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Duration of the Membership in the GATT/WTO, Structural Economic Vulnerability and Trade Costs

Sena Kimm Gnangnon

Development Department, World Trade Organization, Rue de Lausanne 154, CH-1211 Geneva, Switzerland; kgnangnon@yahoo.fr

Abstract: This paper assesses the effects of the duration of membership in the General Agreement on Tariffs and Trade (GATT)/World Trade Organization (WTO) and structural economic vulnerability on trade costs in developing countries. The analysis is performed on an unbalanced panel dataset of 121 countries over the period 1996–2018 and primarily utilizes the two-step system generalized method of moments estimator. It has established several findings. We obtain that longstanding GATT/WTO members enjoy a larger reduction in trade costs than relatively new GATT/WTO members. Concomitantly, a higher degree of structural economic vulnerability leads to higher trade costs. Moreover, the membership duration exerts a higher trade costs reduction effect in countries that are highly "structurally" vulnerable, including those that face high levels of exposure to shocks and high magnitudes of shocks. Finally, longstanding GATT/WTO members that receive higher amounts of development aid (including total development aid flows, Aid for Trade flows, and NonAfT flows) enjoy a larger trade costs reduction than relatively new GATT/WTO members.

Keywords: duration of GATT/WTO membership; structural economic vulnerability; development aid; trade costs

JEL Classification: E22; F24; F35

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1. Introduction

Do members of the World Trade Organization (WTO), successor of the General Agreement on Tariffs and Trade (GATT), experience lower trade costs as their membership duration expands, and notably when they are highly vulnerable to environmental shocks and external economic and financial shocks? The present paper aims to empirically address this important question that has received little attention in the literature.

The world has witnessed a significant fall in import tariffs since the creation of the World Trade Organization (WTO). This has been achieved not only thanks to unilateral tariffs liberalization, but also and primarily to member states' commitments at the WTO to lower and bind tariff rates (e.g., Chowdhury et al. 2021; Groppo and Piermartini 2014; Jakubik and Piermartini 2019; Koopman et al. 2020). According to Jakubik and Piermartini (2019), the stringency of tariff bindings limits WTO members' ability to raise tariffs in response to import shocks. Additionally, WTO rules on nontariff border regulatory measures such as technical regulations[1] and sanitary and phytosanitary[2] measures limit the capacity of member states[3] to make use of these measures to regulate trade (e.g., Chowdhury et al. 2021; Heckelei and Swinnen 2012; Koopman et al. 2020; Voon 2015).

While these WTO rules contribute to reducing trade costs and ensuring the stability and predictability of the trading environment, the facilitation of trade, that is, the reduction in the overall trade costs, requires lowering both border and non-border sources of trade costs (e.g., Ali and Milner 2016). The concept of "trade costs" is defined in a broad sense by Anderson and van Wincoop (2004, p. 691) as encompassing all costs incurred in delivering a good to a final user other than the marginal cost of producing the good itself. These include

transportation costs (both freight costs and time costs), policy barriers (tariffs and nontariff barriers), information costs, contract enforcement costs, costs associated with the use of different currencies, legal and regulatory costs, and local distribution costs (wholesale and retail). Thus, trade facilitation entails reducing both border-induced trade costs[4] and non-border sources of trade costs such as inadequate domestic transport infrastructure and inefficient domestic transport and other services (e.g., port services). It also involves reducing additional costs related, for example, to the communication and information that are involved in conducting business across national frontiers (e.g., Ali and Milner 2016). The literature has shown that in parallel to the fall in import tariff rates, non-border trade costs have been on rise and generate massive trade costs (e.g., Arvis et al. 2012, 2016; Rubínová and Sebti 2021; Sourdin and Pomfret 2012) that inhibit countries' participation in international trade[5].

The Trade Facilitation Agreement (TFA) adopted by WTO members at the Bali Ministerial Conference held in December 2013 has been instrumental in promoting the stability and predictability of the trading environment. It contains provisions that aim to simplify, modernize, and harmonize export and import processes, in order to address soft infrastructure-related challenges faced by developing countries. Moreover, Aid for Trade (AfT) flows mobilized by the WTO to support developing countries' efforts to implement WTO Agreements also help to reduce trade costs (e.g., Busse et al. 2012; Calì and te Velde 2011; de Melo and Wagner 2016). The compliance with the transparency[6] provisions in multilateral trade rules, and more generally the implementation of WTO Agreements, are discussed in the various WTO councils and committees. Moreover, the multilateral surveillance of the consistency of members' trade policies with WTO rules is performed by the WTO's Trade Policy Review Mechanism[7] (e.g., Chaisse and Matsushita 2013; Collins-Williams and Wolfe 2010). All these contribute to making the trading environment more stable and predictable, notably as member states improve their trade policy regime (by making it more transparent, predictable, and stable) over time.

Against this background, one could question whether the duration of the membership in the WTO has genuinely contributed to reducing the overall trade costs faced by its member states, notably developing countries' ones. The first contribution of this paper to the literature is to address this question by investigating the effect of the duration of the membership in the WTO (i.e., not merely the WTO membership) on trade costs, notably in developing countries. The theoretical argument here is that the concept of "duration of GATT/WTO membership" (or implicitly the "duration of WTO membership") encompasses both the membership and the time spent by a country as member of the WTO. As member states' trade policy is subject to transparency rules and high scrutiny by their counterparts at the WTO, it is likely that as time passes, member states would further liberalize their trade regime and design appropriate trade facilitation policies that would enhance their participation in international trade. In addition, AfT interventions could help developing countries successfully implement WTO Agreements and rules, including those in line with their commitments. Therefore, we expect theoretically that longstanding WTO members are likely to experience a greater trade costs reduction (in the sense of Anderson and van Wincoop 2004) than relatively new WTO members. Moreover, AfT flows are likely to enhance the trade costs reduction effect of the duration of GATT/WTO membership.

Moreover, developing countries' economies are plagued with shocks[8] that are more frequent and of larger magnitudes than advanced economies (e.g., Aguiar and Gopinath 2007; Cariolle et al. 2016; Essers 2013; Guillaumont 2009, 2010; Koren and Tenreyro 2007). These shocks could lead to higher trade costs due, inter alia, to the uncertainty[9] arising from the economic fluctuations that they have induced in these countries[10]. For example, a recent study by Azomahou et al. (2021) has documented that the joint COVID-19 pandemic and oil price crises have exerted a severe adverse impact on African oil-dependent economies, as they have resulted in a higher forecasted growth loss in these economies.

The United Nations refers to the concept of "structural economic vulnerability" to apprehend the structural vulnerability of developing countries to shocks, with a view to

informing policy decisions and policymaking. Structural economic vulnerability is "the risk of a (poor) country seeing its development hampered by the natural or external shocks it faces" (Guillaumont 2010). Hence, countries' structural economic vulnerability reflects both their degree of exposure to external economic (and financial) and environmental shocks and the magnitude (size) of these shocks (e.g., Briguglio et al. 2009; Guillaumont 2009, 2010). The index of structural economic vulnerability (also referred to as "EVI") is used by the United Nations, along with the human assets index and the per capita income, to include a country in or graduate a country from the group of the least developed countries (LDCs)[11]. Hence, the category of LDCs contains countries that are both the poorest in the world and the most vulnerable to external and environmental shocks (that is, countries among developing countries that are both poor and have the highest degrees of EVI).

As a second contribution to the literature, the present paper examines the effect of structural economic vulnerability on trade costs. It additionally considers whether longstanding WTO members are more capable of mitigating the trade costs raising effects of structural economic vulnerability than relatively new members. In other words, we examine here how the duration of GATT/WTO membership affects trade costs in structurally vulnerable countries.

The line of argument is as follows. On the one hand, the duration of membership in the GATT/WTO is likely to affect trade costs. On the other hand, structural economic vulnerability would also affect trade costs. Additionally, the membership duration could potentially affect some components of structural economic vulnerability, including both the exposure and shock components of EVI (as explained in the paper). Therefore, it is likely that the effect of the membership duration on trade costs would depend on the level of structural economic vulnerability.

The empirical analysis has been conducted using a sample of 121 countries over the period 1996–2019 and the two-step system generalized method of moment (GMM) estimator. Several findings emerge from the analysis. Longstanding GATT/WTO members enjoy a larger reduction in trade costs than relatively new GATT/WTO members. Concomitantly, a higher degree of structural economic vulnerability leads to higher trade costs. In addition, the membership duration exerts a higher trade costs reduction in countries that are highly structurally vulnerable, including those that have high levels of exposure to shocks and high magnitudes of shocks. Finally, the membership duration exerts a larger trade costs reduction effect in countries that receive high amounts of development aid flows, including both AfT flows and NonAfT flows.

The rest of the paper is organized around five sections. Section 2 provides a theoretical discussion on the issues at hand. Section 3 presents the baseline model specification that would help empirically address these issues. Section 4 discusses the estimation strategy, and Section 5 interprets the empirical outcomes. Section 6 concludes.

2. Theoretical Discussion

This section first discusses how the duration of the WTO membership can affect trade costs (Section 2.1) and then considers how structural economic vulnerability can affect trade costs (Section 2.2). Finally, it examines the extent to which the duration of GATT/WTO membership and structural economic vulnerability interact in influencing trade costs (Section 2.3).

2.1. Membership in the GATT/WTO and the Stability and Predictability of Trading Environment

Our theoretical argument is that the duration of GATT/WTO membership can affect trade costs through its effect on improving the predictability and stability of the trading environment. This involves not only the regulation of the use of tariffs and other nontariff border barriers, but also the facilitation of trade through the reduction of non-border trade costs. The commitments by WTO members to reduce and bind tariff rates and to limit the utilization of nontariff border barriers to regulate trade[12] play a major role in improving the transparency[13], stability, and predictability of trade policy. Especially, the various WTO

Councils and Committees ensure that members fulfil their transparency obligations in multilateral trade rules. Additionally, the WTO's Trade Policy Review Mechanism (see note 7) performs the function of multilateral surveillance, which indirectly contributes to ensuring the consistency of members' trade policies with WTO rules (e.g., Chaisse and Matsushita 2013; Collins-Williams and Wolfe 2010). According to Annex 3[14] of the Marrakesh Agreement establishing the WTO, the frequency of reviews of a WTO member's trade policy is tightly related to its weight in the multilateral trading system, as defined by that member's share of world trade in goods and services. Especially, the trade policy review is performed every two years for the four largest trading entities (the European Union being considered as a single entity), every four years for the next sixteen countries, and every six years for other members. LDCs enjoy a longer interval for their trade policy review at the WTO. On the empirical front, Aaronson and Abouharb (2014) have examined the performance of WTO members in terms of WTO's norms of good governance (see Aaronson and Abouharb (2014, p. 548). They have observed, among others, that longstanding WTO members have performed well in terms of trade policy transparency and their "ability to review, comment upon, and challenge trade-related policies". In contrast, new members have performed essentially in terms of the transparency of their trade policies. Drabek and Bacchetta (2004) have shown that the membership in the WTO promotes good governance and the implementation of better economic policies. International Monetary Fund et al. (2017) have emphasized that by anchoring tariff reductions, the WTO has helped to lower trade costs through both the substantial reduction of the average tariffs and the dispersion of tariffs over time and across countries. According to Groppo and Piermartini (2014), WTO members' commitments of not increasing tariffs above a certain level have helped significantly reduce trade policy uncertainty. Along the same lines, Jakubik and Piermartini (2019) have shown that member states' trade policy commitments at the WTO have been instrumental in lowering the overall trade policy uncertainty (and reducing the probability of adoption of protectionist measures) because more stringent tariff bindings limit the likelihood of raising tariffs in response to import shocks.

On another note, the WTO dispute settlement legal rulings serve, inter alia, to provide "security and predictability to the multilateral trading system" and to preserve the rights and obligations of members under the covered agreements (Article 3.2 of the DSU[15]). It also serves to "ensure a positive and prompt settlement of disputes; and foster the adoption of mutually acceptable solutions consistent with the covered agreements" (Article 3.7 of the DSU). Shin and Ahn (2019) have shown that the WTO dispute settlement system has genuinely played its role of a regulatory instrument to promote multilateralism and market competition. This is because legally winning a WTO dispute helps promote multilateral trade liberalization, not only by addressing trade problems for prevailing complainants but also by improving market access for all WTO members.

In addition to its rules that govern the utilization of import tariffs and nontariff regulatory measures to regulate trade, the WTO also facilitates cross-border trade flows through the multilateral Trade Facilitation Agreement[16] (TFA) adopted by WTO members at the WTO's Bali Ministerial Conference in December 2013. This agreement aims to simplify, modernize, and harmonize export and import processes, and in this regard, helps to improve the stability and predictability of the trading environment (e.g., Eliason 2015; Grainger 2014; Portugal-Perez and Wilson 2009). The TFA would help reduce trade costs by allowing member states to overcome their soft infrastructure-related challenges (e.g., enhancing transparency, customs efficiency, and implementing institutional reforms), although the provisions in this agreement do not cover hard infrastructure-related bottlenecks (e.g., highways, railroads, and ports) (e.g., Hoekman and Shepherd 2015; Beverelli et al. 2015).

Furthermore, the WTO mobilizes financial resources (the so-called Aid for Trade—AfT flows) to support the efforts of developing member states and the LDCs among them, to build trade capacity. It does so by addressing soft and hard infrastructure-related bottlenecks that obstruct their participation in international trade (e.g., Busse et al. 2012; Calì and te Velde 2011; de Melo and Wagner 2016). These include AfT interventions to build

economic infrastructure (including both soft and hard infrastructure), AfT interventions to foster productive capacities, and AfT flows related to trade policy and regulation. The latter type of AfT flows contribute, inter alia, to strengthening the capacity of policymakers in developing countries to participate in trade negotiations in the WTO, design trade policy, and establish trade-related institutions (or improve existing ones) in a way that is consistent with their commitments at the WTO and more generally with WTO rules. Aid for trade facilitation (as part of AfT interventions for trade policy and regulation) is closely related to the TFA and helps developing countries successfully implement the TFA (e.g., de Melo and Wagner 2016; Hoekman and Nicita 2010).

The empirical literature has established that AfT flows have contributed significantly to reducing trade costs in recipient countries (e.g., Busse et al. 2012; Calì and te Velde 2011; OECD/WTO 2015; Tadesse et al. 2021; Vijil and Wagner 2012). Beyond the trade costs reduction effect of AfT interventions, the literature has also documented the trade costs reduction effect of trade facilitation measures[17] (considered in a broader sense) (e.g., Moïsé and Sorescu 2013) and more specifically of the implementation of the TFA (e.g., Moïsé et al. 2012). Moïsé et al. (2012) empirically obtained that the implementation of the various provisions of the TFA would be associated with trade cost reduction in developing countries by around 14%. Beverelli et al. (2015) have argued that the TFA is likely to result in the reduction of both fixed and variable trade costs, with the fixed costs being associated with the number and complexity of the documents needed for clearance.

Against this background, we postulate that as the time spent as a WTO member state increases, member states will likely improve their trade policy regime[18] and their trade-related institutions (e.g., Basu et al. 2008). It ensues, therefore, that longstanding WTO members (including advanced developing countries) could perform better than relatively new member states in improving their trade policy regime insofar as they are subject to a higher frequency of the multilateral surveillance of their trade policy than relatively new members.

We submit the following two hypotheses.

Hypothesis 1. *The duration of the WTO membership would exert a negative impact on the overall trade costs, i.e., longstanding WTO members are likely to experience a greater (overall) trade costs reduction than relatively new member states.*

Hypothesis 2. *AfT recipient countries are likely to experience a larger reduction of the overall trade costs as they receive higher amounts of total AfT flows. In addition, the greater the amounts of these resource flows, the larger would likely be the overall trade costs reduction effects of the duration of the WTO membership.*

2.2. Effect of Structural Economic Vulnerability on Trade Costs

The high exposure, the high extent of shocks as well as the high frequency of shocks faced by developing countries[19] translates into the high structural economic vulnerability of their economies. The structural economic vulnerability index has two main components, namely the intensity of exposure to shocks and the extent (magnitude) of environmental and external shocks. Components of the index of intensity of exposure to shocks include the population size; the remoteness from world markets; the export product concentration; the share of agriculture, forestry, and fisheries in GDP; and the share of the population living in low-elevated coastal zones. The components of the sub-index of the intensity of exogenous shocks are the agricultural production instability; the export instability; and the index of the victims of natural disasters.

One theoretical argument is that higher structural economic vulnerability (i.e., higher exposure to shocks and/or a greater extent of external shocks) could affect the overall trade costs through their effect on uncertainty[20]. The latter is positively associated with economic policy uncertainty[21] (e.g., Ahir et al. 2019), including trade policy uncertainty, and can generate higher trade costs. For example, total public revenue in many developing

countries is highly dependent on international trade tax revenue. Hence, in the wake of negative trade (e.g., import) shocks, policymakers in these countries may be tempted to adjust their trade policy (for example, by raising import tariffs) so as to recoup trade tax revenue losses. According to Pástor and Veronesi (2013), policy uncertainty rises during recessions because policymakers try to experiment (to search for the right policies) so as to revive economic growth.

Some elements of the exposure to shocks sub-index of EVI are de facto related to trade costs. For example, a high remoteness from the world markets is associated with higher trade costs (e.g., Arvis et al. 2012, 2016; Hou et al. 2021; Novy 2013; Rubínová and Sebti 2021). At the same time, a less diversified economic structure characterized by a higher share of agriculture, forestry, and fisheries in GDP and (in the same vein) a high degree of export product concentration (including on low-value-added products, notably primary commodities) are likely associated with a higher uncertainty. In turn, greater uncertainty could generate higher trade costs (World Trade Organization 2021). For example, according to Koren and Tenreyro (2007) and the World Bank (2013), certain features of developing countries contribute to heightening uncertainty in these countries. These include the less diversified portfolio of export products (including primary products), whose prices are subject to the vagaries of the international trade market, and the susceptibility of developing economies to a variety of shocks, including domestic shocks (e.g., political shocks) and natural disasters. These suggest that a greater intensity of exposure to shocks can be associated with higher trade costs through their positive effects on uncertainty. Similarly, a higher exposure to shocks can increase the demand for insurance by firms, which can translate into higher transport costs and, hence, higher trade costs.

Adverse external and environmental shocks could also raise uncertainty and lead to higher trade costs. This is the case when a higher magnitude of shocks increases the insecurity of international exchange, which in turn raises transaction costs (e.g., Anderson and Marcouiller 2002) and consequently generates higher trade costs. Bekkers and Koopman (2022) have shown that the COVID-19 pandemic has been a major shock to trade costs, as it significantly raises the costs of transporting goods and services. Additionally, natural disasters could be associated with higher trade costs because they destroy (or at least cause temporary disruption in) transport infrastructure (e.g., ports, roads, and railways), which raises transport costs[22]. Even though the availability of many alternative sources of supply and routes for transport can cushion the higher trade costs effects of external shocks (Lundgren 1996), rerouting can also be associated with additional costs. As a consequence, natural disasters are likely to induce higher transport costs despite the availability of alternative sources of supply and routes for transport (World Trade Organization 2021).

The other theoretical argument could be that the higher trade costs effect of structural economic vulnerability can work through the economic growth effect of structural economic vulnerability. The higher trade costs effect of structural economic vulnerability could arise from the uncertainty brought about by the adverse effect of structural economic vulnerability on economic growth and economic volatility. In fact, structural economic vulnerability is a factor of higher economic instability (Guillaumont 2010), and a greater structural economic vulnerability adversely affects economic growth (e.g., Cordina 2004; Gnangnon 2021; Guillaumont and Wagner 2012; Wagner 2014) and induces greater economic growth volatility (Gnangnon 2021). On the other hand, uncertainty arises from adverse aggregate shocks (e.g., Fajgelbaum et al. 2017; Saijo 2017; Van Nieuwerburgh and Veldkamp 2006) or firm-specific shocks (e.g., Ilut and Saijo 2021). The theoretical rationale here is that adverse shocks under asymmetric learning slow down economic activity and make it more difficult for agents to learn about the economy, a phenomenon which amplifies equilibrium dynamics. For example, according to Fajgelbaum et al. (2017), the slowdown in economic activity reduces the flow of new information among agents and raises uncertainty. The economy, therefore, experiences uncertainty traps featured by self-reinforcing episodes of high uncertainty and low economic activity. This feedback loop between uncertainty and economic activity has also been put forth by Saijo (2017), for whom lower investments by

agents during recessions lead to noisier estimates of macroeconomic conditions and higher uncertainty. In turn, the endogenous increase in aggregate uncertainty further reduces economic activity. Bloom (2014) has argued that all types of bad events that cause recessions (e.g., oil price shocks, wars) also generate higher uncertainty at the same time.

Overall, we postulate the following Hypothesis 3.

Hypothesis 3. *Higher structural economic vulnerability leads to an increase in the overall trade costs.*

2.3. How Can the Duration of GATT/WTO Membership and Structural Economic Vulnerability Interact in Affecting Trade Costs?

Thus far, we hypothesized that the membership duration is likely to affect the overall trade costs. On the other hand, an increase in the level of structural economic vulnerability would result in a rise in the overall trade costs. At the same time, the membership duration could affect some aspects of structural economic vulnerability. Therefore, in this sub-section, we propose that the effect of the membership duration on the overall trade costs is likely to depend on the degree of structural economic vulnerability.

In fact, in light of the discussion in the previous two sub-sections, we hypothesize that as the duration of GATT/WTO membership helps to reduce trade costs by making the trading environment more stable and predictable, it could contribute to addressing or mitigating some aspects of countries' structural economic vulnerability. For example, through its positive effect on export diversification, the duration of GATT/WTO membership could reduce its member states' exposure to shocks, and hence their structural economic vulnerability. In fact, the membership in the WTO is positively associated with export product upgrading, including export diversification at the extensive product margin of exports (e.g., Dutt et al. 2013; Dutt 2020; Felbermayr and Kohler 2010). Additionally, the implementation of the WTO TFA has been associated with greater extensive margins of trade, notably in Sub-Saharan Africa, Latin America, and the Caribbean (Beverelli et al. 2015). Moreover, membership in the GATT/WTO could help reduce some sub-components of the shock components of the indicators of structural economic vulnerability, the agricultural production instability and the export instability. This is because Mansfield and Reinhardt (2008) empirically found that preferential trading arrangements and the WTO regime have significantly reduced export volatility. In the same spirit, Cao and Flach (2015) have shown that the GATT/WTO membership has contributed to reducing the volatility of prices over time for both import and export countries. This is particularly the case in member states that entered into the institution through rigorous accession procedures. Likewise, Chowdhury et al. (2021) empirically obtained that the WTO membership has been instrumental in stabilizing international trade, i.e., in reducing trade volatilities.

Incidentally, the 2021 world trade report titled "Economic resilience and trade" has extensively discussed the key role of international cooperation in strengthening countries' resilience to shocks (see World Trade Organization 2021, pp. 122–74). In particular, the WTO supports policies that generate or expand positive spillovers, limits WTO members' discretion to adopt policies that generate negative cross-border spillovers, and offers a forum to address and resolve frictions (see World Trade Organization 2021, p. 11). This report has also largely discussed how WTO members could contribute to building economic resilience by strengthening their cooperation on various issues, including transparency, export restriction, and electronic commerce (see World Trade Organization 2021, p. 123).

Against this background, we argue that WTO membership, including its duration, would reduce the "exposure" component of structural economic vulnerability and limit the intensity of shocks that affect countries. Therefore, we posit the following hypothesis:

Hypothesis 4. *The duration of GATT/WTO membership would exert a higher trade costs reduction in highly vulnerable WTO members than in relatively less vulnerable member states.*

3. Model Specification

The empirical literature has pointed out that a better institutional quality is associated with lower trade costs (e.g., Clark et al. 2004; Hou et al. 2021; Pomfret and Sourdin 2010). Hou et al. (2021) have argued that poor legal enforcement raises trade risks and trade costs because it is associated with higher insurance rates and inventory costs. Pomfret and Sourdin (2010) empirically established that the improvement in the institutional quality helps to reduce trade costs in the most dynamic segment of international trade and time-sensitive manufacturing. Clark et al. (2004) have pointed out that some legal restrictions and the presence of organized crime increase the efficiency of ports and shipping costs.

A country's level of trade costs may depend on their development level, proxied by their real per capita income. In particular, less developed countries may experience higher trade costs than relatively advanced countries.

Development aid can affect trade costs in various ways. As noted above, AfT flows (which represent a non-negligible part of total development aid flows) contribute to trade costs reduction (e.g., Busse et al. 2012; Calì and te Velde 2011; de Melo and Wagner 2016; OECD/WTO 2015; Tadesse et al. 2021; Vijil and Wagner 2012). On the other hand, the other part of total development aid, namely NonAfT flows, could help dampen the adverse economic effects of external shocks and in this way play an important role in helping to reduce trade costs. Savun and Tirone (2012) have found empirical evidence that foreign aid is a useful tool for preventing civil wars in the wake of negative economic shocks. Chauvet and Guillaumont (2009) have found that development aid exerts a large mitigating effect of external shocks on economic growth volatility in vulnerable countries (i.e., countries with a high degree of structural economic vulnerability). In the same spirit, Chen and Singh (2020) have reported that development aid significantly cushions the negative economic growth effect of natural disasters. Mary and Mishra (2020) have found that humanitarian food aid reduces the incidence of small-scale and large-scale civil conflicts and the onset and duration of civil conflicts. Alda and Cuesta (2019) have shown that many countries could improve the efficiency of their humanitarian aid by an average of between 20 percent and 50 percent with respect to best performers. All these empirical findings show that development aid, in particular AfT flows, could help reduce trade costs.

The literature has also documented that financial frictions distort firms' export decisions and act as an important barrier to international trade (e.g., Amiti and Weinstein 2011; Foley and Manova 2015; Kohn et al. 2016; Leibovici 2021; Minetti and Zhu 2011). Access to finance would help trading firms overcome the trade costs (including both fixed and variable trade costs) involved in international trade transactions (e.g., Chaney 2016; Foley and Manova 2015; Leibovici 2021; Manova 2013). In addition, Svaleryd and Vlachos (2002) have shown that the development of the domestic financial market provides firms with greater opportunities for insurance and allows them to diversify risks, and hence allows them to reduce the uncertainty that could arise from greater trade openness. Therefore, we expect that a greater financial development would be associated with lower trade costs. Likewise, an improvement in terms of trade would increase firms' profits from foreign sales and improve their ability to overcome trade costs, in particular after their entry into the export market. However, it is also possible that an improvement in terms of trade leads governments that wish to increase international trade tax revenue to raise tariffs (e.g., Gnangnon 2018). In this case, an improvement in terms of trade could be associated with higher trade costs, notably higher tariff costs. Overall, the expected effect of an improvement in the terms of trade on trade costs is theoretically ambiguous and would therefore be determined empirically.

Against this backdrop, and inspired by previous works on the determinants of trade costs (e.g., Hou et al. 2021; Pomfret and Sourdin 2010), we postulate the following baseline model in the country-year analytical framework:

$$\begin{aligned} Log(COST)_{it} &= \alpha_1 Log(COST)_{it-1} + \alpha_2 DURWTO_{it} + \alpha_3 \text{Log}(\text{EVI})_{it} + \alpha_4 Log(GDPC)_{it} \\ &+ \alpha_5 Log(ODA)_{it} + \alpha_6 FINDEV_{it} + \alpha_7 INST_{it} + \alpha_8 TERMS_{it} + \alpha_9 DUMOUT_{it} \\ &+ \mu_i + \delta_t + \epsilon_{it} \end{aligned} \quad (1)$$

The subscripts i and t indicate a country and a time-period, respectively. The analysis uses an unbalanced panel dataset of 121 countries for which data on structural economic vulnerability is available over the period 1996–2018. Following the practice in the empirical literature, non-overlapping sub-periods have been used to avoid modelling business cycles. Specifically, we have used eight non-overlapping sub-periods of a 3-year average, which are 1996–1998; 1999–2001; 2002–2004; 2005–2007; 2008–2010; 2011–2013; 2014–2016; and 2017–2018 (this sub-period covers only 2 years).

α_1 to α_9 are parameters that we will estimate. μ_i stands for countries' time-invariant specific characteristics. δ_t are sub-period dummies that act for global shocks that affect all countries' level of trade costs simultaneously. These time dummies help to eliminate time-related shocks from the error term and avoid facing the contemporaneous correlation problem. ϵ_{it} is a well-behaving error term.

The dependent variable "COST" is the indicator of trade costs and includes all costs involved in trading goods (agricultural and manufactured goods) internationally with another partner relative to those involved in trading goods domestically. It can be the average overall trade costs, denoted "TRCOST", or one of its two components, namely the average tariff costs denoted "TARIFF" and the average nontariff costs denoted "NTARIFF". These indicators have been computed using the database on bilateral overall trade costs developed by Arvis et al. (2012, 2016) (i.e., the UNESCAP-World Bank Trade Cost Database), building on the approach proposed by Novy (2013), and using the trade costs definition provided by Anderson and van Wincoop (2004). The indicator of the overall trade costs has been computed for a given country and in a given year as the average of the bilateral overall trade costs on goods across all trading partners of that country. The indicator of average tariff costs, which is the first component of the average overall trade costs, has been computed for a given country in a given year as the average of the bilateral comprehensive tariff costs across all trading partners of this country. Note that bilateral tariff costs data were computed by Arvis et al. (2013) as the geometric average of the tariffs imposed by the two partner countries on each other's imports (of agricultural and manufactured goods). The indicator of average nontariff costs (i.e., the second component of the comprehensive trade costs) has been calculated for a given country in a given year as the average of the bilateral comprehensive nontariff costs (i.e., the comprehensive trade costs, excluding the tariff costs) across all trading partners of this country. Higher values of each of these three indicators reflect higher trade costs.

The first key regressor of interest in the analysis is the duration of GATT/WTO membership. It is the transformed indicator of the time spent by a country as a member state of the GATT/WTO. We first compute the indicator "DUR1", which is the duration of membership in the GATT/WTO. It represents, for each country and in a given year, the time that has elapsed since that country has joined the GATT or the WTO. The indicator "DUR1" has been computed taking into account the month (of a given year) in which a country has joined the GATT or WTO. For example, if countries A and B joined the GATT in February 1990 and September 1990, respectively, the variable "DUR" takes the value of 0.166 (=2/12) for country A in the year 1990 and the value of 0.333 (=4/12) for country B in the same year. The value of the indicator "DUR" is then incremented by 1 for every additional year of membership in the GATT/WTO until the year 2018 (i.e., the last year of the period under analysis). The indicator "DUR1" has many zeros. Thus, to transform it using the natural logarithm, we first added to it the value of "0.0001" (equivalent to less than one hour), and then we transformed it: DUR = Log(0.0001 + DUR1). This approach would facilitate the interpretation of results, while allowing obtaining coefficients in terms of elasticity, insofar as the dependent variable has also been transformed using the natural logarithm. Appendix B presents the duration of the GATT/WTO membership for each country in the panel dataset, as at 2018, which is the last year of the panel dataset.

The second regressor of interest in the analysis is the indicator of structural economic vulnerability described in Section 2 and denoted "EVI" in model (1). As noted above, it has two major components, namely the intensity of the exposure to shocks, denoted "EXPO-

SURE", and the magnitude of shocks, denoted "SHOCK". Each of these two components of EVI has been calculated using a weighted average of the different sub-component indexes described above, with the sum of components' weights being equal to 1. The indicator "EVI" has been computed as the simple arithmetic average of its two components, and its values of "EVI" range between 0 and 100 (see Feindouno and Goujon 2016 for further details on the computation of this indicator).

The variables "GDPC" and "ODA" are the real per capita GDP (constant 2010, USD) and the real gross disbursements of total Official Development Assistance (ODA) (constant prices 2019, US Dollar), respectively. The variables "FINDEV", "INST", and "TERMS" stand for the indicator of financial development (proxied by the share of domestic credit to private sector by banks in GDP, and not expressed in percentage), the indicator of the quality of governance and institutions, and the index of the terms of trade, respectively. Appendices A and B present the description of the variables contained in model (1) and the list of the 121 countries contained in the dataset used in the analysis, respectively. Appendix C contains the descriptive statistics related to variables used in the analysis.

We have applied the natural logarithm to the variables "COST", "EVI", "GDPC", and "ODA" to reduce their skewed distributions. The sources of all regressors are provided in Appendix A.

To obtain a first glimpse of the correlation between the key indicators of interest in the analysis, we use the dataset over the non-overlapping sub-periods to present in Figure 1 the development of the indicators of the overall trade costs and the indicator of the structural economic vulnerability. Using the same dataset, we display in Figure 2 the correlation pattern between the transformed indicator of the duration of GATT/WTO membership and the indicator of the overall trade costs (see the left-hand side graph in Figure 2). The right-hand side graph of Figure 2 shows the correlation pattern between the indicator of structural economic vulnerability and the indicator of the duration of GATT/WTO membership. We note from Figure 1 that the indicator of structural economic vulnerability and the indicator of the overall trade costs moved in opposite directions. Structural economic vulnerability had steadily declined, from 36.14 in 1996–1998 to 32 in 2017–2018. At the same time, the indicator of the average overall trade costs increased from 283.5 in 1996–1998 to 334.6 in 2008–2010. It then declined to reach 316.4 in 2017–2018. While the correlation pattern observed in the left-hand side graph in Figure 2 between the variables "EVI" and "DUR1" is slightly negative, structural economic vulnerability appears to be positively correlated with the overall trade costs (see the right-hand side graph in Figure 2).

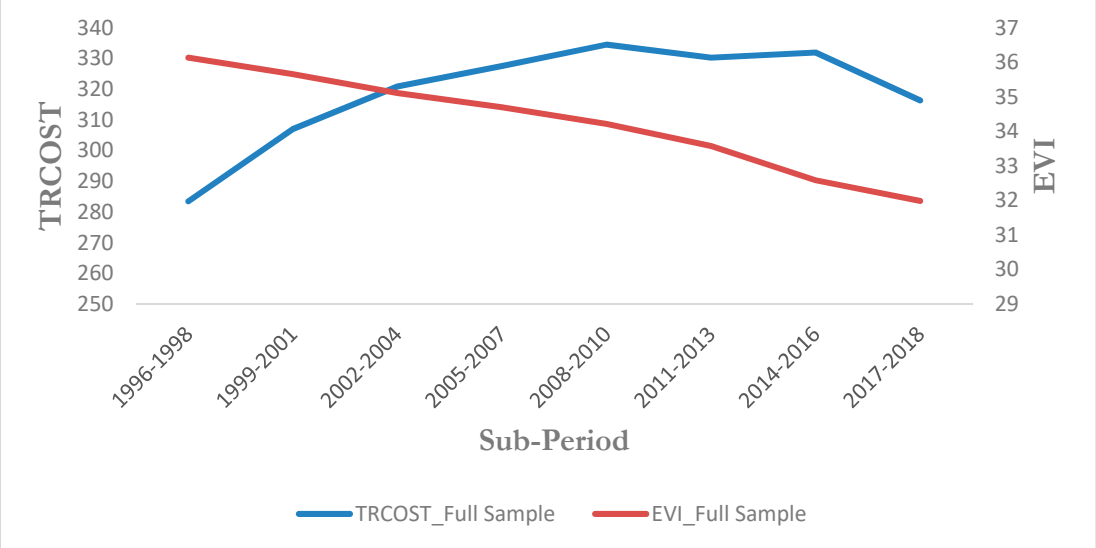

Figure 1. Structural Economic Vulnerability and the overall Trade Costs over the full sample. Source: Author.

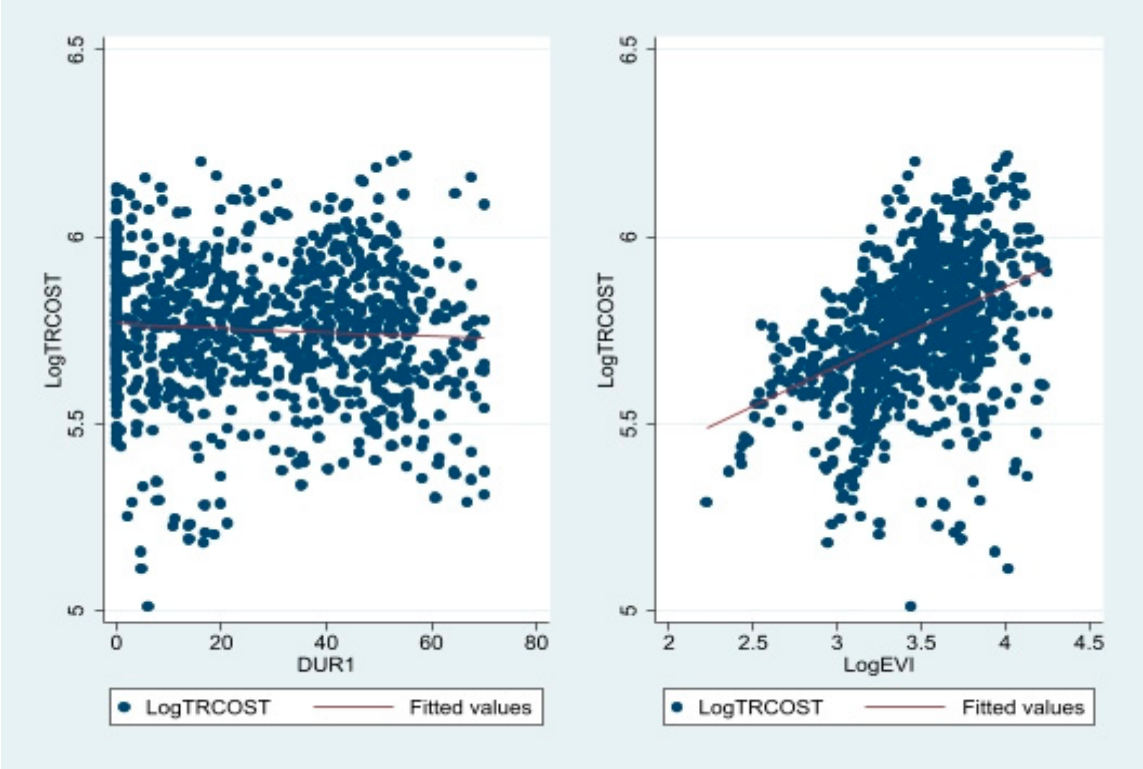

Figure 2. Correlation between the duration of GATT/WTO Membership, Structural economic vulnerability, and the overall trade costs over the full sample. Source: Author. Note: The variable "DUR1" is the indicator of the duration of GATT/WTO membership.

4. Estimation Strategy

We estimate model (1) and its different variants presented below using the two-step system generalized method of moments (GMM) estimator (see Arellano and Bover 1995; Blundell and Bond 1998), which is widely used in empirical microeconomic and macroeconomic analyses. This estimator is suitable for dynamic panel datasets that have a small time dimension and a large cross-sectional dimension and where time series display a strong persistence (e.g., Alonso-Borrego and Arellano 1999; Bond 2002). The dataset used in the present analysis meets these criteria. The two-step system GMM estimator helps to handle (or at least mitigate) the endogeneity problem generated by the correlation between the lagged dependent variable (as a regressor) and countries' fixed effects in the error term (Nickell bias—Nickell 1981). It also helps handle the endogeneity concern arising from the possible reverse causality between the dependent variable and all regressors, except for the indicator of terms of trade. The reverse causality problems can be explained as follows. Countries join the WTO and stay in the organization as members in order to take full advantage of the WTO membership, owing to, for example, the "locking in trade policy" effects of the multilateral trade agreements, including through trade costs reduction and enhancement of participation in international trade. Thus, one could expect non-WTO member states with higher trade costs to strive to join the organization. Similarly, WTO members would be willing to pursue their membership in the WTO so as to enhance the reform of their trade regimes. On another note, while we expect the real per capita income (as proxy for the economic development level) to affect trade costs, it could also be envisaged that trade costs influence the real per capita income (e.g., Sakyi et al. 2018). Hence, there is possible endogeneity of the real per capita income indicator. The endogeneity of the development aid variable is explained by the fact that countries that face higher trade costs (i.e., countries that lack adequate soft and hard infrastructure to participate effectively in international trade) could benefit from higher development aid, including both AfT flows and NonAfT flows from donor countries. Incidentally, countries that face higher trade

costs may be willing to further develop their domestic financial markets and improve the institutional quality, with a view to lowering these trade costs and facilitating their firms' participation in international trade.

In using the two-step system GMM estimator, we estimate a system of equations that combines an equation in differences and an equation in levels. In this system of equations, the lagged first difference variables are used as instruments in the equation in levels, and the lags of the variables in levels are used as instruments of the first-difference equation. The correctness of a specification of model (1) estimated by the two-step system GMM estimator is evaluated by means of a number of diagnostic tests: the Arellano–Bond test of the presence of first-order serial correlation in the first-differenced error term (AR (1)); the Arellano–Bond test of the absence of second-order autocorrelation in the first-differenced error term (denoted AR (2)); and the Hansen/Sargan test of over-identifying restrictions (OID). The *p*-values of the relevant statistics of the AR(1) and AR(2) tests should be lower than 0.10 and higher than 0.10 at the 10% level, respectively. The *p*-value of the statistic associated with the OID test should be higher than 0.1 at the 10% level. Finally, we avoid the proliferation of instruments in regressions by capping the number of lags of variables used as instruments to two. It is important to note here that when performing the different regressions based on the two-step system GMM estimator (see the description of these regressions below), we noticed that the variable "COST" displays a strong state dependence path. Therefore, to meet the requirements of the two-step system GMM described above, we had to use two lags of the indicator of the overall trade costs as right-hand side regressors, two lags of the indicator of nontariff costs as right-hand side regressors, and three lags of the indicator of tariff costs as regressors (otherwise, the requirements of the estimator were not met).

Even though the two-step system GMM estimator is our main estimator in the analysis, we nevertheless commence the analysis by estimating model (1) using the standard econometric estimators, namely the pooled ordinary least squares (POLS) and the within fixed effects (FE) estimators. The results of these estimations (where the dependent variable is the overall trade costs) are presented in columns (1) and (2) of Table 1. While these results can be biased because of the endogeneity concerns raised above, they are still useful for comparison purposes, including with the estimation's results obtained when using the two-step system GMM estimator. Furthermore, the comparison of the coefficients of the lags of the dependent variable arising from the use of the POLS, FE, and two-step system GMM estimators represents an additional way to check the correctness of the model (1) specification estimated. Especially, Bond et al. (2001) have suggested that the coefficient(s) of the lagged dependent variable(s) obtained from the use of the two-step system GMM estimator should be lower than the coefficient(s) of the same lagged dependent variable(s) arising from the use of the POLS estimator. Concurrently, it should be higher than the coefficient(s) of the same lagged dependent variable(s) arising from the use of the FE estimator.

The empirical analysis conducted using the two-step system GMM estimator proceeds as follows.

Column (3) of Table 1 reports the estimates obtained from the specification of model (1), where the variable "COST" is measured only by the indicator of the overall trade costs. Columns (4) and (5) report the estimates obtained when estimating the model (1) still with the indicator of the overall trade costs as the dependent variable, but where the variable "EVI" have been replaced with its two main components, namely the intensity of exposure to shocks and the magnitude of shocks. These outcomes help test Hypotheses 1 and 3 set out in Section 2.

Table 1. Effect of the duration of GATT/WTO membership and structural economic vulnerability on the overall trade costs. Estimators: POLS, FE, and two-step system GMM.

	POLS	**FE**	**Two-Step System GMM**		
Variables	Log(TRCOST)	Log(TRCOST)	Log(TRCOST)	Log(TRCOST)	Log(TRCOST)
	(1)	(2)	(3)	(4)	(5)
$Log(TRCOST)_{t-1}$	1.196 ***	0.637 ***	1.071 ***	1.049 ***	1.092 ***
	(0.0242)	(0.0486)	(0.0321)	(0.0288)	(0.0299)
$Log(TRCOST)_{t-2}$	−0.290 ***	−0.0749 ***	−0.233 ***	−0.199 ***	−0.214 ***
	(0.00964)	(0.0186)	(0.0324)	(0.0263)	(0.0267)
DUR	0.000347 **	−0.00333 ***	−0.00265 ***	−0.00161 **	−0.00231 **
	(0.000172)	(0.000552)	(0.000951)	(0.000652)	(0.00101)
Log(EVI)	0.0160 *	0.0644 *	0.0583 ***		
	(0.00874)	(0.0353)	(0.0131)		
Log(EXPOSURE)				0.0314 ***	
				(0.0108)	
Log(SHOCK)					0.0267 ***
					(0.00850)
Log(GDPC)	−0.00609	−0.102 ***	0.0162 *	−0.00272	0.0168 *
	(0.00411)	(0.0289)	(0.00937)	(0.00629)	(0.00957)
Log(ODA)	−0.00770 ***	0.00782 ***	0.00530	0.000786	−0.000482
	(0.00144)	(0.00174)	(0.00333)	(0.00326)	(0.00358)
FINDEV	−0.0247 ***	−0.0116	−0.0474 ***	−0.0599 ***	−0.0541 ***
	(0.00695)	(0.0146)	(0.0172)	(0.0145)	(0.0158)
INST	0.000688	0.00538	0.00126	0.00708 **	0.00181
	(0.00243)	(0.00518)	(0.00388)	(0.00299)	(0.00380)
Log(TERMS)	−0.0160 ***	−0.0195 ***	−0.0447 ***	−0.0246 **	−0.0396 ***
	(0.00477)	(0.00608)	(0.0108)	(0.00967)	(0.0104)
Constant	0.689 ***	2.975 ***			
	(0.159)	(0.216)			
Observations—Countries	582–121	582–121	582–121	602–121	583–121
R-squared/Within R-squared	0.878	0.417			
AR1 (*p*-Value)			0.0000	0.0000	0.0000
AR2 (*p*-Value)			0.6661	0.9019	0.7641
OID (*p*-Value)			0.2675	0.3311	0.4418

Note: * *p*-value < 0.1; ** *p*-value < 0.05; *** *p*-value < 0.01. Robust standard errors are in parentheses. In the regressions based on the two-step system GMM approach, the variables "DUR", "EVI", "EXPOSURE", "SHOCK", "DUMOUT", "ODA", "FINDEV", "INST", and the interaction variables have been treated as endogenous. Time dummies have been included in the regressions.

In Table 2, we re-estimate the model specifications whose results were reported in column (3) of Table 1, but where the dependent variables are the indicator of tariff costs (see results in column (1) of Table 2) and the indicator of nontariff costs (see results in column (2) of Table 2). It is important to point out that in the specifications of model (1) where the variables "TARIFF" (in Log) and "NTARIFF" (in Log) are dependent variables, we have included the indicators of "NTARIFF" (in Log) and "TARIFF" (in Log) as regressors, respectively. The objective of doing so is, for example, for the first regression, to examine the effect of the membership duration and structural economic vulnerability on the overall trade costs that do not work through nontariff costs, while concomitantly controlling for the effect of nontariff costs on tariff costs. The same reasoning applies to the second regression with "NTARIFF" (in Log) as the dependent variable: here, the introduction of the indicator "TARIFF" (in Logs) allows not only to control for the effect of the membership duration and structural economic vulnerability on nontariff costs that do not translate through tariff costs but also to obtain the effect of tariff costs on nontariff costs. All these outcomes help test Hypotheses 1 and 3 set out in Section 2.

Table 2. Effect of the duration of GATT/WTO membership and structural economic vulnerability on tariff and nontariff costs. Estimator: Two-step system GMM.

	Log(TARIFF)	**Log(NTARIFF)**
Variables	(1)	(2)
One-period lag of the dependent variable	0.643 ***	0.997 ***
	(0.0307)	(0.0189)
Two-period lag of the dependent variable	−0.0641 ***	−0.132 ***
	(0.0134)	(0.0146)
Three-period lag of the dependent variable	0.0808 ***	
	(0.0122)	
DUR	−0.000436 ***	−0.00202 **
	(0.000131)	(0.000829)
Log(EVI)	0.00423 **	0.0780 ***
	(0.00195)	(0.00937)
Log(NONTARIFF)	0.00949 ***	
	(0.00289)	
Log(TARIFF)		0.339 ***
		(0.0850)
Log(GDPC)	3.05×10^{-05}	0.00780
	(0.00114)	(0.00618)
Log(ODA)	−0.000408	5.38×10^{-05}
	(0.000417)	(0.00261)
FINDEV	0.00434 **	−0.0636 ***
	(0.00200)	(0.0124)
INST	−0.00101 *	−0.00199
	(0.000603)	(0.00255)
Log(TERMS)	−0.000650	−0.0266 ***
	(0.00171)	(0.00842)
Observations—Countries	404–107	503–115
AR1 (*p*-Value)	0.0255	0.0000
AR2 (*p*-Value)	0.8789	0.7797
OID (*p*-Value)	0.3547	0.5091

Note: * *p*-value < 0.1; ** *p*-value < 0.05; *** *p*-value < 0.01. Robust standard errors are in parentheses. The variables "DUR", "EVI", "GDPC", "ODA", "FINDEV", "INST", and the interaction variables have been treated as endogenous. Time dummies have been included in the regressions.

Outcomes reported in Table 3 allow testing whether the effect of countries' duration of GATT/WTO membership on the overall trade costs depends on their level of structural economic vulnerability (i.e., the EVI and its components). These outcomes help test Hypothesis 4 set out in Section 2. They are obtained from the estimation of different specifications of model (1), where the dependent variable is the overall trade costs, and that contains the interaction between the indicator of structural economic vulnerability (or each of its two components) and the indicator of the duration of GATT/WTO membership.

Table 3. Interaction effect of the duration of GATT/WTO membership and structural economic vulnerability on the overall trade costs. Estimator: Two-step system GMM.

Variables	Log(TRCOST)	Log(TRCOST)	Log(TRCOST)
	(1)	(2)	(3)
$Log(TRCOST)_{t-1}$	1.083 ***	1.062 ***	1.097 ***
	(0.0249)	(0.0229)	(0.0234)
$Log(TRCOST)_{t-2}$	−0.242 ***	−0.191 ***	−0.221 ***
	(0.0248)	(0.0196)	(0.0230)
Log(EVI)	0.0539 ***		
	(0.0104)		
DUR	−0.00324	0.0139 ***	0.00344
	(0.00494)	(0.00310)	(0.00403)
DUR *Log(EVI)	0.000147		
	(0.00137)		
DUR *Log(EXPOSURE)		−0.00427 ***	
		(0.000911)	
Log(EXPOSURE)		0.0256 ***	
		(0.00884)	
DUR *Log(SHOCK)			−0.00176
			(0.00111)
Log(SHOCK)			0.0316 ***
			(0.00651)
Log(GDPC)	0.0139 *	0.00147	0.0110
	(0.00756)	(0.00452)	(0.00764)
Log(ODA)	0.00619 **	−0.00212	0.000885
	(0.00258)	(0.00239)	(0.00281)
FINDEV	−0.0418 ***	−0.0592 ***	−0.0303 **
	(0.0132)	(0.0114)	(0.0135)
INST	0.00351	0.00497 *	0.00189
	(0.00315)	(0.00279)	(0.00328)
Log(TERMS)	−0.0439 ***	−0.0238 ***	−0.0457 ***
	(0.00984)	(0.00787)	(0.0100)
Observations—Countries	582–121	602–121	583–121
AR1 (*p*-Value)	0.0000	0.0000	0.0000
AR2 (*p*-Value)	0.6307	0.9263	0.7111
OID (*p*-Value)	0.3120	0.4697	0.2713

Note: * *p*-value < 0.1; ** *p*-value < 0.05; *** *p*-value < 0.01. Robust standard errors are in parentheses. The variables "DUR", "EVI", "EXPOSURE", "SHOCK", "GDPC", "ODA", "FINDEV", "INST", and the interaction variables have been treated as endogenous. Time dummies have been included in the regressions.

In light of the importance of development aid (including AfT flows) for trade costs reduction (see discussion in Section 2) and given especially that the developing members of WTO receive higher AfT flows (Lee et al. 2015), we move on to testing Hypothesis 4 set out in Section 2. We do so by exploring whether the effect of the duration of GATT/WTO membership on trade costs depends on the amounts of development aid received by countries. We first empirically address this question by estimating a series of specifications of model (1), where the dependent variable is the indicator of the overall trade costs, and in which we include the interaction between a relevant development aid variable and the indicator of the duration of GATT/WTO membership. Here, development aid variables include total development aid ("ODA") and its two major components, namely total AfT flows (denoted "AfT") and total NonAfT flows (denoted "NonAfT"). The outcomes of the estimation of these specifications of model (1) are presented in columns (1) to (3) of Table 4. Note that in all these regressions, the variables measuring total AfT flows and NonAfT flows are expressed in constant prices 2019, US Dollar (see Appendix A for the description of these two variables).

Table 4. Effect of the duration of GATT/WTO Membership on structural economic vulnerability on trade costs. Estimator: Two-step system GMM.

Variables	Log(TRCOST)	Log(TRCOST)	Log(TRCOST)
	(1)	(2)	(3)
One-period lag of the dependent variable	1.049 ***	1.091 ***	1.076 ***
	(0.0232)	(0.0239)	(0.0267)
Two-period lag of the dependent variable	−0.215 ***	−0.248 ***	−0.212 ***
	(0.0244)	(0.0267)	(0.0315)
DUR	0.0191 ***	0.00909 **	0.0406 ***
	(0.00617)	(0.00371)	(0.00773)
DUR *Log(ODA)	−0.00108 ***		
	(0.000309)		
Log(ODA)	−0.00103		
	(0.00245)		
DUR *Log(AfT)		−0.000701 ***	
		(0.000211)	
Log(AfT)		0.00395	
		(0.00260)	
DUR *Log(NonAfT)			−0.00230 ***
			(0.000397)
Log(NonAfT)			0.00676 **
			(0.00274)
Log(EVI)	0.0326 ***	0.0593 ***	0.0462 ***
	(0.0107)	(0.0124)	(0.0124)
Log(GDPC)	0.00238	0.0145 **	0.00598
	(0.00542)	(0.00629)	(0.00761)
FINDEV	−0.0574 ***	−0.0503 ***	−0.0534 ***
	(0.0151)	(0.0134)	(0.0144)
INST	0.00679 ***	−0.000464	0.00500 *
	(0.00235)	(0.00293)	(0.00289)
Log(TERMS)	−0.0407 ***	−0.0334 ***	−0.0379 ***
	(0.00993)	(0.00969)	(0.0107)
Observations–Countries	582–121	592–116	592–116
AR1 (*p*-Value)	0.0000	0.0000	0.0000
AR2 (*p*-Value)	0.7845	0.6873	0.8952
OID (*p*-Value)	0.3012	0.2404	0.2446

Note: * *p*-value < 0.1; ** *p*-value < 0.05; *** *p*-value < 0.01. Robust standard errors are in parentheses. The variables "DUR", "EVI", "AfT", "NonAfT", "ODA", "GDPC", "FINDEV", "INST", and the interaction variables have been treated as endogenous. Time dummies have been included in the regressions.

5. Empirical Results

Results in Tables 1–4 show that the three indicators of trade costs display a strong state-dependent path, as the coefficients of the lags of these variables (as regressors) are significant at the 1% level. In addition, the outcomes of the diagnostic tests related to the validity of the two-step system GMM (reported at the bottom of columns (3) to (5) of Table 1, and in Tables 2–4) indicate that all variants of model (1) estimated using the two-step system GMM estimator are correctly specified. Moreover, we obtain that, as suggested by Bond et al. (2001), the coefficients of the lagged dependent variables (introduced as regressors) obtained by the two-step system GMM estimator lie between the coefficients of the same variables obtained using the within fixed effects estimator, and the estimates of these variables are obtained by means of the POLS estimator (see results in columns (1) to (3) of Table 1). All these outcomes suggest that the two-step system GMM estimator is suitable for the empirical analysis.

Interpretation of results in Table 1

As noted above, while results based on the POLS and FE estimators (see columns (1) and (2) of Table 1) could be biased, they could be compared to those obtained when using the two-step system GMM estimator (see column (3) of Table 1). We note from column (1)

of Table 1 that the duration of GATT/WTO membership exerts a positive and significant effect (at the 5% level) on the overall trade costs. Results in column (2) of the table (i.e., the ones based on the FE estimator) indicate that the membership duration is associated with the fall in the overall trade costs at the 1% level. Outcomes in column (2) of Table 1 suggest that an additional year of WTO membership (i.e., an increase in the value of the duration of GATT/WTO membership[23] ("DUR") by 1 year, i.e., by 100 percent) is associated with a 0.333 percentage (=0.00333 × 100) decrease in the overall trade costs. In the meantime, structural economic vulnerability exerts a positive and significant effect on the overall trade costs (it is significant only at the 10% level in columns (1) and (2)). Focusing on the outcomes in column (2), we obtain that, at the 10% level, a 1 percent increase in the value of structural economic vulnerability is associated with 0.064 percent increase in the overall trade costs. Concerning the estimates of control variables, we obtain from outcomes in column (1) that the real per capita income exerts no significant effect (at the conventional significance levels) on the overall trade costs. Results in column (2) indicate that at the 1% level, countries with a higher real per capita income experience lower overall trade costs than countries with a relatively lower income per capita. Development aid and terms of trade improvements are associated with lower trade costs for results based on the POLS and FE estimators. While the institutional quality exerts no significant effect on the overall trade costs in the first two columns of Table 1, financial development appears to be associated with lower trade costs for results based on the POLS estimator but exerts no significant effect on trade costs for results based on the FE estimator (see column (2)).

Turning now to outcomes reported in column (3) of Table 1 (the ones based on the two-step system GMM approach), we obtain that the duration of GATT/WTO membership negatively and significantly (at the 1% level) affects the overall trade costs, and the structural economic vulnerability positively and significantly (at the 1% level) affects the overall trade costs. Precisely, an additional year of WTO membership is associated with a fall in the values of the indicator of overall trade costs by 0.265 percent (=0.00265 *100). The magnitude of this negative effect (−0.00265) as reported in column (3) of Table 1 is slightly lower than the one (−0.00333) obtained in column (2) of Table 1 (result based on the FE estimator). On the other hand, a 1 percent increase in the values of the index of structural economic vulnerability is associated with a rise in the values of the index of overall trade costs by 0.058 percent. The positive effect of structural economic vulnerability on the overall trade costs is confirmed by the positive and significant effects (at the 1% level) of its two major components on the overall trade costs (see columns (4) and (5) of Table 1). An increase in the intensity of exposure to shocks by 1 percent induces an increase in the values of the index of overall trade costs by 0.031 percent (see column (4)). An increase in the magnitude of shocks by 1 percent induces an increase in the values of the index of overall trade costs by 0.0267 percent (see column (5)). All these outcomes lend credence to Hypotheses 1 and 3. Incidentally, the negative and significant effect (at the 1% level) of the duration of GATT/WTO membership on the overall trade costs obtained in column (3) of Table 1 are confirmed in columns (4) and (5) of the same table, although with slightly different magnitudes of the effects. Results concerning control variables are quite similar in columns (3) to (5) of Table 1. They suggest the absence of significant impact (at the 5% level) of the real per capita income on the overall trade costs. At the same time, a higher volume of credit to the private sector and terms of trade improvements exert negative and significant effects on the overall trade costs. Development aid flows do not significantly affect the overall trade costs in the three columns of the table. In columns (3) and (4), the institutional quality appears to exert no significant effect on the overall trade costs, while in column (4), we find—with surprise—that its effect on the overall trade costs is positive and significant at the 5% level. It is difficult to explain this peculiar outcome, although one may argue that this effect reflects differentiated effects across countries in the full sample. Testing this assumption goes beyond the scope of the present analysis.

The institutional quality exerts no significant effect (at the conventional significance levels) on the overall trade costs. It is worth noting at this stage of the analysis that results of control variables in Tables 2–4 align broadly with those in columns (3) to (5) of Table 1.

Interpretation of results in Table 2

Outcomes in column (1) of Table 2 suggest that the duration of GATT/WTO membership and structural economic vulnerability exert a negative and positive effect (both being significant at least at the 5% level) on tariffs costs and nontariff costs, respectively. Once again, these outcomes lend support to Hypotheses 1 and 3. An additional year of WTO membership leads to a decline in tariff costs by 0.044 percent (=0.000436 $\times$ 100) and a fall in nontariff costs by 0.202 percent (=0.000202 $\times$ 100). These, therefore, suggest that countries' membership in the WTO allows them to reduce more tariff costs than nontariff costs over time. A 1 percent increase in the values of the index of structural economic vulnerability leads to an increase in tariff costs by 0.004 percent (see column (1)) and a rise in nontariff costs by 0.078 percent. Hence, structural economic vulnerability exerts a higher positive effect on nontariff costs than on tariff costs. As for control variables, we observe that at the 1% level, countries that face higher nontariff costs tend to also experience higher tariff costs (see column (2)), and vice versa (see column (3)). Likewise, at the conventional significance levels, the real per capita income, development aid, and the terms of trade exert no significant effect on both tariff costs and nontariff costs, while the institutional quality appears to significantly (but only at the 10% level) affect tariff costs, as it exerts no significant effect on nontariff costs. Finally, financial development is positively associated with tariff costs but negatively associated with nontariff costs, at least at the 5% level. This may suggest that countries with a greater financial development tend to experience higher tariff costs but lower nontariff costs.

Interpretation of results in Table 3

We now consider outcomes in Table 3. We observe from column (1) that neither the coefficient of the variable "DUR" nor the interaction term of the interaction variable between the variable "DUR" and the variable measuring the structural economic vulnerability are significant at the conventional significance levels. These outcomes indicate that on average, over the full sample, the effect of the membership duration on trade costs does not appear to depend on the size of structural economic vulnerability.

This finding is reflected in Figure 3 that shows, at confidence intervals of 95 percent, the marginal impact of the duration of GATT/WTO membership on the overall trade costs for varying degrees of structural economic vulnerability. It indicates that this marginal impact is always negative but not always significant. In particular, it is not significant for relatively low levels of structural economic vulnerability. However, for countries that experience a relatively high degree of structural economic vulnerability, the membership duration is associated with a decline in the overall trade costs, with the magnitude of this negative effect becoming slightly higher as the level of structural economic vulnerability increases. Thus, one key message conveyed by Figure 3 is, therefore, that the duration of GATT/WTO membership reduces the overall trade costs in highly vulnerable countries, and the higher the degree of structural economic vulnerability, the relatively larger the negative impact of the duration of GATT/WTO membership on the overall trade costs.

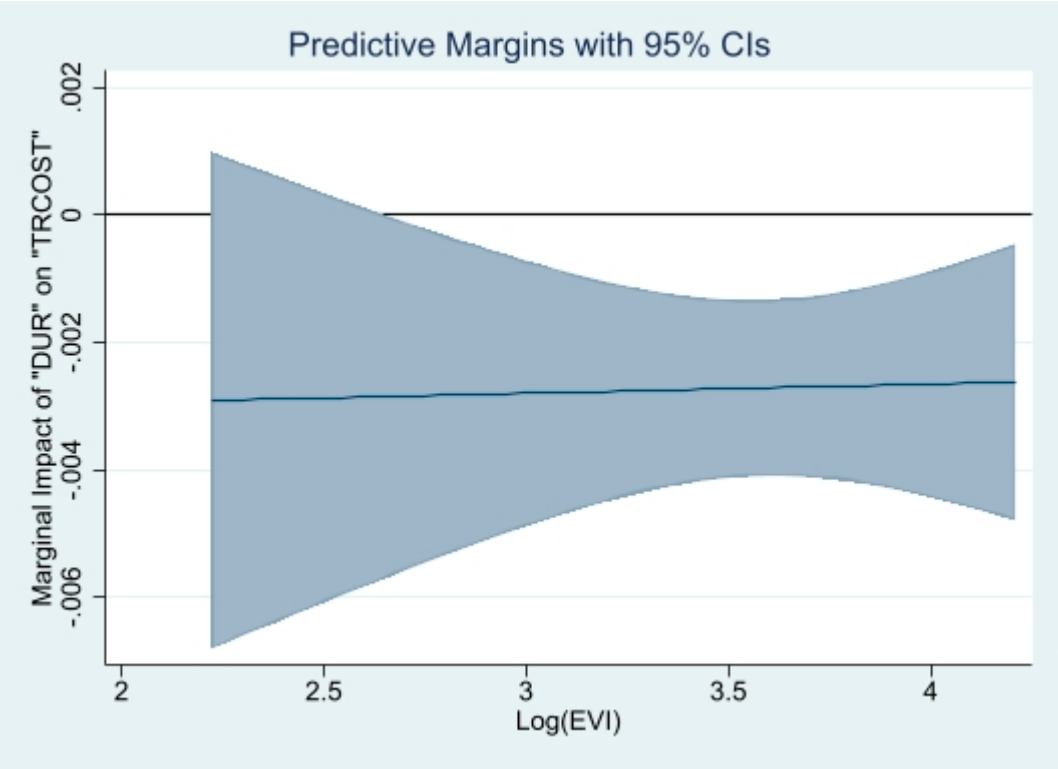

Figure 3. Marginal impact of "DUR" on "TRCOST" for varying degrees of structural economic vulnerability. Source: Author.

Estimates in column (2) of Table 3 show that the coefficient of "DUR" is positive and significant at the 1% level, while the interaction term of the variable "DUR *Log(EXPOSURE)" is negative and significant at the 1% level. We infer that on average over the full sample, the effect of the membership duration on the overall trade costs changes sign (and in particular becomes negative) for values of the indicator of exposure to shocks higher than 25.93 (=exponential (0.0139/0.00427)). It may be useful to recall here that the maximum value of the variable "EXPOSURE" in the full sample is 79 (see Appendix B). We conclude that on average, over the full sample, countries whose degree of exposure to shocks exceeds the value of 25.93 experience a fall in their overall trade costs as their membership duration expands. For these countries, the higher the level of exposure to shocks, the greater the magnitude of the negative effect of the membership duration on the overall trade costs. In contrast, the membership duration exerts a positive effect on the overall trade costs in countries with relatively lower levels of exposure to shocks (i.e., values lower than 25.93). These outcomes are reflected in Figure 4, which provides, at confidence intervals of 95 percent, the marginal impact of the duration of GATT/WTO membership on the overall trade costs for varying levels of exposure to shocks. It appears from this figure that countries that face high degrees of exposure to shocks enjoy lower trade costs as their membership duration increases. In contrast, among GATT/WTO members states with relatively lower levels of exposure to shocks, longstanding members experience a higher fall in trade costs as their membership duration expands than relatively new GATT/WTO members.

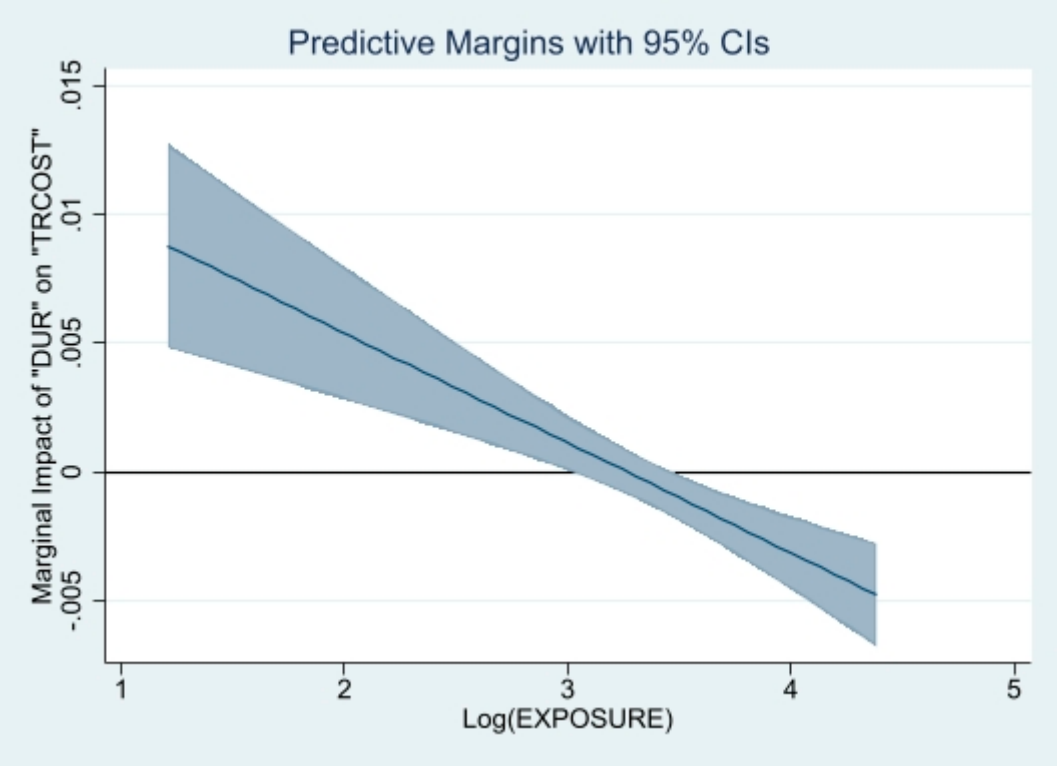

Figure 4. Marginal impact of "DUR" on "TRCOST" for varying degrees of exposure to shocks. Source: Author.

Finally, we note from column (3) of Table 3 that, like in column (1) of the same Table, we find that neither the coefficient of "DUR" nor the interaction variable between "DUR" and the indicator of the size of shocks are significant at the 10% level. Therefore, we could be tempted to infer that on average over the full sample, the effect of the membership duration on the overall trade costs does not depend on the magnitude of shocks that hit countries. However, Figure 5 provides a slightly different story. It shows, at confidence intervals of 95 percent, the marginal impact of the duration of GATT/WTO membership on the overall trade costs for varying magnitudes of shocks. We observe that for high levels of shocks, the membership duration exerts a negative effect on the overall trade costs, and the greater the size of shocks, the larger the negative effects of the membership duration on the overall trade costs. Conversely, countries that face relatively lower magnitudes of shocks experience no significant effect of the membership duration on the overall trade costs.

Overall, the findings from Table 3 tend to confirm Hypothesis 4 set out in Section 2 that longstanding WTO members that are highly vulnerable to shocks experience lower overall trade costs than relatively new WTO members that face the same level of structural economic vulnerability.

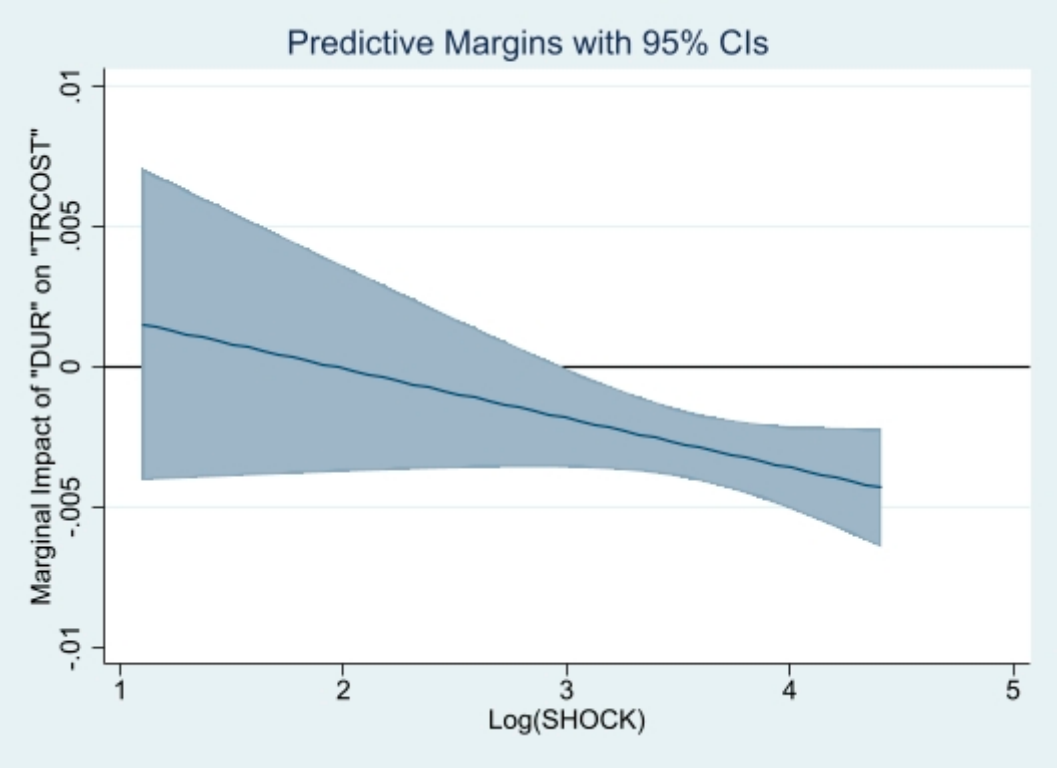

Figure 5. Marginal impact of "DUR" on "TRCOST" for varying sizes of shocks. Source: Author.

Interpretation of results in Table 4

Outcomes in Table 4 help, inter alia, to examine the extent to which development aid influences the effect of the duration of GATT/WTO membership on trade costs indicators. We obtain across columns (1) to (3) that the coefficient of the variable "DUR" is always positive and significant at least at the 5% level. In the same columns of the table, the interaction terms associated with the interaction variables (that capture the interaction between the variable "DUR" and each aid variable, i.e., total ODA flows, AfT flows, and NonAfT flows) are negative and significant at the 1% level. These outcomes suggest that, on average, over the full sample, the duration of GATT/WTO membership reduces the overall trade costs when development aid flows exceed a certain amount (otherwise, the membership duration induces higher trade costs). On average, over the full sample, this amount development aid is USD 47.93 million (=exponential (0.0191/0.00108)) for total ODA flows, USD 0.428 million (=exponential (0.00909/0.000701)) for total AfT flows, and USD 46.37 million (=exponential (0.0406/0.00230)) for NonAfT flows. As a reminder, values of total ODA, AfT flows, and NonAfT flows (in millions of USD) in the full sample range between 0.16 and 15300; 0.0533 and 3640; and 2.42 and 12400, respectively (see Appendix C). As these amounts of development aid represent average amounts in the full sample, we find it useful to examine, at 95 percent confidence intervals, the marginal impact of the duration of GATT/WTO membership on the overall trade costs, for varying amounts of development aid, including total ODA (see Figure 6), AfT flows (see Figure 7), and NonAfT flows (see Figure 8). The three Figures 6–8 display similar patterns, whereby for high amounts of aid inflows (be these total ODA flows, AfT flows, or NonAfT flows), the membership duration exerts a negative effect on the overall trade costs. In contrast, for low amounts of aid inflows, the membership duration exerts a positive effect on the overall trade costs, and for moderate amounts of development aid inflows, there is a statistically nil effect on the overall trade costs. Thus, the key message from the first three columns of Table 4 is that countries that benefit from high amounts of development aid flows, including both AfT flows and NonAfT flows, experience a fall in the overall trade costs as their membership duration expands. For these countries, the higher the amounts of development aid inflows,

the greater the magnitude of the negative effect of the membership duration on the overall trade costs. These findings support Hypothesis 2.

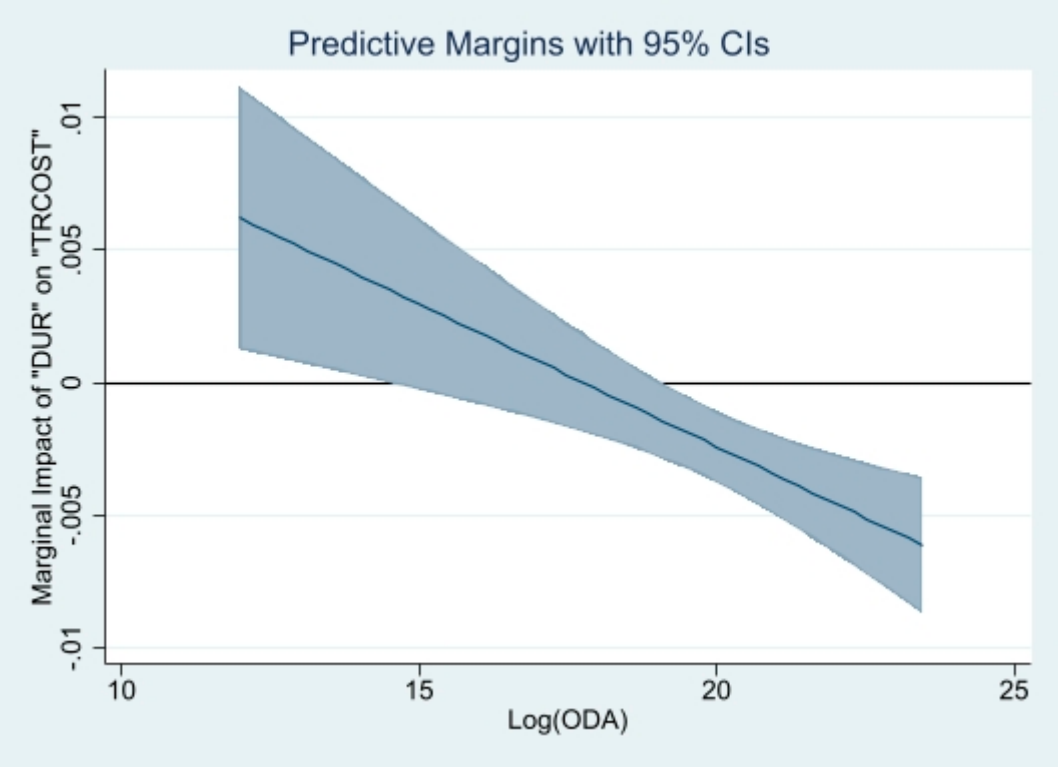

Figure 6. Marginal impact of "DUR" on "TRCOST" for varying amounts of total ODA flows. Source: Author.

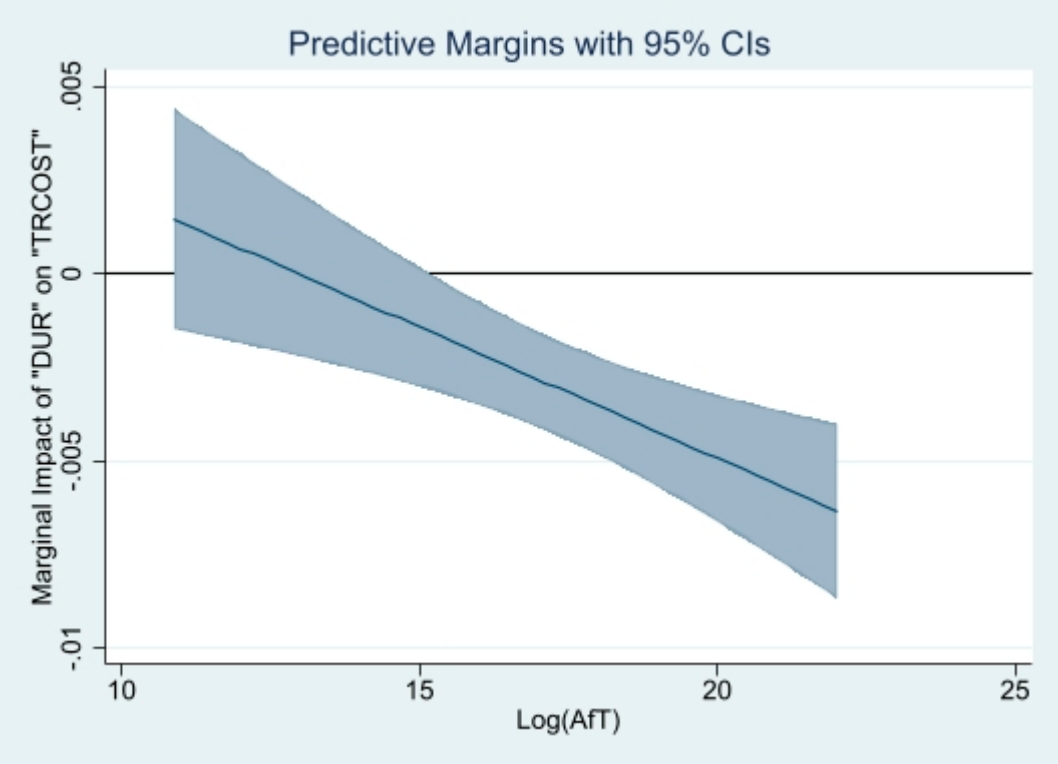

Figure 7. Marginal impact of "DUR" on "TRCOST" for varying amounts of AfT flows. Source: Author.

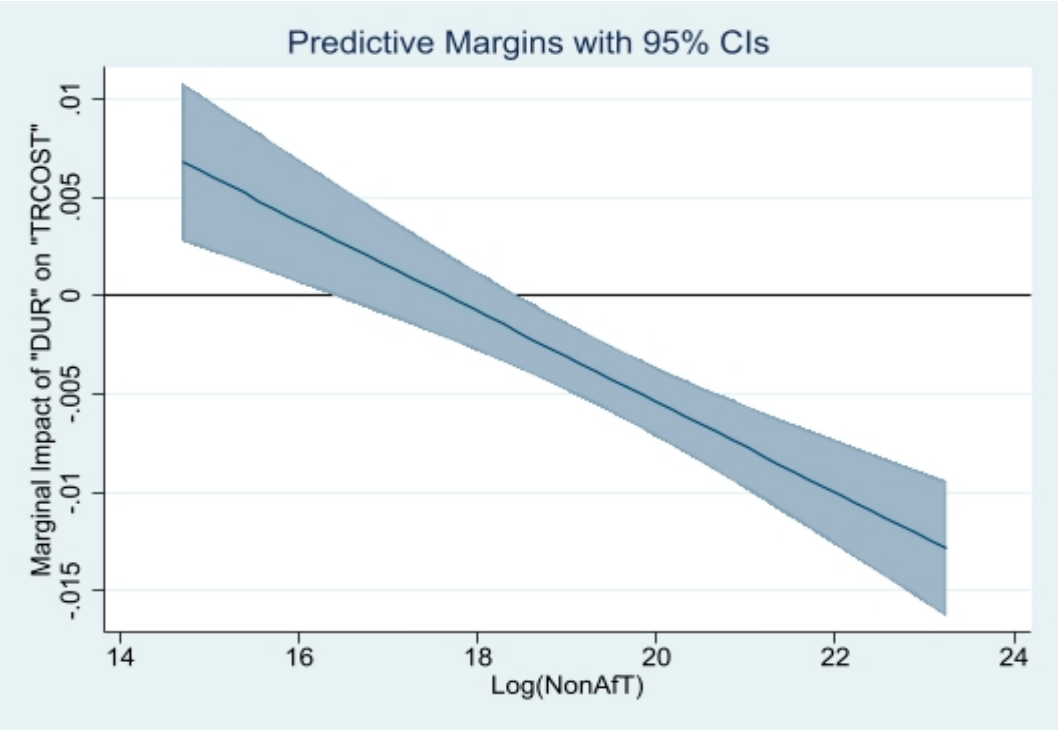

Figure 8. Marginal impact of "DUR" on "TRCOST" for varying amounts of NonAfT flows. Source: Author.

6. Conclusions

The present article has examined how the duration of GATT/WTO membership and structural economic vulnerability (including both the intensity of the exposure to shocks and the magnitude of shocks) affect trade costs (the overall trade costs, and the components of the latter that are tariff costs and nontariff costs). The analysis has been carried out using a panel dataset of 121 countries over the period of 1996–2018. Many findings emerge from it.

The duration of GATT/WTO membership reduces trade costs, while structural economic vulnerability (including both the intensity of the exposure to shocks and the magnitude of shocks) increases trade costs, including the overall trade costs and its two components (tariff costs and nontariff costs). Furthermore, longstanding GATT/WTO members that face high degrees of structural economic vulnerability (including both high levels of exposure to shocks and high magnitudes of shocks) experience a greater trade costs reduction. The overall trade costs significantly decline in longstanding WTO members that receive higher amounts of development aid (including both AfT flows and NonAfT flows) more than in relatively new GATT/WTO members.

From a policy perspective, these findings highlight once again the benefits of the "permanent" membership in the WTO, including in terms of trade costs reduction. They, additionally, shed further light not only on the strong trade costs' raising effects of structural economic vulnerability, but also on the extent to which the membership in the WTO (notably the duration of such a membership) helps alleviate the higher trade costs' effects of structural economic vulnerability. Development aid, notably AfT flows (mobilized by the WTO), could play a major role in dampening the trade costs' raising effect of structural economic vulnerability.

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Conflicts of Interest: I hereby confirm that there is no actual or potential conflict of interest including any financial, personal or other relationships with other people or organizations within three years of beginning the submitted work that could inappropriately influence, or be perceived to influence, the work.

Appendix A

Table A1. Definition and Source of Variables.

Variables	Definition	Source
TRCOST	This is the indicator of the average comprehensive (overall) trade costs. The average overall trade costs have been calculated for a given country in a given year, as the average of the bilateral overall trade costs on goods across all trading partners of this country. Data on bilateral overall trade costs has been computed by Arvis et al. (2012, 2016) following the approach proposed by Novy (2013). Arvis et al. (2012, 2016) have built on the definition of trade costs by Anderson and van Wincoop (2004) and considered bilateral comprehensive trade costs as all costs involved in trading goods (agricultural and manufactured goods) internationally with another partner (i.e., bilaterally) relative to those involved in trading goods domestically (i.e., intranationally). Hence, the bilateral comprehensive trade costs indicator captures trade costs in its wider sense, including not only tariffs and international transport costs but also other trade cost components discussed in Anderson and van Wincoop (2004), such as direct and indirect costs associated with differences in languages, currencies, and cumbersome import or export procedures. Higher values of the indicator of average overall trade costs indicate higher overall trade costs.	Author's computation using the ESCAP-World Bank Trade Cost Database. Accessible online at: https://www.unescap.org/resources/escap-world-bank-trade-cost-database (accessed on 1 January 2021). Detailed information on the methodology used to compute the bilateral comprehensive trade costs can be found in Arvis et al. (2012, 2016), as well as in the short explanatory note accessible online at: https://www.unescap.org/sites/default/d8files/Trade%20Cost%20Database%20-%20User%20note.pdf (accessed on 1 January 2021)
TARIFF	This is the indicator of the average tariff costs. It is the tariff component of the average overall trade costs. We have computed it, for a given country in a given year, as the average of the bilateral comprehensive tariff costs across all trading partners of this country. Data on the bilateral tariff costs indicator has been computed by Arvis et al. (2012, 2016). As the bilateral tariff costs indicator is (like the comprehensive trade costs) bi-directional in nature (i.e., it includes trade costs to and from a pair of countries), Arvis et al. (2013) have measured it as the geometric average of the tariffs imposed by the two partner countries on each other's imports (of agricultural and manufactured goods). Higher values of the indicator of the average tariff costs show an increase in the average tariff costs.	Author's computation using the ESCAP-World Bank Trade Cost Database. Detailed information on the methodology used to compute the bilateral tariff costs can be found in Arvis et al. (2012, 2016), as well as in the short explanatory note accessible online at: https://www.unescap.org/sites/default/d8files/Trade%20Cost%20Database%20-%20User%20note.pdf (accessed on 1 January 2021)

Table A1. *Cont.*

Variables	Definition	Source
NTARIFF	This is the indicator of the average nontariff costs. It represents the second component (i.e., nontariff component) of the comprehensive trade costs. This is the indicator of the comprehensive trade costs, excluding the tariff costs. We have computed it, for a given country in a given year, as the average of the bilateral comprehensive nontariff costs (i.e., the comprehensive trade costs, excluding the tariff costs) across all trading partners of this country. Data on the bilateral nontariff costs indicator has been computed by Arvis et al. (2012, 2016), following Anderson and van Wincoop (2004). Comprehensive trade costs excluding tariff encompass all additional costs other than tariff costs involved in trading goods (agricultural and manufactured goods) bilaterally rather than domestically. Higher values of the indicator of average nontariff costs reflect a rise in nontariff costs. Detailed information on the methodology used to compute the bilateral nontariff costs can be found in Arvis et al. (2012, 2016), as well as in the short explanatory note accessible online at: https://www.unescap.org/sites/default/d8files/Trade%20Cost%20Database%20-%20User%20note.pdf (accessed on 1 January 2021)	Author's computation using the ESCAP-World Bank Trade Cost Database. Detailed information on the methodology used to compute the bilateral nontariff costs can be found in Arvis et al. (2012, 2016), as well as in the short explanatory note accessible online at: https://www.unescap.org/sites/default/d8files/Trade%20Cost%20Database%20-%20User%20note.pdf (accessed on 1 January 2021)
DUR	This is the indicator of the duration of the GATT/WTO membership. See its description in Section 3.	Author's computation based on data collected from the website of the WTO. The list of countries (128) that had signed GATT by 1994 is accessible online at: https://www.wto.org/english/thewto_e/gattmem_e.htm (accessed on 1 January 2021) The list of states that were GATT Members, and that joined the WTO, as well as those that joined the WTO under the WTO's Article XII is accessible online at: (https://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm (accessed on 1 January 2021))
EVI	This is indicator of structural economic vulnerability, also referred to as the Economic Vulnerability Index. It has been set up at the United Nations by the Committee for Development Policy (CDP), and used by the latter as one of the criteria for identifying LDCs. It has been computed on a retrospective basis for 145 developing countries (including 48 LDCs) by the "Fondation pour les Etudes et Recherches sur le Developpement International (FERDI)". The EVI has been computed as the simple arithmetic average of two sub-indexes, namely the intensity of exposure to shocks (exposure sub-index) (denoted "EXPOSURE") and the intensity of exogenous shocks (shocks sub-index) (denoted "SHOCK"). These two sub-indexes have been calculated using a weighted average of different component indexes, with the sum of components' weights equaling 1 so that the values of EVI range between 0 and 100. For further details on the computation of the EVI, see, for example, Feindouno and Goujon (2016). The components of the exposure sub-index are the population size; the remoteness from world markets index; the export product concentration; the share of agriculture, forestry, and fisheries in GDP; and the index of the share of the population living in low-elevated coastal zones. The components of the shocks sub-index are the agricultural production instability; the export instability; and the index of the victims of natural disasters.	Data on EVI is extracted from the database of the Fondation pour les Etudes et Recherches sur le Developpement International (FERDI)–see online at: https://ferdi.fr/donnees/un-indicateur-de-vulnerabilite-economique-evi-retrospectif (accessed on 1 January 2021)

Table A1. *Cont.*

Variables	Definition	Source
GDPC	Real per capita Gross Domestic Product (constant 2010 USD).	World Development Indicators (WDI)
ODA	This is the real gross disbursements of total Official Development Assistance (ODA) expressed in constant prices 2019, US Dollar.	OECD (Organization for Economic Cooperation and Development) database on development indicators.
AfT	This is the indicator of the real gross disbursements of total Aid for Trade. It is the sum of the real gross disbursements of Aid for Trade allocated to the buildup of economic infrastructure, the real gross disbursements of Aid for Trade for building productive capacities, and the real gross disbursements of Aid allocated for trade policy and regulation. All components of total AfT variables are expressed in constant prices 2019, US Dollar.	Author's calculation based on data extracted from the OECD statistical database on development, in particular the OECD/DAC-CRS (Organization for Economic Cooperation and Development/Donor Assistance Committee)-Credit Reporting System (CRS).
NonAfT	This is the measure of the development aid allocated to other sectors in the economy than the trade sector. It has been computed as the difference between the gross disbursements of total ODA and the gross disbursements of total Aid for Trade (both being expressed in constant prices 2019, US Dollar).	Author's calculation based on data extracted from the OECD/DAC-CRS database.
TERMS	This is the indicator of terms of trade, measured by the net barter terms of the trade index (2000 = 100). This indicator has been re-scaled (i.e., divided by 100) so that its values range between 0 and 1.	Author's calculation based on terms of trade data extracted from the WDI.
FINDEV	This is the proxy for financial development. It is measured by the share of domestic credit to private sector by banks in GDP (not expressed in percentage).	WDI
INST	This is the variable capturing the institutional and governance quality. It has been computed by extracting the first principal component (based on factor analysis) of the following six indicators of governance. These indicators are respectively: political stability and absence of violence/terrorism; regulatory quality; rule of law; government effectiveness; voice and accountability, and corruption. Higher values of the index "INST" are associated with better governance and institutional quality, while lower values reflect worse governance and institutional quality.	Data on the components of "INST" variables has been extracted from World Bank Governance Indicators developed by Kaufmann et al. (2010) and updated recently. See online at: https://info.worldbank.org/governance/wgi/ (accessed on 1 January 2021)

Appendix B

Table A2. List of countries used in the analysis along with the duration of their WTO membership as at 2018 (end-year of the period under analysis).

Country	Duration of Membership in 2018	Country	Duration of Membership in 2018	Country	Duration of Membership in 2018	Country	Duration of Membership in 2018
Afghanistan **	2.5	Cote d'Ivoire	55.0833	Lesotho **	31	Senegal	55.3333
Algeria	0	Cyprus	55.5	Liberia	2.5	Seychelles	3.75
Angola	24.75	Dominica	25.75	Madagascar	55.6667	Sierra Leone	57.6667
Antigua and Barbuda	31.8333	Dominican Republic	68.6667	Malawi **	54.4167	Singapore	45.4167
Argentina	51.25	Ecuador	23	Malaysia	61.25	South Africa	70.5833
Armenia **	15.9167	Egypt, Arab Rep.	48.6667	Maldives	35.75	Sri Lanka	70.5
Azerbaijan **	0	El Salvador	27.6667	Mali **	26	St. Kitts and Nevis	24.8333
Bahamas, The	0	Equatorial Guinea	0	Mauritania	55.3333	St. Lucia	25.75

Table A2. *Cont.*

Country	Duration of Membership in 2018	Country	Duration of Membership in 2018	Country	Duration of Membership in 2018	Country	Duration of Membership in 2018
Bangladesh	46.0833	Eswatini **	25.8333	Mauritius	48.3333	St. Vincent and the Grenadines	25.6667
Barbados	51.9167	Fiji	25.1667	Mexico	32.4167	Sudan	0
Belize	35.25	Gabon	55.6667	Micronesia, Fed. Sts.	0	Suriname	40.8333
Benin	55.3333	Gambia, The	53.9167	Mongolia **	22	Tajikistan **	5.83333
Bhutan **	0	Georgia	18.5833	Morocco	31.5833	Tanzania	57.0833
Bolivia **	28.3333	Ghana	61.25	Mozambique	26.5	Thailand	36.1667
Botswana **	31.4167	Grenada	24.9167	Myanmar	70.5	Togo	54.8333
Brazil	70.5	Guatemala	27.25	Namibia	26.3333	Tonga	11.5
Brunei Darussalam	25.0833	Guinea	24.0833	Nepal **	14.75	Trinidad and Tobago	56.25
Burkina Faso **	55.6667	Guyana	52.5	Nicaragua	68.6667	Tunisia	28.4167
Burundi **	53.8333	Honduras	24.75	Niger **	55.0833	Turkey	67.25
Cabo Verde	10.5	India	70.5	Nigeria	58.1667	Uganda **	56.25
Cambodia	14.25	Indonesia	68.9167	Oman	18.1667	Uruguay	65.0833
Cameroon	55.6667	Iran, Islamic Rep.	0	Pakistan	70.5	Uzbekistan **	0
Central African Republic **	55.6667	Iraq	0	Panama	21.6667	Vanuatu	6.41667
Chad **	55.5	Israel	56.5	Papua New Guinea	24.0833	Venezuela, RB	28.4167
Chile	69.8333	Jamaica	55.0833	Paraguay **	25	Vietnam	12
China	17.0833	Jordan	18.75	Peru	67.25	Yemen, Rep.	4.58333
Colombia	37.25	Kazakhstan **	3.16667	Philippines	39.0833	Zambia **	36.9167
Comoros	0	Kenya	54.9167	Rwanda **	53	Zimbabwe **	70.5
Congo, Dem. Rep.	47.3333	Kyrgyz Republic **	20.0833	Samoa	6.66667		
Congo, Rep.	55.6667	Lao PDR **	5.91667	Sao Tome and Principe	0		
Costa Rica	28.1667	Lebanon	0	Saudi Arabia	13.0833		

Note: Landlocked developing countries (LLDCs) are marked with "**".

Appendix C

Table A3. Descriptive statistics on variables used in the analysis.

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
TRCOSTS	582	330.691	56.527	150.240	500.805
TARIFF	557	1.100	0.024	1.047	1.208
NONTARIFF	557	287.006	52.638	128.532	433.378
DUR1	582	30.285	21.146	0	70.083
EVI	582	34.002	11.528	9.224	70.045
EXPOSURE	582	35.262	13.551	3.352	79.036
SHOCK	582	32.745	15.217	4.378	87.964
ODA	582	661	1010	0.16	15,300
AfT	576	206	378	0.05333433	3640
NonAfT	576	637	901	2.419856	12,400
FINDEV	582	0.346	0.275	0.008	1.518
TERMS	582	1.221	0.419	0.281	4.537
INST	582	−0.945	1.533	−4.264	3.666
GDPC	582	4464.304	4858.752	212.472	36,938.410

Note: The variables "ODA", "AfT", and "NonAfT" are expressed in millions of USD.

Notes

1 The WTO Technical Barriers to Trade Agreement (see World Trade Organization 2012) is available online at: https://www.wto.org/english/tratop_e/tbt_e/tbt_e.htm (accessed on 1 January 2021).

2 The WTO Agreement on the Application of Sanitary and Phytosanitary Measures is available online at: https://www.wto.org/english/tratop_e/sps_e/spsagr_e.htm (accessed on 1 January 2021).

3 Nontariff border measures are increasingly used to regulate trade at a time when the ghost of protectionism looms large across the world economy (e.g., Cha and Koo 2021), notably in high-income countries (e.g., Cha and Koo 2021; Hoekman and Nicita 2011).

4 These include, for example, tariffs and other explicit and implicit border taxes, such as those associated with stringent and costly customs procedures.

5 See, for example, Ali and Milner (2016); Gaurav and Mathur (2016); Hummels (2007); Jacks et al. (2008, 2011); Milner and McGowan (2013); Novy (2013); Papalia and Bertarelli (2015); and Shepherd (2022).

6 Further details on the fulfilment of the transparency objective by WTO Councils and Committees are available online at: https://www.wto.org/english/tratop_e/monitor_e/monitor_e.htm (accessed on 1 January 2021).

7 Further information on the WTO's role of overseeing national trade policies is available online at: https://www.wto.org/english/tratop_e/tpr_e/tp_int_e.htm (accessed on 1 January 2021).

8 These shocks include, for example, commodity prices shocks, shocks to international export demand; capital flow reversals; natural disasters (droughts, earthquakes, pandemics, extreme temperatures, storms, hurricanes, volcanoes); and potentially domestic political shocks.

9 Knight (1921) has defined uncertainty as the inability of people to forecast the likelihood of the occurrence of events. This, therefore, refers to a situation where economic agents are not capable of predicting the likely state of the economy in the future. For example, the COVID-19 pandemic has generated high uncertainty in economies severely affected by this crisis in the world. According to Abel (1983), economic uncertainty can refer to unexpected changes that affect the economic ecosystem, and how changes in fiscal or monetary policies or any other government policies affect corporations.

10 See, for example, Azomahou et al. (2021), Barrot et al. (2018), Dabla-Norris and Gündüz (2014), Kim et al. (2020), and Raddatz (2007).

11 The category of LDCs was first established (by the United Nations General Assembly) in 1971. Information on this group of countries is accessible online at: https://www.un.org/ohrlls/content/ldc-category (accessed on 1 January 2021).

12 See, for example, Chowdhury et al. (2021); Koopman et al. (2020), and Mansfield and Reinhardt (2008).

13 The transparency provisions embedded in WTO agreements require that member states disclose their trade regulations and notify changes to these regulations (e.g., Chowdhury et al. 2021). Basic information on the role of the Trade Policy Review Mechanism concerning "transparency" can be found online at: https://www.wto.org/english/thewto_e/whatis_e/tif_e/agrm11_e.htm (accessed on 1 January 2021).

14 See further information online at: https://www.wto.org/english/docs_e/legal_e/29-tprm.pdf (accessed on 1 January 2021).

15 "DSU" refers to the Dispute Settlement Understanding of the WTO. The legal text of the DSU is accessible online at: https://www.wto.org/english/tratop_e/dispu_e/dsu_e.htm (accessed on 1 January 2021)

16 Detailed information on the TFA is available online at: https://www.wto.org/english/tratop_e/tradfa_e/tradfa_e.htm (accessed on 1 January 2021).

17 Beverelli et al. (2015) and Hoekman and Shepherd (2015) have provided a literature review on the trade costs effect of soft trade facilitation, including the WTO trade facilitation.

18 This could include the liberalization of their trade policies, i.e., both tariff and nontariff border barriers, as well as the improvement of beyond-the-border trade facilitation policies.

19 See, for example, Aguiar and Gopinath (2007); Cariolle et al. (2016); Essers (2013); Guillaumont (2009, 2010); and Koren and Tenreyro (2007).

20 Uncertainty is significantly higher in developing countries than in advanced economies (e.g., Ahir et al. 2019).

21 Policy uncertainty refers to the economic risk associated with undefined future government policies and regulatory frameworks (e.g., Al-Thaqeb and Algharabali 2019).

22 See, for example, Colon et al. (2019); Doll et al. (2014); Friedt (2021); Gassebner et al. (2010); Oh (2017); Osberghaus (2019); United Nations Economic Commission for Europe (UNECE) (2020); and Martincus and Blyde (2013).

23 An increase in the value of "DURWTO1" by one year represents a rise in the value of this indicator by 100%.

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