity not exceeding 1000cc
870322	Vehicles: spark-ignition internal combustion reciprocating piston engine, cylinder capacity exceeding 1000cc but not exceeding 1500cc
870323	Vehicles: spark-ignition internal combustion reciprocating piston engine, cylinder capacity exceeding 1500cc but not exceeding 3000cc
870331	Vehicles: compression-ignition internal combustion piston engine (diesel or semi-diesel), cylinder capacity not exceeding 1500cc
870332	Vehicles: compression-ignition internal combustion piston engine (diesel or semi-diesel), cylinder capacity exceeding 1500cc but not exceeding 2500cc
870333	Vehicles: compression-ignition internal combustion piston engine (diesel or semi-diesel), cylinder capacity exceeding 2500cc
870421	Vehicles: compression-ignition internal combustion piston engine (diesel or semi-diesel), for transport of goods, (of a gvw not exceeding 5 tonnes), n.e.c. in item no 8704.1
940161	Seats: with wooden frames, upholstered, (excluding medical, surgical, dental, veterinary or barber furniture)
940180	Seats: n.e.c. in heading no. 9401, (excluding medical, surgical, dental, veterinary or barber furniture)
940320	Furniture: metal, other than for office use
940350	Furniture: wooden, for bedroom use
940360	Furniture: wooden, other than for office, kitchen or bedroom use
940389	Furniture: of cane, osier, or similar materials (other than bamboo or rattan)
940429	Mattresses: of other materials, not cellular rubber or plastics
940510	Chandeliers and other electric ceiling or wall light fittings: excluding those used for lighting public open spaces or thoroughfares
940540	Lamps and light fittings: electric, n.e.c. in heading no. 9405

Table A6: Products of export interest to Cape Verde

HS6 code	Description
030341	Fish: frozen, albacore or longfinned tunas (<i>Thunnus alalunga</i>), excluding fillets, livers, roes, and other fish meat of heading 0304
030343	Fish: frozen, skipjack or stripe-bellied bonito, excluding fillets, livers, roes, and other fish meat of heading 0304
030344	Fish: frozen, bigeye tunas (<i>Thunnus obesus</i>), excluding fillets, livers, roes, and other fish meat of heading 0304
030349	Fish: frozen, tuna, n.e.c. in item no. 0303.4, excluding fillets, livers, roes, and other fish meat of heading 0304
030487	Fish fillets: frozen, tunas (of the genus <i>Thunnus</i>), skipjack or stripe-bellied bonito (<i>Euthynnus</i> (<i>Katsuwonus</i>) <i>pelamis</i>)
030549	Fish: smoked, whether or not cooked before or during smoking, n.e.c. in item no. 0305.4, includes fillets, but excludes edible fish offal
040229	Dairy produce: milk and cream, containing added sugar or other sweetening matter, in powder, granules or other solid forms, of a fat content exceeding 1.5% (by weight)
100630	Cereals: rice, semi-milled or wholly milled, whether or not polished or glazed
110220	Cereal flour: of maize (corn)
150910	Vegetable oils: olive oil and its fractions, virgin, whether or not refined, but not chemically modified
160414	Fish preparations: tunas, skipjack and Atlantic bonito (<i>sarda</i> spp.), prepared or preserved, whole or in pieces (but not minced)
160415	Fish preparations: mackerel, prepared or preserved, whole or in pieces (but not minced)
160419	Fish preparations: fish prepared or preserved, whole or in pieces (but not minced), n.e.c. in heading no. 1604
230120	Flours, meals and pellets: of fish or of crustaceans, molluscs or other aquatic invertebrates
271000	Petroleum oils and oils from bituminous minerals, not crude: preparations n.e.c. containing by weight 70% or more of petroleum oils or oils from bituminous minerals: these being the basic constituents of the preparations: waste oils
283210	Sulphites: of sodium
283319	Sodium sulphates: other than disodium sulphate
401110	Rubber: new pneumatic tyres, of a kind used on motor cars (including station wagons and racing cars)
520959	Fabrics, woven: containing 85% or more by weight of cotton, printed, of weaves n.e.c. in item no. 5209.5, weighing more than 200g/m ²
551219	Fabrics, woven: of synthetic staple fibres, containing 85% or more by weight of polyester staple fibres, other than unbleached or bleached
551419	Fabrics, woven: unbleached or bleached, containing less than 85% by weight of synthetic staple fibres n.e.c. in item no. 55.14.1, mixed mainly or solely with cotton, exceeding 170g/m ²
600690	Fabrics: knitted or crocheted fabrics, other than those of headings 60.01 to 60.04, and other than those made of wool, fine animal hair, cotton, synthetic or artificial fibres
630900	Clothing: worn, and other worn articles
854810	Waste and scrap of primary cells, primary batteries and electric accumulators: spent primary cells, spent primary batteries and spent electric accumulators
870421	Vehicles: compression-ignition internal combustion piston engine (diesel or semi-diesel), for transport of goods, (of a gvwt not exceeding 5 tonnes), n.e.c. in item no 8704.1
890110	Cruise ships, excursion boats and similar vessels, principally designed for the transport of persons, ferry boats of all kinds

Source: own elaboration based on technical criteria

C Productive sectors

Table A7: Sector Aggregation of the Cape Verde SAM 2017 for CGE model calibration

Description of productive sectors of goods & services
01 - Agriculture and livestock
02 - Fishing and aquaculture
03 - Extractive industries
04 - Food and beverages
05 - Tobacco industry
06 - Textiles and footwear
07 - Wood
08 - Chemical products
09 - Non-metallic minerals
10 - Metals industries
11 - Furniture and mattresses
12 - Other manufacturing industries
13 - Electricity
14 - Water collection, treatment and distribution
15 - Construction
16 - Wholesale and retail trade
17 - Transport and auxiliar activities
18 - Storage
19 - Communication and information technologies
20 - Accomodation, rental and real estate activities, and tourism operators
21 - Restaurants and drinking establishments
22 - Business, professional, financial and insurance services
23 - Public administration services
24 - Education
25 - Human health and social action
26 - Artistic, performing, sporting and recreational activities
27 - Other services
28 - Activities of households employing domestic staff and household production activities for their own use

D Tariff variations

Table A8: Tariffs changes due to the adoption of ECOWAS CET

HS6 code	Applied tariff	CET	Var. (%)	HS6 code	Applied tariff	CET	Var. (%)
020230	20%	35%	75%	392410	20%	20%	0%
020329	20%	35%	75%	401110	30%	10%	-67%
020714	30%	35%	17%	401693	15%	10%	-33%
030341	20%	15%	-25%	401699	15%	10%	-33%
030342	20%	15%	-25%	440729	5%	10%	100%
030343	20%	15%	-25%	441820	40%	20%	-50%
030344	20%	15%	-25%	442010	40%	20%	-50%
030349	20%	15%	-25%	520959	20%	35%	75%
030487	20%	20%	0%	551219	20%	20%	0%
030489	20%	20%	0%	551419	20%	10%	-50%
030549	20%	20%	0%	600690	20%	20%	0%
030617	30%	20%	-33%	610342	30%	20%	-33%
030749	30%	20%	-33%	620342	40%	20%	-50%
030759	30%	20%	-33%	620442	40%	20%	-50%
040120	20%	20%	0%	630900	10%	20%	100%
040221	5%	7%	33%	640411	30%	15%	-50%
040229	5%	7%	33%	670419	50%	20%	-60%
040310	24%	35%	47%	732690	15%	20%	33%
040390	25%	14%	-45%	761010	20%	20%	0%
070190	30%	35%	17%	761090	20%	20%	0%
100590	10%	5%	-50%	841490	15%	10%	-33%
100630	5%	10%	100%	841510	30%	13%	-58%
110220	20%	20%	0%	841582	15%	20%	33%
150910	5%	10%	100%	851712	7%	10%	40%
160100	20%	35%	75%	851762	0%	10%	10%
160232	20%	35%	75%	851830	4%	14%	233%
160414	40%	20%	-50%	854810	2%	12%	500%
160415	40%	20%	-50%	870321	21%	16%	-21%
160419	40%	20%	-50%	870322	27%	16%	-40%
170199	5%	20%	300%	870323	33%	16%	-51%
170490	30%	35%	17%	870331	27%	18%	-33%
190219	40%	20%	-50%	870332	33%	18%	-45%
190410	20%	20%	0%	870333	33%	18%	-45%
190490	20%	20%	0%	870421	15%	9%	-38%
190531	40%	35%	-13%	890110	5%	5%	0%
200410	20%	35%	75%	940161	50%	20%	-60%
200520	20%	35%	75%	940180	50%	20%	-60%
200599	20%	20%	0%	940320	25%	20%	-20%
200919	35%	15%	-57%	940350	50%	20%	-60%
200989	35%	15%	-57%	940360	50%	20%	-60%
200990	35%	15%	-57%	940389	50%	20%	-60%
210390	20%	20%	0%	940429	30%	20%	-33%
210690	27%	16%	-42%	940510	15%	20%	33%
220300	50%	20%	-60%	940540	30%	20%	-33%
220421	33%	20%	-38%	RDC01	4%	9%	106%
220429	33%	20%	-38%	RDC02	20%	10%	-50%
230120	5%	10%	100%	RDC03	5%	3%	-35%
240220	25%	20%	-20%	RDC04	14%	17%	26%
240319	50%	20%	-60%	RDC05	11%	14%	22%
252329	5%	20%	300%	RDC06	23%	17%	-28%
271000	6%	8%	41%	RDC07	7%	10%	44%
271113	5%	0%	-100%	RDC08	6%	7%	25%
283210	0%	5%	5%	RDC09	10%	14%	38%
283319	5%	5%	0%	RDC10	6%	9%	54%
330300	30%	20%	-33%	RDC11	44%	13%	-70%
330499	30%	20%	-33%	RDC12	5%	10%	84%
340111	28%	23%	-18%	RDC13	0%	5%	5%
340220	50%	35%	-30%	RDC26	5%	20%	300%

Source: own elaboration based on data from INE.