

Gnangnon, Sèna Kimm

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# Effect of the Duration of Membership in the GATT/WTO on Human Development in Developed and Developing Countries

**Author:** Sèna Kimm GNANGNON<sup>1</sup>

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## Abstract

The present article has examined the effect of the duration of the membership in the General Agreement on Tariffs and Trade (GATT) and/or the World Trade Organization (WTO) (and not the mere membership in the GATT/WTO) on human development, considered as a measure of citizens' welfare. The theoretical hypothesis underpinning the analysis is that by fostering export product upgrading, the duration of the membership in the GATT/WTO would reduce economic growth volatility, and consequently promotes human development. The analysis has relied on a panel dataset of 148 developed and developing countries, over the period from 1990 to 2019. It has provided support for the theoretical hypothesis by showing that the membership duration fosters human development in countries that enjoy a high level of export product upgrading, measured through export product diversification, the quality of export products, and the level of economic complexity. Countries with low levels of export product upgrading experience no significant effect of the membership duration on the growth of human development. Interestingly, the membership duration is associated with a higher growth of human development regardless of countries' degree of economic growth volatility. However, the lower the level of economic growth volatility, the larger is the magnitude of the positive effect of the membership duration on the growth of human development. Finally, there exists an heterogeneous effect of the membership duration on the growth rate of human development across countries in the full sample, reflecting the degree of stringency of countries' accession procedures to the GATT/WTO.

**Keywords:** Duration of the membership in the GATT/WTO; Human development; Export product upgrading; Economic growth volatility.

**JEL Classification:** F13; F14; O15.

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This is a working paper, which represents the personal opinions of individual staff members and is not meant to represent the position or opinions of the WTO or its Members, nor the official position of any staff members. Any errors or omissions are the fault of the author.

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<sup>1</sup> Economist at the World Trade Organization (WTO). E-mail for correspondence: [kgnangnon@yahoo.fr](mailto:kgnangnon@yahoo.fr)

## 1. Introduction

Improving citizens' welfare is at the heart of the policy agendas of national policymakers and international institutions. The contribution of international trade to citizens' welfare, and in particular to human development has been underlined by many studies (e.g., Ali and Cantner, 2020; Bussmann, 2009; Carmignani and Avom, 2010; Hartmann and Pyka, 2013; Kosack and Tobin, 2015; Sakyi et al., 2018; Shepherd and Pasadilla, 2011; Vu, 2020). In addition, the Preamble<sup>2</sup> to the Marrakesh Agreement Establishing the World Trade Organization (WTO) has recognized, *inter alia*, "that the relations among states in the field of trade and economic endeavour should be conducted with a view to raising standards of living, ensuring full employment and a large and steadily growing volume of real income and effective demand, and expanding the production of and trade in goods and services, while allowing for the optimal use of the world's resources in accordance with the objective of sustainable development".

Is there an effect of the duration of the membership in the General Agreement on Tariffs and Trade (GATT) and the WTO on citizens' welfare in member states? The present analysis aims to address this important policy question, which has received little attention in the literature.

Numerous studies have shown that the membership in the GATT/WTO has helped member states improve significantly the predictability and stability of trading conditions for domestic producers and foreign investors<sup>3</sup>, enhance states' credibility (e.g., Dreher and Voigt, 2011), and improve their domestic policies, governance and trade-related institutions<sup>4</sup>, as well as consumers' income (e.g., Amiti et al., 2020; Koopman et al., 2020). The membership in the GATT/WTO has, therefore, resulted in a significant expansion of trade flows, including both exports and imports<sup>5</sup>. Furthermore, it has promoted the diversification of export products at the intensive and/or extensive margins (e.g., Dutt, 2020; Dutt et al., 2013; Felbermayr and Kohler, 2010; Helpman et al. 2008; Liu, 2009). This latter finding of the literature is at the heart of the present study. In fact, Dutt (2020) has provided empirical evidence that the membership in the WTO has led to a substantial increase in bilateral trade flows over time, including almost monotonically with years of membership. In addition, the WTO membership has been associated with an increase (over time) of both the extensive and intensive margins of trade, with a stronger impact on the former than on the latter. According to the author, these trade effects of the membership in the WTO are consistent with the gradual trade liberalization and declining trade policy uncertainty (over time) that arise from the membership in the WTO.

The findings by Dutt (2020) have pointed out the relevance of the duration of membership in the WTO for trade flows, and in particular for export product upgrading. Building on these findings, some studies have recently examined, for example, the effect of the duration of the membership in the GATT<sup>6</sup>/WTO on commercial services exports (Gnangnon, 2022a) and on economic growth volatility (Gnangnon, 2021c).

In an attempt to explore the welfare effect of the membership in the GATT/WTO, few other recent works have considered the effect of this membership on economic growth (e.g., Brotto et al., 2021; Tang and Wei, 2009), global welfare (e.g., Fan et al., 2021) and poverty (Kouwoaye, 2021). Tang and Wei (2009) have obtained that the accession to the GATT/WTO has been associated with an improvement in the economic growth rate, especially in countries that were subject to rigorous accession procedures, i.e., those that undertook extensive policy reform commitments upon accession to the GATT/WTO. Brotto et al. (2021) have expanded the work

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<sup>2</sup> See document online at: [https://www.wto.org/english/docs\\_e/legal\\_e/04-wto\\_e.htm](https://www.wto.org/english/docs_e/legal_e/04-wto_e.htm)

<sup>3</sup> See for example, Chowdhury et al. (2021); Feng et al. (2017); Jakubik and Piermartini (2019); Limão and Maggi (2015); Maggi and Rodriguez-Clare (1998); Mansfield and Reinhart (2008); Shin and Ahn (2019) and WTO (2019).

<sup>4</sup> See for example, Aaronson and Abouharb (2014); Basu (2008); Basu et al. (2008) and Drabek and Bacchetta (2004).

<sup>5</sup> See for example, Chang and Lee (2011); Dutt (2020), Dutt et al. (2013); Eicher and Henn (2011); Gnangnon (2022a, 2022b); Larch et al. (2019); Subramanian and Wei (2007) and Tomz et al. (2007).

<sup>6</sup> "GATT" means the General Agreement on Tariffs and Trade.

by Tang and Wei (2009) by including in their analysis 32 newly acceded countries to the WTO. They have obtained that the effects of the GATT/WTO membership on economic growth are larger than the ones obtained by Tang and Wei (2009). In particular, five years after the accession to the GATT/WTO, an economy is 30% larger, with the impact of WTO entry on economic growth persisting beyond the first five years of accession. Fan et al. (2021) have obtained that both China and the rest of the world have benefited significantly from the import tariff reduction after China's entry into the WTO, with the estimated welfare gains falling in a range of [1.4697%, 3.8743%] and [0.0743%, 0.1015%], respectively for China and the rest of the world. Kouwoaye (2021) has uncovered, *inter alia*, that member states that undertook extensive policy reforms commitments upon entry into the GATT/WTO, experienced lower poverty rates.

However, little attention has been paid to the relationship between the membership in the GATT/WTO and human development, a key measure of citizens' welfare (e.g., Kosack and Tobin, 2015). The present paper aims to contribute to the literature on the welfare effect of the membership in the GATT/WTO by examining the effect of the duration of such a membership on human development in both developed and developing member states. The rationale for examining the effect of the duration of the membership in the GATT/WTO (and not only the membership in the GATT/WTO) on human development is several folds.

First, more than the mere membership in the GATT/WTO, the duration of such membership allows grasping the time spent by a country as a member state of the GATT/WTO. This is important because once they join the GATT/WTO, member states' trade policies are subject to a rigorous review by their peers, which contributes to improving their trade regimes over time (see for example, Dutt, 2020). The multilateral surveillance of GATT/WTO member states' trade policies is undertaken in different Councils and Committees of the GATT/WTO, and more importantly under the Trade Policy Review Mechanism<sup>7</sup>, the objective being to improving transparency in, and understanding of, member states' trade policies and practices, with a view to ensuring that they continuously improve their trade regimes (e.g., Chaisse and Matsushita, 2013; Collins-Williams and Wolfe, 2010; Ghosh, 2010; Laird, 1999).

Second, as noted above, Dutt (2020) has found that the positive bilateral trade flows and export product upgrading effect of the membership in the WTO increases over time. These findings by Dutt (2020) have pointed out the relevance of the duration of membership in the WTO for trade flows, and in particular for export upgrading.

Third, other studies have also pointed out the relevance of the duration of the membership in the WTO on member states' governance. Aaronson and Abouharb (2014) have considered how WTO member states have performed in terms of WTO's norms of good governance. They have shown that, among others, that longstanding WTO member states have improved their performance in terms of trade policy transparency, and in terms of their "ability to review, comment upon, and challenge trade-related policies, while new member states have enhanced their performance essentially on the front of the transparency of trade policies.

Our paper is closed in spirit<sup>8</sup> to the study by Kosack and Tobin (2015), even though the relationship between the GATT/WTO membership and human development was not at the heart of these authors' work<sup>9</sup>. Rather, the authors have used a panel dataset of 141 countries (both developed and developing countries) over the period from 1980 to 2010 (5-year non-overlapping

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<sup>7</sup> For example, information concerning 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](https://www.wto.org/english/tratop_e/tpr_e/tp_int_e.htm)

<sup>8</sup> Other works related to ours are those of Bussmann (2009) and Carmignani Avom (2010) who have examined respectively the effect of trade openness on women's welfare, and the effects of primary commodity export dependence on social development.

<sup>9</sup> Nevertheless, as part of their study, the authors have examined whether the effect of the membership in the GATT/WTO on human development depends on the level of human capital. They have obtained that the membership in the GATT/WTO promotes human development in countries that are well-endowed in human capital, although the effect is significant only at the 10% level.

intervals) to examine the implications of international trade for citizens' well-being, measured by the level of human development, and notably whether the level of human capital plays a role in this relationship. They have obtained that greater trade openness enhances welfare improvement in countries that are already well-endowed with human capital, while in other countries, greater trade openness has been associated with slower improvements in welfare.

In the present analysis, the level of human capital is not the major player on the relationship between the duration of the membership in the GATT/WTO and member states' human development. Rather, the paper places the relationship between export product upgrading and economic growth volatility at the heart of the analysis concerning the effect of the duration of the GATT/WTO membership on human development. The theoretical arguments are developed around the following lines. On the one hand, the duration of the membership in the GATT/WTO is associated with greater export product upgrading (Dutt, 2020). On the other hand, export product upgrading (e.g., export product diversification and the export of complex products) is associated with lower economic growth volatility (e.g., Haddad et al., 2013; Maggioni et al., 2016; Miranda-Pinto, 2021; Malik and Temple, 2016), while at the same time, lower economic growth volatility improves welfare (e.g., Aurland-Bredesen, 2021; Loayza et al., 2007; Naoussi and Tripier, 2013; Wang and Wen, 2011). Thus, we postulate that by enhancing export product upgrading, the duration of the membership in the GATT/WTO would reduce economic growth volatility and improve citizens' welfare, in particular their human development level. This line of argument is consistent with the findings by Gnangnon (2022c) that the duration of the membership in the GATT/WTO is associated with lower economic growth volatility in member states. The author has observed that member states that joined the organization under rigorous accession procedures enjoyed a larger negative effect of the membership duration on economic growth volatility than other member states. Furthermore, the analysis has revealed that the duration of the membership in the GATT/WTO has exerted a larger negative effect on economic growth volatility in countries that further upgrade their export products, including towards greater export product diversification, and the export of complex products.

The present study has used an unbalanced panel dataset of 148 countries (both developed and developing countries) over the annual period from 1990 to 2019. We have employed the fixed effects estimator and the two-step system generalized method of moments estimator to perform the empirical analysis. Results have shown that the duration of the membership in the GATT/WTO has been associated with a higher growth of human development in countries that have a high level of export product upgrading, measured by high degrees of export product diversification, quality of export products, and of economic complexity. Countries that export unsophisticated, including low-value added products experience no significant effect of the membership duration on the growth of human development. On the other side, the membership duration enhances human development regardless of countries' degree of economic growth volatility, but exerts a larger positive effect on human development growth in countries with lower levels of economic growth volatility. Finally, there exists an heterogeneous effects of the membership duration on the growth rate of human development across countries in the full sample, reflecting the degree of stringency of countries' accession procedures to the GATT/WTO.

The remainder of the paper is organized around five sections. Section 2 explains how the duration of membership in the GATT/WTO can affect human development through the export upgrading channel, and ultimately through economic growth volatility. Section 3 presents the empirical strategy. Section 4 interprets empirical outcomes, and Section 5 deepens the analysis. Section 6 concludes.

## 2. Theoretical discussion

The present analysis is built around the argument<sup>10</sup> that by promoting export product upgrading, the duration of the membership in the GATT/WTO would reduce economic growth volatility, and help improve human development in member states. This section provides the background for these elements of the argument.

Before discussing how the duration of the membership in the GATT/WTO can affect human development, including through export product upgrading channels (and ultimately through economic growth volatility), it is worth mentioning that the network constituted by the GATT/WTO membership provides member states with the possibility of strengthening the cooperation on trade matters with a view to limiting the negative cross-border spillovers of unilateral trade policy responses to adverse shocks, and to increase the positive spillovers of trade policies (e.g., WTO, 2021a: pages 122 to 174). Moreover, the GATT/WTO rules contain some provisions that allow member states to weather the adverse effects of crises, including on citizens (e.g., Yoo, 2019). Incidentally, Cao and Flach (2015) have shown that the membership in the GATT/WTO has been associated with a fall in the volatility of prices over time for both import and export countries, and especially for member states subject to rigorous procedures when joining the GATT/WTO. This finding shows that the duration of membership in the GATT/WTO can be positively associated with human development through lower prices enjoyed by consumers.

Let us now turn to the main avenue (in the present study) through which the duration of membership in the GATT/WTO can influence human development. As noted above, Dutt (2020) has demonstrated empirically that the duration of membership in the WTO is associated with greater export product upgrading, including export of products at both the extensive and intensive margins. At the same time, export product upgrading (export product diversification and the export of complex products) is associated with lower economic fluctuations, including the dampening of economic growth volatility. According to Haddad et al. (2013), countries with relatively diversified export products baskets enjoy lower economic growth volatility, in particular when they experience greater trade openness. Along the same lines, Balavac and Pugh (2016) have obtained for transition economies that export product diversification at the intensive margins (but not at the extensive margins) contributes to ensuring that trade openness reduces output volatility. Similarly, undiversified exports are associated with greater output growth volatility (Malik and Temple, 2009), and exporting complex products leads to lower economic growth volatility (e.g., Breitenbach et al., 2022; Maggioni et al., 2016; Miranda-Pinto, 2021). At the firm-level, studies have also revealed that export product diversification has helped mitigate the volatility of firms' output and exports (e.g., Hirsch and Lev, 1971; Kramarz et al. 2020; Vannoorenberghe et al. 2016).

Against this background, we can postulate that the duration of the membership in the GATT/WTO could be associated with lower economic fluctuations, including lower economic growth volatility, in countries that further upgrade their export products.

On the other hand, the literature has established that macroeconomic economic fluctuations, manifested for example in greater economic growth volatility, reduces economic growth (e.g., Posch and Wälde, 2011; Ramey and Ramey, 1995) and welfare (e.g., Aurland-Bredesen, 2021; Loayza et al., 2007; Lucas, 1987; Naoussi and Tripier, 2013; Pallage and Robe, 2003; Stiglitz et al. 2006; Wang and Wen, 2011). For example, Pallage and Robe (2003) have shown that the welfare cost of consumption volatility is far higher in developing countries than in the United States. The authors have concluded that eliminating volatility in poor countries may generate far higher welfare

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<sup>10</sup> Some studies in the literature have considered the effect of export product upgrading (including export product diversification and economic complexity) on human development through other channels than economic growth volatility (e.g., Ali and Cantner, 2020; Hartmann, 2019; Hartmann and Pyka, 2013; Vu, 2020), and tend to report a positive human development effect of export product upgrading. In contrast, the present analysis postulates that the positive human development effect of the duration of the membership in the GATT/WTO works via the negative effect of export product upgrading on economic growth volatility.



gain than the one that could arise from an additional percentage point of economic growth. According to Loayza et al. (2007), high aggregate instability stems from a combination of large external shocks, volatile macroeconomic policies, microeconomic rigidities, and weak institutions, and entails direct welfare cost for risk-averse individuals. Higher economic volatility also generates indirect welfare costs for the economy through its adverse effect on income growth and development. Stiglitz (2012) has put forth several channels through which economic volatility can affect human development. These include for example, the loss of skills over an extended period of unemployment, weaker social expenditure, the fall in firms' long term investment (including in physical capital and Research and Development) especially in economic downturns due *inter alia*, to the resulting financial constraints. Economic volatility discourages risk-taking in the absence of adequate safety nets or systems of social protection.

Overall, we postulate the following hypothesis.

**Hypothesis 1:** As countries improve their duration of membership in the GATT/WTO, they experience an improvement in their level of human development. This is because the positive export upgrading effect of the membership duration is associated with lower economic growth volatility that helps member states improve their welfare, notably their human development level. This argument aligns with the findings by Carmignani and Avom (2010) that dependent countries on primary commodity exports tend to experience higher income inequality and greater macroeconomic volatility that worsen social outcomes.

### 3. Empirical strategy

To recall, the main regressor of interest in the empirical analysis is the duration of the membership in the GATT/WTO, and the dependent variable is the human development indicator. In addition, we aim to test hypothesis 1, which is whether the duration of membership in the GATT/WTO affects human development, and if this effect works through the indirect channel of economic growth volatility, and the more direct channel of export product upgrading. To perform this empirical analysis, we build on related recent works (e.g., Bussmann, 2009; Carmignani and Avom, 2010; Kosack and Tobin, 2015; Sakyi et al., 2018), and use as control variables the real GDP as a measure of a country's income (e.g., Kosack and Tobin, 2015), the inflation rate, as a proxy for macroeconomic stability (e.g., Kosack and Tobin, 2015), the political regime type, which acts for a proxy for the institutional quality (e.g., Bussmann, 2009; Kosack and Tobin, 2015), the size of the government, proxied by government consumption<sup>11</sup> in percentage of GDP (e.g., Carmignani and Avom, 2010), and the size of fiscal redistribution.

We expect higher inflation rates to erode people income, and hence their ability to invest in education and health; to reduce gross national income, and ultimately to exert a negative effect on human development.

In democratic societies where governments are interested in being re-elected, policymakers would have greater incentives to improve the quality of life for the voters by increasing their supply of public goods of education and health care. This is in line with the argument by Carmignani and Avom (2010) that by making policymakers more accountable to the people, efficient institutions and good governance would lead to the delivery of public services and public goods, and ultimately promote social development. As a result, one may expect that greater democracy will be associated with an improvement in human development. Higher government consumption is also expected to be positively associated with social outcomes (e.g., Carmignani and Avom, 2010; Gründler and Scheuermeyer, 2018), including with the promotion of human development. Likewise, by reducing inequality and extreme poverty, greater fiscal redistribution through taxes and transfers (e.g., Jouini

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<sup>11</sup> The indicators of public expenditure on health and education would have been better than that of the government consumption. However, the limitation of data availability on these two indicators has prevented us from using them.

et al., 2018; Lustig, 2016) can promote human development. Finally, [Discuss the effect of the population size].

We have additionally included an indicator of trade openness as a control regressor. Yet, one could argue that the effect of the duration of membership in the GATT/WTO on human development can work through the trade openness channel, insofar as the membership duration is positively associated with trade flows (e.g., Chang and Lee, 2011; Dutt, 2020; Larch et al., 2019). However, as economic growth volatility (via export product upgrading) is the main channel of the effect of the membership duration on human development, the introduction of the trade openness indicator in the analysis aims to capture the effect of the membership duration on human development that does not work through the trade openness channel, but rather works via the export product upgrading channel. In fact, the relevance of participation in international trade for improving human development (or social development) has been highlighted by many studies (e.g., Bussmann, 2009; Carmignani and Avom, 2010; Kosack and Tobin, 2015). For example, Bussmann (2009) has reported a positive effect of trade openness on female labor force participation in developing countries, and a negative effect of trade openness on the share of working women in developed countries. At the same time, trade openness has led to an increase in the number of women employed in the service sector in developed countries, while in developing countries, it has resulted in a higher number of women working in industrial jobs and in agriculture. Carmignani and Avom (2010) have uncovered that a higher dependence on primary commodity exports increases income inequality and macroeconomic volatility, and worsens social outcomes. Kosack and Tobin (2015) have shown that trade openness promotes human development in countries that are well endowed in human capital, while in other countries, greater trade openness has been associated with slower improvements in welfare.

Against this background, we postulate the following model specification:

$$HDIR_{it} = \alpha_0 + \alpha_1 HDIR_{it-1} + \alpha_2 DUR_{it-5} + \alpha_3 [(DUR_{it-5}) * (VAR)] + \alpha_4 VAR + \alpha_5 TRADE_{it-5} + \alpha_6 \log(GDP)_{it-5} + \alpha_7 INFL_{it-5} + \alpha_8 FISCREd_{it-5} + \alpha_9 GOVC_{it-5} + \alpha_{10} DEM_{it-5} + \alpha_{11} \log(POP)_{it} + \gamma_t + \mu_i + \epsilon_{it} \quad (1)$$

The subscripts  $i$  and  $t$  represent respectively a country, and a year. An unbalanced panel dataset of 148 countries (including both developed and developing countries) over the annual period from 1990 to 2019, has been constructed on the basis of data availability on variables included in the model.

The dependent variable "HDIR" is the rate of change in the human development indicator (see Kosack and Tobin, 2015). Following Kosack and Tobin (2015), we use the index of the human development (HDI) computed by the United Nations Development Programme (whose data is available annually from 1990 to 2019) to compute the HDIR indicator. The human development index is calculated as the geometric mean of three elements, namely life expectancy at birth, mean and expected years of schooling, and the natural logarithm of the national income per capita at PPP. Our indicator HDIR for a country  $i$  in year  $t$  is computed as follows:  $HDIR_{it} = \frac{HDI_{it} - HDI_{it-1}}{HDI_{it-1}}$ , where  $HDI_{it}$  is the indicator of human development of country  $i$  in year  $t$ , and  $HDI_{it-1}$  is the same indicator for country  $i$  in year  $t-1$ . It is important to note that following previous works (e.g., Bussmann, 2009; Carmignani and Avom, 2010; Kosack and Tobin, 2015), a dynamic specification of model (1) has been considered, that is, through the introduction of the one-year lag of the dependent variable as a right-hand side regressor. This helps, *inter alia*, account for the persistence of the growth rate of human development over time.

The variable "DUR" is the duration of membership in the GATT/WTO. It is measured by the time spent by a country in the GATT/WTO since it has joined it. This indicator is measured in terms of years, but takes into account the month in which a country joins the GATT/WTO.



Thus, for example, when a country joined the GATT/WTO in July of a given year, the variable "DUR" takes the value of 0.5 for that year, and is incremented by 1 for every subsequent (additional) year spent as GATT/WTO member, until 2019, which is the last year of the period under analysis. The variable "DUR" takes the value of 0 for years of non-membership in the GATT/WTO, and particular for countries that have not yet acceded to the WTO.

"VAR" is the channel-variable, which are the export product upgrading indicators (direct channel), and the economic growth volatility indicator (indirect channel). We use different indicators of export product upgrading. These are the overall export product concentration (denoted "EPC"), and its two components, namely export product concentration at the intensive margins (denoted "EPCINT"), and export product concentration at the extensive margins (denoted "EPCEXT"); the index of export product quality (denoted "QUAL") and the index of economic complexity (denoted "ECI"). Lower values of indices of export product concentration reflect greater export product diversification. Higher values of "QUAL" show an improvement in the export product quality, and higher values of "ECI" indicate greater economic complexity, i.e., the export of increasingly complex products. Appendix 1 contains the description and sources for all these variables.

The control variables "TRADE", "GDP", "FISCRED", "GOVC", "DEM" and "POP" are respectively the indicators of trade openness (measured by the share of the sum of exports and imports of goods and services in GDP), the real GDP (constant 2015 US\$), the magnitude of fiscal redistribution through tax and transfers, the share of government consumption in GDP, the level of democracy and the population size. The indicator of democracy represents the type of political regime that prevails in a country, and reflects various institutional characteristics of a political system (its values range from -10 for autocracies to +10 for pure democracies) (see Jagger and Gurr, 1995). Note that the indicators of trade openness and government consumption are not expressed in percentage, simply for the sake of analysis. The indicators of the real income and the population size have been logged (using the natural logarithm) in order to reduce their skewed distributions. Finally, the variable "INFL" represents the transformed indicator of inflation rate. The original indicator of inflation rate collected from the World Development Indicators of the World Bank displays a highly skewed distribution. Therefore, we have transformed it using the following formula (see Yeyati et al. 2007):  $INFL = \text{sign}(INFLATION) * \log(1 + |INFLATION|)$  (2), where  $|INFLATION|$  refers to the absolute value of the original indicator of annual inflation rate (%), denoted "INFLATION".

All variables included in model (1) as well as those that will be utilized later in the analysis, along with their sources are described in Appendix 1. Appendix 2 reports the list of countries in the full sample along with the duration of their membership in the GATT/WTO at 2019 (i.e., the last year of the period under analysis). Standard descriptive statistics related to variables are provided in Appendix 3a.

$\alpha_0$  to  $\alpha_{11}$  are parameters to be estimated.  $\mu_i$  are countries' (time invariant) fixed effects, and  $\varepsilon_{it}$  is an error-term.  $\gamma_t$  are year dummies, which represent global trends that affect simultaneously all countries' human development rate.

It is important to note that all variables in model (1) except for the population size, have been introduced at year  $t-5$ , with a view to ensuring their exogeneity (i.e., to avoid the simultaneity bias) with respect to the dependent variable. Thus, concerning for example our variable of main interest, we are investigating the effect of the duration of the membership in the GATT/WTO in year  $t-5$  on the growth rate of human development in year  $t$ , building on the idea that it takes time for countries (once they join the GATT/WTO) to upgrade their export products, notably to diversify their export product baskets, or to export complex products. This allows us to assume that the duration of membership in the GATT/WTO in year  $t-5$  helps reduce economic growth volatility between years  $t-4$  and  $t$  (including through export product upgrading over this period of time) and hence increase the growth rate of human development in year  $t$ . The time lag between

the duration of membership in the GATT/WTO and the rate of human development is consistent with the argument by Kosack and Tobin (2015) that any effect of trade on human development is not likely to appear instantly, as the effect of trade on the incentives and resources of households and governments will translate into changes in the human development rates only after a lag. The authors have used a five-year period lag in their analysis.

The relatively large time dimension of our panel dataset (i.e., 30 years) render almost nil the bias that could arise from the correlation between the lagged dependent variable and countries' time invariant unobserved specific effects in the error term (Nickell bias - Nickell, 1981). The robust Cluster-robust<sup>12</sup> Hausman test developed by Kaiser (2015) has indicated a Chi-square statistic equal to 72.5, and a related p-value amounting to 0.0000. As a result, we estimate the specifications of model (1) with different indicators "VAR" by means of the within fixed effects estimator (denoted "FEDK") where standard errors are corrected using the Driscoll and Kraay (1998) technique. The latter uses a nonparametric covariance matrix estimator to produce heteroskedasticity consistent standard errors that are robust to very general forms of spatial and temporal dependence (e.g., Hoechle, 2007; Vogelsang, 2012).

Before estimating the specifications of model (1) as presented, we first estimate the specification of model (1) that includes neither the variable "VAR" nor its interaction with the indicator "DUR". The objective of doing so is to test empirically the part of hypothesis 1 that has posited a positive effect of the duration of membership in the GATT/WTO on the growth rate of human development over the full sample. The results of the estimation of this model specification are presented in column [1] of Table 1.

Second, we test how economic growth volatility matters for the effect of the duration of membership in the GATT/WTO on the growth rate of human development. This empirical assessment is performed by estimating a specification of model (1) where the variable "VAR" is measured by the volatility of the economic growth. The indicator of economic growth volatility has been calculated as the standard deviation over 5-year rolling windows (that is, from year  $t-4$  to year  $t$ ) of the annual economic growth rate (constant 2015 US\$) (see for example, Bekaert et al. 2006). The reliance on the economic growth volatility channel allows capturing how the duration of the membership in the GATT/WTO in year  $t-5$  affects the growth rate of human development through the volatility of economic growth from the year  $t-4$  to the year  $t$ . Thus, the economic growth volatility indicator is introduced in model (1) from the year  $t-4$  to the year  $t$ . The outcome of the estimation of this variant of model (1) are reported in column [2] of Table 1.

Third, we estimate different other variants of model (1) without the multiplicative variable " $[(DUR_{it-5}) * (VAR)]$ ", but with each of the indicators "VAR". These regressions allow examining how the coefficient of our main regressor of interest "DUR" changes once each direct channel-variable is introduced in the regression. In other words, they help test whether export product upgrading is a genuine channel through which the duration of the membership in the GATT/WTO can affect the growth rate of human development. If this is really the case, then after the introduction of the export upgrading indicator in the relevant variant of model (1), the coefficient of the variable "DUR" would become lower (and eventually significant at the conventional significance levels) than the one reported in column [1] of Table 1, or it would become statistically nil. The outcomes of these estimations are displayed in Table 2.

Fourth, once the results in Table 2 confirm that export product upgrading represents a direct channel through which the duration of membership in the GATT/WTO affects human development, we will then proceed with examining how the effect of the duration of membership in the GATT/WTO affects human development for varying degrees of export product upgrading over the full sample. This entails estimating different specifications of model (1) where the variable

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<sup>12</sup> The Cluster-robust Hausman test of Kaiser (2015) allows obtaining robust standard errors clustered at the country level. The standard Hausman test of the fixed effects estimator versus the random effects estimator has size distortions when robust standard errors are clustered at the cross-sectional level in the fixed effects estimations.

"VAR" is measured by each of the export product upgrading indicators described above. The outcomes of these estimations are presented in Table 3.

Next, we test hypothesis 1 using another dynamic model specification, which is similar to model (1), but where all variables are considered at year  $t$ . Thus, we examine the effect of regressors, including the duration of the GATT/WTO membership at year  $t$  on the growth rate of human development in the same year.

$$HDIR_{it} = \beta_1 HDIR_{it-1} + \beta_2 DUR_{it-5} + \beta_3 [(DUR_{it}) * (VAR_{it})] + \beta_4 VAR_{it} + \beta_5 TRADE_{it} + \beta_6 \log(GDP)_{it} + \beta_7 INFL_{it} + \beta_8 FISCRE_{it} + \beta_9 GOVC_{it} + \beta_{10} DEM_{it} + \beta_{11} \log(POP)_{it} + \gamma_t + \mu_i + \omega_{it} \quad (1)$$

Non-overlapping sub-periods of five-year average data have been used to limit the business cycle effects on variables, as well as to uncover medium-to long-term effects of regressors on the growth rate of human development. These sub-periods are 1990-1994, 1995-1999, 2000-2004, 2005-2009, 2010-2014, and 2015-2019.

All variables are as described above, and their related standard descriptive statistics are presented in Appendix 3b. The variable "VAR" is still measured either by the economic growth volatility indicator, or by export product upgrading indicators. Note here that the indicator of economic growth volatility (denoted here "GRVOL2") is computed for each country, as the standard deviation of the annual economic growth rate (constant 2015 US\$) over each of the six non-overlapping sub-periods of 5-year. The export product upgrading indicators are as defined above.

$\beta_1$  to  $\beta_{11}$  are new parameters to be estimated.  $\mu_i$  are still countries' (time invariant) fixed effects, and  $\omega_{it}$  is an error-term.  $\gamma_t$  are time-period dummies that represent global trends affecting simultaneously all countries' human development rate.

The different specifications of model (2) described below are also estimated here by means of the two-step system generalized method of moments estimator (denoted SGMM) proposed by Blundell and Bond (1998) and widely used in the empirical literature. This estimator is appropriate for dynamic panels with a large number of individuals and a small time dimension (like the one used in the present analysis, i.e., with 148 countries and 6 sub-periods), and where series show a strong persistence over time (e.g., Alonso-Borrego and Arellano, 1999). It helps handle several endogeneity problems, including the Nickell bias highlighted above, and the potential bi-directional causality between the dependent variable and regressors. Using this estimator involves estimating a system of equations that combines an equation in differences and an equation in levels. In this system of equations, lagged first differences are used as instruments in the equation in levels, and lagged levels are used as instruments in the first-difference equation. This estimator uses moment conditions to derive a set of valid instruments for the endogenous variables based on past values of those variables.

The SGMM estimator is asymptotically more efficient than the difference GMM estimator proposed by Arellano and Bond (1991), as the additional moment conditions that it uses help reduce the imprecision and potential bias arising from the use of the difference GMM estimator (e.g., Bond, 2002; Blundell and Bond, 1998). In the present analysis, we have treated all regressors (except for the population size) as endogenous. To avoid the problem of instruments proliferation, we limit to two (2) the number of lags used to generate the instrumental variables in the regressions (e.g., Roodman, 2009). We report the p-value related to the statistic of the Sargan/Hansen-J test of over-identifying restrictions (OID) that tests the validity of instruments used in the regressions. The rejection (at the conventional significance levels) of the null hypothesis that instruments are valid, i.e., uncorrelated with the error term, would suggest that instruments are valid (the p-value should be higher than 0.10 at the 10% level). We also present the Arellano-Bond test of the presence of first-order serial correlation in the first-differenced error term (AR (1)) and the Arellano-Bond test of the absence of second-order autocorrelation in the first-differenced error

term (denoted AR (2)). The baseline model (2) and its variants estimated by the SGMM estimator, are considered as correctly specified if in addition to meeting the condition of the validity of instruments used in the regressions, the p-value of statistic associated with the AR(1) test is lower than 0.10 at the 10% level, and the p-value of the statistics related respectively to the AR(2) test is higher than 0.1 at the 10% level.

To test the validity of hypothesis 1 here, we proceed in the same way as for model (1), that is, by using model (2) to replicate here all estimations of different variants of model (1) whose results were reported in Tables 1 to 3. The outcomes of the estimation of these various specifications of model (2) are reported in Tables 4 to 6.

## 4. Interpretation of empirical results

We first note across all Tables 1 to 6 that the coefficients of the lagged dependent variable are positive and significant at the 1% level. These outcomes highlight the pertinence of considering the dynamic specifications of models (1) and 2 in the analysis. In addition, we observe from the bottom of Tables 4 to 6 that all requirements of the SGMM estimator are met. In other words, the diagnostic tests on the correctness of all model specifications whose results are reported in these three Tables indicate that all these models are correctly specified. These findings suggest that the SGMM estimator is appropriate for the estimation of model (2) and its different variants described above.

### 4.1. Interpretation of outcomes in Tables 1 to 3 (based on the FEDK estimator)

Results in column [1] of Table 1 suggest that the membership duration exerts a positive and significant effect on the growth rate of human development. This is because the coefficient of the indicator measuring the duration of membership in the GATT/WTO has a positive and significant coefficient at the 1% level. This outcome supports hypothesis 1. An additional year of the membership duration is associated with an increase in the growth rate of human development by 0.021 percentage point. Outcomes concerning control variables indicate that the democracy level, the inflation rate, government consumption, and the population size exert no significant effect (at the conventional significance levels) on the growth rate of human development. We also obtain that greater trade openness is negatively and significantly (at the 5% level) associated with the growth rate of human development. This peculiar result may hide the fact that the effect of the duration of the membership in the GATT/WTO on the growth rate of human development depends on countries' level of trade openness, insofar as such this membership duration influences significantly trade flows. This prompts us to examine whether the effect of the duration of GATT/WTO membership on the growth rate of human development does not, in reality, depend on the level of trade openness. Building on the discussion concerning the effect of trade openness on citizen welfare in section 3, one may expect that the membership duration could exert a larger positive effect on the growth of human development as countries enjoy higher trade flows, manifested in a greater trade openness (*hypothesis 2*).

We also observe in column [1] of Table 1 that in contrast with our theoretical expectation, a greater fiscal redistribution affects negatively and significantly (at the 5% level) the growth rate of human development. This peculiar outcome also motivates us to explore how the duration of the membership in the GATT/WTO affects the growth rate of human development for varying sizes of fiscal redistribution. On the one hand, one could argue that as trade flows tend to increase with the membership duration, countries that face greater income inequalities due to greater export product upgrading (i.e., export product diversification or export product sophistication) would likely redistribute more through taxes and transfers so as to reduce the widening income inequality effect of the export product upgrading.<sup>13</sup> In this scenario, fiscal redistribution would alleviate the

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<sup>13</sup> A number of empirical studies have reported that greater export product upgrading (i.e., export product diversification or/export product quality or export of sophisticated goods) can lead to higher income inequality (e.g.,

negative effect of the membership duration on human development. Thus, the duration of the membership in the GATT/WTO would lead to an improvement of citizens' welfare, i.e., a higher growth rate of human development as the size of fiscal redistribution increases (hypothesis 3). On the other hand, if export product upgrading reduces income inequality, then countries that further upgrade their export products (as their membership duration increases) would need to redistribute less. In this case, the lower the size of fiscal redistribution, the likely greater is the positive effect of the membership duration on human development growth rate (hypothesis 4).

In the meantime, we find a negative and significant (at the 1% level) effect of the real income on the growth rate of human development. This outcome is similar to that of Kosack and Tobin (2015), and suggests that countries with higher incomes tend to experience a lower growth in human development than countries with relatively lower income. This somewhat surprising outcome prompts us to consider how the effect of the duration of membership in the GATT/WTO influences the growth of human development conditioned on countries' real income. Intuitively, we can expect that as countries experience an improvement in their real per capita income, they would likely enjoy a better citizens' welfare (i.e., a higher growth rate of human development), given that these countries are also likely those with a higher degree of export product upgrading, and those that export increasingly sophisticated products<sup>14</sup> (hypothesis 5).

We test hypotheses 3 to 5 later in the analysis. For the time being, we consider the outcomes reported in column [2] of Table 1, which help shed light on how the duration of membership in the GATT/WTO affects human development growth rate for varying levels of economic growth volatility.

We note from column [2] of Table 1 that while the coefficient of the variable "DUR<sub>t-5</sub>" is positive and significant at the 1% level, the interaction term of the variable (" $[DUR_{t-5}] * [Log(GRVOL)_{t-1}]$ ") is yet negative, but not significant at the conventional significance levels (i.e., at least at the 10% level). On the basis of these outcomes, we can infer that over the full sample, the effect of the duration of the membership in the GATT/WTO tends to always affect positively the growth of human development, but the magnitude of this positive effect tends to decline as the level of economic growth volatility increases (this is due to the negative but non-significant coefficient of the interaction variable). We illustrate this impact in Figure 1, which shows at the 95 per cent confidence intervals, the marginal impact of the membership duration on the growth rate of human development for varying levels of economic growth volatility. It appears from this Figure that this marginal impact is always positive and significant, but decreases as countries face a heightened economic growth volatility. Thus, the membership duration always affects positively the growth rate of human development for all levels of economic growth volatility, but countries with lower levels of economic growth volatility experience a larger positive effect of the membership duration on the growth rate of human development than countries with higher degrees of economic growth volatility.

We now test empirically hypotheses 2 to 4. All specifications of model (1) used to test empirically hypotheses 2 to 5 rely on the baseline specification of this model without the variable "VAR" and the multiplicative variable between "VAR" and the indicator of the membership duration. We test hypothesis 2 by estimating a specification of this baseline model (1) that includes the multiplicative variable between the indicator of trade openness and the indicator that measures the duration of membership in the GATT/WTO. The outcomes of this estimation are reported in column [3] of Table 1. We obtain that both the coefficient of the variable (DUR<sub>t-5</sub>) and the

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Lee and Vu, 2020) and hence in a greater extent of fiscal redistribution. Other studies have obtained that export product upgrading can reduce income inequality (e.g., Hartmann et al., 2017; Hartmann et al., 2020; Le et al., 2020; Zhu et al., 2020), and result in a lower extent of fiscal redistribution.

<sup>14</sup> Studies such as Cadot et al. (2011); De Benedictis et al. (2009); Hausman et al. (2007) and Mau (2016) have noted the positive association with export product upgrading and the real income (and in particular the real per capita income).

interaction term related to the variable (" $[DUR_{t-5}] * [TRADE_{t-5}]$ ") are positive and significant at the 1% level. We conclude that the duration of membership in the GATT/WTO exerts a positive and significant effect on human development for all levels of trade openness, and the magnitude of this positive effect increases as the degree of trade openness rises. This finding is confirmed by Figure 2, which depicts at the 95 per cent confidence intervals, the marginal impact of the duration of the membership in the GATT/WTO on the growth of human development for varying degrees of trade openness. In fact, it appears from this Figure that this marginal impact is always positive and significant, and increases as the degree of trade openness rises. These findings support hypothesis 2.

To test hypothesis 3 versus hypothesis 4, we estimate another variant of the above-mentioned baseline model (1) that includes the interaction variable between the indicator of fiscal redistribution and that of the membership duration. The results arising from this estimation are presented in column [4] of Table 1. It appears that the coefficient of the variable ( $DUR_{t-5}$ ) is positive and significant at the 1% level, while the interaction term of the variable (" $[DUR_{t-5}] * [FISCRED_{t-5}]$ ") is negative and significant at the 1% level. These two outcomes suggest that on average over the full sample, the membership duration exerts a negative effect on human development growth once the size of fiscal redistribution exceeds 32.27 ( $= 0.0313/0.000970$ ). The maximum value of the indicator of fiscal redistribution over the full sample is 25.8 (see Appendix 3a). This maximum value is, however, lower than the value of 32.27 found just above. We, therefore, conclude that on average over the full sample, the duration of membership in the GATT/WTO always exerts a positive effect on the growth rate of human development as the size of fiscal redistribution increases, but the magnitude of this positive effect decreases as size of fiscal redistribution rises, i.e., as countries tend to redistribute more through taxes and transfers. These findings are confirmed by Figure 3, which depicts at the 95 per cent confidence intervals, the marginal impact of the duration of the membership in the GATT/WTO on the growth rate of human development for varying magnitudes of fiscal redistribution. It shows that this marginal impact is always positive and significant, but decreases as the size of fiscal redistribution increases. Specifically, this marginal impact becomes statistically nil for very high levels of fiscal redistribution (i.e., higher than the value of 25.16). This signifies that the membership duration enhances citizens' welfare in countries that redistribute less than in countries that redistribute more. This can reflect the fact that the duration of the membership in the GATT/WTO exerts a larger positive effect on citizens' welfare in countries that experience lower income inequalities than in countries that face higher income inequalities. For high levels of income inequality (i.e., high magnitudes of fiscal redistribution), the membership duration exerts no significant effect on the growth of human development. These findings, therefore, support hypothesis 4, at the expense of hypothesis 3.

Finally, we test hypothesis 5 by estimating a variant of the above-described baseline model (1). This variant of the model contains the multiplicative variable between the real income and the indicator of the duration of membership in the GATT/WTO. The resulting estimates are presented in column [5] of Table 1. They indicate that neither the coefficient of the variable ( $DUR_{t-5}$ ), nor that of the multiplicative variable (" $[DUR_{t-5}] * [\text{Log}(GDPC)_{t-5}]$ ") are significant at the 10% level. On the basis of these outcomes, we will be tempted to deduce that on average, over the full sample, the effect of the duration of the membership in the GATT/WTO on the growth rate of human development does not depend on countries' real income. However, a different picture is provided by Figure 4, which displays at the 95 per cent confidence intervals, the marginal impact of the duration of the membership in the GATT/WTO on the growth rate of human development for varying levels of the real income. We observe that this marginal impact is always positive and significant, but decreases as the real income rises. In other words, regardless of their income level, all countries enjoy a positive and significant effect of the membership duration on the growth rate of human development, but the magnitude of this positive effect is larger for countries with relatively low income levels than for countries with relatively high income levels. This surprising

outcome does not fully support hypothesis 5, wherein we expected that the effect of the membership duration on the growth rate of human development would increase as the real income. Nevertheless, these outcomes may be attributed to the estimation strategy<sup>15</sup> used, which might not fully address the possible endogeneity of the regressors. As we will see later, the results based on the two-step system GMM estimator, are fully consistent with hypothesis 5.

Incidentally, estimates concerning control variables in columns [2] to [5] of Table 1 are broadly in line with those in column [1] of the same Table.

We now take up results in columns [1] to [4] of Table 2. We note from this Table that the introduction of the each of the export product upgrading indicators in the specification of model (1) (that does not contain the multiplicative variable between "VAR" and the indicator of the membership duration) generates coefficients of these export product upgrading indicators that are yet significant at least at the 5% level, but lower than the one in column [1] of Table 1 (the latter amounted to 0.021). Note that the coefficients of the relevant export product upgrading indicators range between 0.0117 and 0.0198. We conclude that export product upgrading is a channel through which the duration of the membership in the GATT/WTO affects citizens' welfare. On another note, the estimates of control variables are consistent with those in Table 1.

Results in Table 3 allow assessing how the effect of the membership duration on human development growth depends on the level of export product upgrading. Estimates presented in column [1] of the Table show that the coefficient of  $[DUR_{t-5}]$  is positive and significant at the 1% level, while that of the interaction variable (" $[DUR_{t-5}] * [EPC_{t-5}]$ ") is negative and significant at the 5% level. These results, therefore, suggest that on average over the full sample, the membership duration exerts a positive effect on welfare for values of the indicator of overall export concentration higher than 7.07 ( $= 0.0321/0.00454$ ). This value appears, however, to be higher than the maximum value of the indicator "EPC" (which is 6.316) in the full sample (see Appendix 3a). We conclude that on average over the full sample, the membership duration consistently exerts a positive and significant effect on the growth of human development, for varying levels of the overall export product concentration. However, the magnitude of this positive effect is lower for countries with low levels of the overall export product concentration (i.e., a high level of overall export product diversification) than for countries with relatively high degrees of export product concentration (i.e., low levels of export product diversification). These findings are confirmed by Figure 5, which shows at the 95 per cent confidence intervals, the marginal impact of the duration of the membership in the GATT/WTO on the growth rate of human development for varying degrees of the overall export product concentration. It appears that for high levels of the overall export product concentration (i.e., for values of "EPC" higher than 4.1), this marginal impact is statistically nil. Conversely, for values of "EPC" lower than 4.1, the membership duration exerts a positive and significant effect on citizens' welfare, but the magnitude of this positive effect is larger, the lower the degree of the overall export product concentration, i.e., the greater the degree of the overall export product diversification. In a nutshell, countries that enjoy a higher degree of the overall export product diversification (i.e., low levels of the overall export product concentration) experience a larger positive effect of their membership duration on the growth rate of human development than countries that have relatively lower levels of the overall export product diversification (i.e., higher degrees of the overall export product concentration).

Results in column [2] of Table 3 are similar to those in column [1] of the same Table, given that the coefficient of  $[DUR_{t-5}]$  is positive and significant at the 1% level, while that the interaction terms of the variables (" $[DUR_{t-5}] * [EPCINT_{t-5}]$ ") and (" $[DUR_{t-5}] * [EPCEXT_{t-5}]$ ") are negative and significant respectively at the 5% level and the 10% level. Figures 6 and 7 present, at the 95 per cent confidence intervals, the marginal impact of the duration of the membership in the

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<sup>15</sup> The lag of suspected endogenous regressors at year  $t-5$  might not fully help address the endogeneity of these regressors. As a result, the findings may reflect more a conditional correlation among variables at hand, than a full causality from the membership duration to the human development growth rate conditioned on the real income.



GATT/WTO on the growth rate of human development respectively for varying degrees of export product concentration at the intensive margins, and for varying levels of export product concentration at the extensive margins. Both Figures 6 and 7 show patterns that quite similar to the one observed in Figure 5, with the particularity here being that the effect of the membership duration on the growth rate of human development is not significant for levels of export product concentration at the intensive margins higher than the value of 4.4 (see Figure 6), and for degrees of export product concentration at the extensive margins higher than the value of 1.7 (see Figure 6). Thus, once again, we obtain that the duration of the membership in the GATT/WTO exerts a higher positive effect on the growth rate of human development in countries with higher levels of export product diversification at the intensive and the extensive margins than in countries with relatively lower degrees of export product diversification at the intensive and the extensive margins (as long as the values of "EPCINT" and "EPCEXT" are lower respectively than 4.4. and 1.7). For relatively high levels of export product concentration at the intensive and the extensive margins (i.e., for values of "EPCINT" and "EPCEXT" higher respectively than 4.4. and 1.7), there is no significant effect of the membership duration on citizens' welfare.

Outcomes in column [3] of Table 3 reveal that the coefficients of both variables "[DUR<sub>t-5</sub>]" and ("[DUR<sub>t-5</sub>]\*[QUAL<sub>t-5</sub>]") are not significant at the conventional significance levels. Hence, we may be tempted to infer that on average over the full sample, there is no significant effect of the duration of the membership in the GATT/WTO on the growth rate of human development, when countries progressively improve the quality of their export products. In the meantime, Figure 8 shows a slightly different pattern of this effect. It presents, at the 95 per cent confidence intervals, the marginal impact of the duration of the membership in the GATT/WTO on the growth rate of human development for varying levels of export product quality. We observe that this marginal impact is significant and positive for high levels of export product quality. Put differently, the membership duration exerts no significant effect on the growth of human development for levels of export product quality lower than the value<sup>16</sup> of 0.756. For higher levels of export product quality, the membership duration enhances citizens' welfare, with this positive effect being larger as the level of export product quality improves. Overall, the duration of the membership in the GATT/WTO is positively and significantly associated with an improvement in human development only in countries that export products of high quality. In the other countries, it exerts no significant effect on human development growth.

Finally, we note from column [4] of Table 3 that the interaction term of the variable ("[DUR<sub>t-5</sub>]\*[ECI<sub>t-5</sub>]") is negative, but not significant at the 10% level. At the same time, the coefficient of "DUR<sub>t-1</sub>" is positive and significant at the 5% level. We can deduce that on average over the full sample, the membership duration leads to an improvement in human development as the level of economic complexity rises, but the magnitude of this positive effect is lower for countries with high levels of economic complexity than for countries that export relatively less complex products. These findings are confirmed by Figure 9, which provides at the 95 per cent confidence intervals, the marginal impact of the duration of the membership in the GATT/WTO on the growth rate of human development for varying levels of economic complexity. It shows that this marginal impact is significant for values of the indicator of economic complexity<sup>17</sup> lower than 1, and not significant for higher values of this indicator. Additionally, it decreases as the level of economic complexity rises. These findings are somewhat surprising since we expected that the positive effect of the membership duration on the growth of human development would be larger as the level of economic complexity rises (insofar as higher levels of economic complexity exert a larger dampening effect on economic growth volatility). While the outcomes reported in columns [1] to [3] of Table 3 tend to confirm the hypothesis that the membership duration would exert a larger

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<sup>16</sup> The values of the indicator of export product quality range between 0.2 and 1.096 in the full sample (see Appendix 3a).

<sup>17</sup> The values of this indicator range between -2.79 and 2.63 over the full sample (see Appendix 3a).

positive effect on the growth of human development in countries that further upgrade export products, this hypothesis is infirmed when export product upgrading is measured by the level of economic complexity. This is not necessarily surprising given that the concept of "economic complexity" entails both export product diversification and the export of products of low ubiquity (i.e., those that are produced by few countries). At the same time, and as also indicated above, one may argue that the lag of the indicator of the membership duration (and other regressors) at year  $t-5$  might not help fully address the endogeneity of these variables. As we will see later, the use of these variables at year  $t$ , and of the two-step system GMM estimator has revealed a different pattern of the effect of the membership duration on the growth of human development for varying levels of economic complexity.

Estimates of control variables in Table 3 align with those in the previous Tables.

Summing-up the findings in Table 3, we conclude, as expected, that the duration of the membership in the GATT/WTO is associated with a higher improvement of human development in countries that further diversify their export products, including both at the intensive and the extensive margins, and improve their export product quality. However, we obtain that the duration of the membership in the GATT/WTO exerts a larger positive effect on the growth of human development in countries with lower levels of economic complexity than in countries that export relatively more complex products, although for high levels of economic complexity, this impact is statistically nil.

#### ***4.2. Interpretation of outcomes in Tables 4 to 6 (based on the SGMM estimator)***

At the outset, we note that in addition to the above-mentioned specifications of model (2) whose results are reported in columns [1] and [2] of Table 4, we also perform here variants of model (2) (in a similar way as for model (1)) to examine the extent to which the effect of the duration of the membership in the GATT/WTO on the growth rate of human development depends on the level of trade openness (see results in column [3] of Table 4), on the level of size of fiscal redistribution (see results in column [4] of Table 4), and on the real income level (see results in column [5] of Table 4). As it could be noted from these columns of the Table, the three variants of model (2) estimated are correctly specified since they successfully pass the diagnostic tests that help check the appropriateness of the two-step system GMM as econometric estimator for the analysis (see results reported at the bottom of this Table).

We observe from column [1] of Table 4 that the duration of the membership in the GATT/WTO exerts a positive and significant effect (at the 1% level) on the growth rate of human development. An additional year of the membership duration leads to an increase in the growth rate of human development by 0.011 percentage point. The magnitude of this positive effect is the half of the one obtained in column [1] of Table 1 (which amounted to 0.0206). Regarding control variables, we find, as expected theoretically that, trade openness and fiscal redistribution are significantly associated with a higher growth of human development. While the population size also influences positively and significantly the growth of human development, the real income appears to affect it negatively and significantly. This may reflect the fact that the effect of the membership duration on the growth rate of human development depends on the real income. We will test later this hypothesis (hypothesis 5 set out above). In the other columns of the Table, the inflation rate affects, sometimes, positively and significantly human development growth (see columns [2] to [4]), and in one case, its effect is not significant at the 10% level (see column [1]). The same outcomes are obtained for the indicator of the level of democracy, which shows sometimes negative and significant coefficients, and in one case a coefficient that is not significant at the 10% level (see column [2]). These outcomes may be yet difficult to explain, but at the same time, they may reflect differentiated effects (of inflation and democracy) across countries in the full sample, as well as a possible interaction effect with the membership duration on the growth

of human development. Checking these elements goes beyond the scope of the present paper. Incidentally, government consumption exerts no significant effect on citizens' welfare.

Outcomes presented in column [2] of Table 4 indicate that the coefficient of the variable "DUR" is positive and significant at the 1% level, while the coefficient related to the interaction of this variable with the indicator of the economic growth volatility is negative and significant at the 1% level. These signify that on average over the full sample, the membership duration leads to an improvement in citizens' welfare in countries whose degrees of economic growth volatility is lower than 25.20 [= exponential (0.00910/0.00282)]; above this level of economic growth volatility, the membership duration is negatively associated with citizens' welfare. The values of the indicator of economic growth volatility ("GRVOL2") range between 0.107 and 12 (see Appendix 3b). As the value of 25.20 is far higher the maximum value of "GRVOL2", we conclude that the effect of the membership duration on the growth rate of human development is always positive and significant, but decreases as the level of economic growth volatility rises. In other words, the duration of the GATT/WTO membership is always associated with an improvement in citizens' welfare for varying degrees of economic growth volatility, but countries that experience lower economic growth volatility experience a greater positive effect of the membership duration on the growth of human development than those that face higher levels of economic growth volatility. These findings are confirmed by Figure 10, which shows, at the 95 per cent confidence intervals, that for levels of economic growth volatility lower than 6.2, the marginal impact of the membership duration in the GATT/WTO on the growth rate of human development is always positive and significant. Countries facing higher levels of economic growth volatility experience a lower positive effect than those with relatively higher degrees of economic growth volatility. Conversely, there is no significant effect of the membership duration on the welfare in countries that face levels of economic growth volatility higher than 6.2. These findings are clearly similar to those obtained from Figure 1.

Results in column [3] of Table 4 show that while the coefficient of the variable ("[DUR]\*[TRADE]") is positive but not significant at the 10% level, the coefficient of the variable "DUR" is positive and significant at the 1% level. It ensues that on average over the full sample, the magnitude of the positive effect of the membership duration on the growth rate of human development becomes larger as countries expand their trade, manifested in a greater trade openness. Figure 11 confirms this pattern of results and shows that at the 95 per cent confidence intervals, the marginal impact of the duration of the membership in the GATT/WTO consistently exerts a positive and significant effect on the growth rate of human development, with the magnitude of this positive effect rising as the level of trade openness increases. The patterns observed in Figure 11 are similar to those in Figure 2. These findings support hypothesis 2.

Estimates in column [4] of Table 4 indicate that the coefficient of the variable "DUR" is positive and significant at the 1% level, while concurrently, the coefficient of the variable ("[DUR]\*[FISCRED]") is negative, and not significant at the 10% level. We deduce that on average over the full sample, the membership duration exerts yet a positive effect on the growth rate of human development, but the magnitude of this positive effect shrinks as the size of fiscal redistribution increases. These findings are further supported by Figure 12, which like Figure 3, shows at the 95 per cent confidence intervals, that the marginal impact of the duration of the membership in the GATT/WTO exerts a positive effect on the growth rate of human development as the size of fiscal redistribution increases. However, the higher the size of fiscal redistribution, the lower is the magnitude of the positive effect of the duration of the membership in the GATT/WTO on the growth rate of human development. These findings support hypothesis 3.

Outcomes in column [5] of Table 4 show that the coefficient of the variable "DUR" is negative and significant at the 5% level, while the coefficient of the variable ("[DUR]\*[Log(GDP)]") is positive and significant at the 1% level. It follows that on average over

the full sample, the membership duration exerts a positive effect on welfare in countries whose real income<sup>18</sup> exceeds US\$ 419.7 million [=  $\exp(0.0411/0.00207)$ ], as for countries with lower levels of real income, the membership duration reduces the growth rate of human development. Figure 13 provides, at the 95 per cent confidence intervals, the marginal impact of the duration of the membership in the GATT/WTO on the growth rate of human development for varying levels of the real income. It shows that this marginal impact increases as the real income increases, but is statistically significant for values of the real income lower than US\$ 4.70 billion. Thus, Figure 13 (in contrast with Figure 4) reveals that the duration of the membership in the GATT/WTO fosters citizens' welfare in countries whose real income is higher than US\$ 4.70 billion, and the greater the real per capita income, the larger is the magnitude of the positive effect of the membership duration on the growth rate of human development. For countries whose real income is lower than US\$ 4.70 billion, there is no significant effect of the membership duration on the growth rate of human development. Overall, these results support hypothesis 5, and indicate that the membership duration tends to enhance welfare in wealthier countries than in less wealthy ones. In particular, it exerts no significant effect on low-income countries.

Outcomes reported in all columns of Table 5 also confirm that export product upgrading represents a channel through which the membership duration affects the growth rate of human development. In fact, we notice that across all columns of Table 5, the coefficients of the indicator that measures the duration of the GATT/WTO membership are all lower than the one obtained in column [1] of Table 4 (which amounted to 0.011). Coefficients in columns [1], [2] and [4] are significant at the 10% level, and range from 0.0052 to 0.006, and the one in column [3] is yet positive but statistically nil.

Moving to outcomes in Table 6, we find from column [1] that the coefficient of "DUR" is positive and significant at the 1% level, whereas the interaction term related to the multiplicative variable "DUR\*EPC" is negative and significant at the 1% level. This pattern of outcomes is similar to the one obtained in column [1] of Table 3, although the magnitudes of the coefficients and the levels of statistical significance of these coefficients are different from those in column [1] of Table 3. Figure 14 displays, at the 95 per cent confidence intervals, the marginal impact of the duration of the membership in the GATT/WTO on the growth rate of human development for varying degrees of the overall product concentration. It shows patterns similar to the ones observed in Figure 5. This means that the conclusions derived above concerning Figure 5 broadly apply here as well. We conclude that the duration of membership in the GATT/WTO on the growth rate of human development is higher in countries with high degrees of the overall export product diversification (i.e., with lower levels of the overall export product concentration, including than the value of 3.6). Countries with a high degree of export product concentration (especially of values higher than 3.6) experience no significant effect of the membership duration on citizens' welfare.

Estimates presented in column [3] of Table 6 indicate that the coefficients of the variables ("DUR\*EPCINT") and ("DUR\*EPCEXT") are respectively negative and significant at the 1% level, and positive but not significant at the 10% level. Concurrently, the coefficient of the variable "DUR" is positive and significant at the 1% level. These outcomes suggest the following interpretations. First, on average over the full sample, the membership duration influences positively citizens' welfare in countries whose levels of export product concentration at the intensive margins are lower than 4.34 (=  $0.0196/0.00452$ ), as otherwise, the membership duration reduces citizens' welfare. It signifies that the membership duration enhances welfare in countries that diversify their export products at the intensive margins, and the greater the level of export product diversification at the intensive margins, the larger is the positive impact of the membership duration on the growth rate of human development. In contrast, for high degrees of export product concentration at the intensive margins, the membership duration exerts no significant

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<sup>18</sup> Over the full sample, the values of the real income range from US\$ 759 million and US\$ 19100 billion (see Appendix 3b).

effect on the growth rate of human development. Second, regardless of the degree of export product concentration at the extensive margins, the membership duration always exerts a positive effect on the growth rate of human development, but the magnitude of this positive effect declines as countries enjoy a higher level of export product concentration at the extensive margins. Put it differently, the membership duration exerts a larger positive effect on citizens' welfare in countries with a higher degree of export product diversification at the extensive margins than in those with a relatively lower degree of export product diversification at the extensive margins (i.e., a relatively higher level of export product concentration at the extensive margins). Figures 15 and 16 show at the 95 per cent confidence intervals, the marginal impact of the duration of the membership in the GATT/WTO on the growth rate of human development for varying levels respectively of the export product concentration at the intensive margins, and the export product concentration at the extensive margins. Both Figures show that the membership duration leads to a higher growth of human development in countries that experience lower (higher) degrees of export product concentration (diversification) at the both the intensive and extensive margins. This is in particular the case for values of "EPCINT" lower than 3.28, and of "EPCEXT" lower than 0.93. For values of these indicators higher than these levels, the impact of the membership duration on the growth rate of human development is not statistically significant.

Overall, the membership duration fosters citizens' welfare in countries that achieve greater export product diversification, including both at the intensive and extensive margins, but exerts no significant effect on this welfare in countries that have a high level of export product concentration, including at the intensive and extensive margins.

Estimates in column [3] of Table 6 show that while the coefficient of the variable "DUR" is not significant at the 10% level, that of the interaction variable "DUR\*QUAL" is positive, but significant only at the 10% level. These outcomes lead us to infer that over the full sample, the membership duration exerts a positive effect on citizens' welfare as countries further improve their export product quality, but this effect is significant only at the 10% level. Figure 17 displays, at the 95 per cent confidence intervals, the marginal impact of the membership duration on the growth rate of human development for varying levels of export product quality. It shows that this marginal impact is positive and increases as countries further improve the quality of their export products. However, it is significant only for levels of export product quality higher than 0.86<sup>19</sup>. We conclude from Figure 17 that, like in Figure 8, the membership duration promotes citizens' welfare only in countries that enjoy high levels of export product quality. These findings are also confirmed by results in column [4] of Table 6, as well as Figure 18. These results reveal that the coefficients of the variables "DUR" and "DUR\*ECI" are both positive, but the coefficient of the former is significant at the 1% level, while that of the later is significant only at the 10% level. On the basis of these outcomes, we can deduce that over the full sample, the membership duration consistently influences positively and significantly the growth rate of human development as countries further improve their level of economic complexity. In particular, this positive effect is larger, the greater the countries' level of economic complexity. Figure 18 illustrates this impact, by showing at the 95 per cent confidence intervals, the marginal impact of the membership duration on the growth rate of human development for varying levels of economic complexity. It indicates that the membership duration induces an improvement of human development in countries that increasingly export complex products, especially for countries whose level of economic complexity exceeds the value<sup>20</sup> of -0.70. These findings run in contrast with the ones derived from Figure 9, and show that countries that export unsophisticated products experience no significant effect of their membership duration in the GATT/WTO on the growth of human development. In contrast, this effect is positive and significant for countries that produce and export increasingly

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<sup>19</sup> The values of the indicator "QUAL" range from 0.257 and 1.092 (see Appendix 3b).

<sup>20</sup> The values of the indicator "ECI" range from -2.4 and 2.5 (see Appendix 3b).

complex products, and the magnitude of this positive effect is larger, the higher the countries' degree of economic complexity.

## ***5. Taking into account the heterogeneity of countries in the full sample***

In this section, we take into account the heterogeneity of the large sample of 148 countries by considering how the duration of the membership in the GATT/WTO affects human development in various sub-samples.

We start by distinguishing between countries that undertook extensive trade liberalization policy commitments and passed through long negotiation processes, from those that did not, when joining the GATT/WTO. To that effect, we consider several sub-samples. The first sub-sample considered in the analysis is the group of countries that joined the GATT under Article XXVI 5(c)<sup>21</sup> of the GATT. These countries were essentially former colonies that could invoke Article XXVI 5(c) of the GATT to join the GATT. These countries neither undergo long negotiation procedures, nor undertake extensive policy reforms commitments when joining the GATT. In the present analysis, 45 countries out of the 148 countries joined the GATT under Article XXVI 5(c) of the GATT. For the sake of simplicity, we, henceforth, denote this group of countries "Article 26 member states". The second group of countries includes states that did not invoke GATT's Article XXVI 5(c) when joining the GATT. These states underwent long negotiation processes, and carried extensive reforms. We refer these countries to as "non-Article 26 member states". Our panel dataset contains 60 non-Article 26 member states. The group constituted by both Article 26 member states and non-Article 26 member states is considered in the analysis as "original WTO member states".

States that were not original WTO Members, joined the WTO under Article XII<sup>22</sup> of the Marrakesh Agreement establishing the WTO. This set of countries (which is the third sub-group of countries considered in the analysis) acceded to the WTO through more rigorous procedures than the ones undergone by original WTO Members (i.e., contracting parties of the GATT), and even more than the ones of non-Article 26 member states. This is because the procedures guiding states' accession to the WTO under Article XII of the Marrakesh Agreement establishing the WTO entail extensive domestic reforms, essentially because of the increased scope and coverage of WTO agreements (e.g., Drabek and Bacchetta, 2004; Lanoszka, 2001). For the sake of simplicity, we, henceforth, denote this group of countries "Article 12 member states". The panel dataset contains 29 Article 12 member states. Overall, Article 12 member states undertook greater liberalization commitments than non-Article 26 member states, while Article 26 member states did not undertake extensive policy reform commitments when joining the GATT.

At the same time, greater trade liberalization reforms might not necessarily be associated with an improvement in citizens' well-being (including here, human development). In fact, when trade liberalization reforms result in greater trade flows, including exports of goods, what could matter for human development is the nature of goods exported, given that the export of low-value added goods is not likely to have the same effect on human development as the export of high

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<sup>21</sup> The GATT Article XXVI 5(c) reads as follows: If any of the customs territories, in respect of which a contracting party has accepted this Agreement, possesses or acquires full autonomy in the conduct of its external commercial relations and of the other matters provided for in this Agreement, such territory shall, upon sponsorship through a declaration by the responsible contracting party establishing the above-mentioned fact, be deemed to be a contracting party. GATT Article XXVI 5(c) is accessible online at: [https://www.wto.org/english/res\\_e/publications\\_e/ai17\\_e/gatt1994\\_art26\\_gatt47.pdf](https://www.wto.org/english/res_e/publications_e/ai17_e/gatt1994_art26_gatt47.pdf)

<sup>22</sup> Article XII of the Marrakesh Agreement establishing the WTO provides that "*Any State or separate customs territory possessing full autonomy in the conduct of its external commercial relations and of the other matters provided for in this Agreement and the Multilateral Trade Agreements may accede to this Agreement, on terms to be agreed between it and the WTO. Such accession shall apply to this Agreement and the Multilateral Trade Agreements annexed thereto*" (see Article XII.1). Further information on Article XII is available online at: [https://www.wto.org/english/docs\\_e/legal\\_e/04-wto.pdf](https://www.wto.org/english/docs_e/legal_e/04-wto.pdf) and [https://www.wto.org/english/thewto\\_e/acc\\_e/acces\\_e.htm](https://www.wto.org/english/thewto_e/acc_e/acces_e.htm)

value added goods, including sophisticated products. As well pointed out by Hausmann et al. (2007), what matters for countries' long term economic growth and development paths, is not simply exporting products, but rather exporting sophisticated products, i.e., those that are placed higher on the quality spectrum of export products. For example, liberalization reforms that result in the expansion of the export of primary commodities are likely to result in higher income inequality, and greater macroeconomic volatility that would worsen social outcomes, including negatively affect human development (e.g., Carmignani and Avom, 2010). Thus, countries that enjoy a positive effect of the duration of the membership in the GATT/WTO on citizens' human development can be those that, through their liberalization reforms, have been capable of expanding trade flows, and in particular upgrading their export products baskets<sup>23</sup>.

Summing-up, the extent to which the duration of the membership in the GATT/WTO affects human development in each of the three groups of countries (i.e., Article 26 member states, non-Article 26 member states, and Article 12 member states) is an empirical matter.

We additionally consider other sets of countries in the full sample, which are developed countries, developing countries, and least developed countries<sup>24</sup> (LDCs) among the latter. Hence, the first of these other sub-samples of countries is the 'developed countries' among non-Article 26 member states. The GATT and later the WTO have not provided a clear delineation between the categories of 'developed countries' and 'developing countries'. When joining the WTO, a state self-designates either as a "developing country" or a "developed country", although the decision by a member state to opt for the 'developing country' status in order to take advantage of provisions available to developing countries, can be contested by other WTO members. In light of this, we consider the so-called "old-industrialized countries" as 'developed countries'. 22 countries out of the 60 non-Article 26 member states are considered as developed countries in the analysis. This signifies that all other countries are considered as 'developing countries'.

The second group of countries here is LDCs, which are countries designated by the United Nations as the poorest in the world, and concurrently the most vulnerable ones to environmental shocks and exogenous economic and financial shocks. Indeed, in light of the importance of 'export product upgrading' in the relationship between the duration of the membership in the GATT/WTO and human development, we find useful to examine the effect of the membership duration on human development in LDCs. The LDCs export essentially primary commodities (e.g., WTO, 2021b), and are subject to higher magnitudes and frequency of external shocks than other developing countries (Cariolle et al., 2016). The GATT/WTO has provided many special flexibilities to them in the WTO rules, compared to other WTO member states, with a view to facilitating their integration into the global trading system (e.g., WTO, 2021c; 2022). The group of LDCs is heterogeneous and contains Article 26 member states, non-Article 26 member states, and Article 12 member states. Thus, in examining the effect of the duration of the membership in the GATT/WTO on human development in LDCs, we also consider such an effect for LDCs that are Article 26 member states, those that are non-Article 26 member states and those that are Article 12 member states.

Appendix 4 contains the lists of countries in each of the different sub-samples described above.

To examine the effect of the duration of the GATT/WTO membership on the growth rate of human development over the various sub-samples described above, we consider as baseline

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<sup>23</sup> Upgrading export products depends not only on the extent of trade liberalization, but also on other factors such as the accumulated human capital, the access to credit to overcome trade costs and expand production, the ability to attract foreign direct investment inflows, the technological capabilities, and the productivity (e.g., Agosin et al., 2012; Bas, 2015; Lectard and Rougier, 2018; Parteka, 2020; Zhu and Fu, 2013; Weldemicael, 2014).

<sup>24</sup> The list of LDCs and criteria used for the inclusion of a country in the LDC category and the graduation of a country from this category are available online at: <https://www.un.org/ohrlls/content/least-developed-countries>



model, the specification of models (1) and (2) that do not include both the variable "VAR" and its interaction with the membership duration indicator. We do not perform the estimation over each sub-sample simply because the full sample contains states that had not yet joined the WTO. Thus, to obtain the effect of the duration of the GATT/WTO membership on the growth rate of human development over a given sub-sample (among those described above), we introduce, in the baseline models (1) and (2) estimated over the full sample, both the dummy capturing countries in a relevant sub-sample, and the multiplicative variable between this dummy and the indicator of the duration of membership in the GATT/WTO. Note that the dummy created for the sub-sample concerned takes the value of 1 for all countries in the sub-sample and 0, otherwise.

We use the FEDK estimator to estimate the effect of the membership duration on the growth rate of human development for each sub-sample (using the above-mentioned baseline model (1)). Likewise, we use the SGMM estimator to estimate the above-mentioned baseline model (2), with a view to obtaining the effect of the membership duration on the growth rate of human development for each sub-sample. The outcomes arising from all these estimations are summarized in Table 7<sup>25</sup>. In particular, we report in this Table, the net effect of the duration of the GATT/WTO membership on the growth rate of human development over each of the above-mentioned sub-samples. For each sub-sample, the net effect has been computed as the sum of the coefficient of the indicator of membership duration and the coefficient of the interaction variable if both coefficients are significant at the conventional significance levels. If only one coefficient is significant at the conventional significance levels, we retain the value of this coefficient as the net effect.

Results reported at the top of Table 7 (i.e., those obtained by means of the FEDK estimator) indicate that the membership duration exerts a positive effect on the growth rate of human development in Article 26 member states, Article 12 member states, and non-Article 26 member states (see columns [1] to [3]). It, however, appears that Article 26 member states enjoy a slightly higher positive effect of the membership duration on the growth rate of human development than Article 12 member states. These findings may reflect not only differentiated effect of the membership duration across countries in each of these two sub-samples, but it may also reflect differences across countries in each of these groups in terms of factors that underpin the human development path, one of these factors being export product upgrading. Incidentally and interestingly, non-Article 26 member states experience a larger positive effect of the membership duration on the growth rate of human development than Article 26 member states (and consequently than Article 12 member states) (see column [4]).

We note from column [5] of the upper part of Table 7 that developed countries have experienced, on average, a lower positive effect of the membership duration on human capital growth than developing countries. This puzzling result may reflect differentiated outcomes across countries within the sub-sample of developing countries, given the high heterogeneity of the latter. This is to argue that within the group of developing countries considered in the present analysis, some countries (e.g., Singapore) can enjoy high levels of export product upgrading than others, and hence experience a higher positive effect of the membership duration on the growth rate of human development than others, and eventually than some developed countries. On the other side, other developing countries, notably those that export relatively low value-added products, or essentially primary products (for example, LDCs) are likely to experience a lower effect of the membership duration on the growth of human development than other developing countries, let alone than developed countries.

The results in column [6] of the upper part of Table 7 confirm these lines of reasoning, given that we obtain a negative effect of the membership duration on the growth rate of human development. However, estimates presented in columns [7] to [9] indicate that the negative effect

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<sup>25</sup> The full estimations' results have not been reported to save space. The full results could be obtained upon request.

obtained for LDCs is essentially attributed to the negative effect of the membership duration on the growth rate of human development in Article 26 LDC member states. In fact, we obtain from column [8] that the net effect of the membership duration on the growth rate of human development is negative for LDCs that are Article 26 member states, but positive and of the same magnitude for both LDCs that are non-Article 26 member states, and for LDCs that are Article 12 member states. These findings suggest that while developing countries, and LDCs among them need a special attention from the international community for upgrading their export products basket, LDCs that are Article 26 member states would require even greater attention from the international community.

The results (based on the SGMM estimator) presented in columns [1] to [9] of the lower part of Table 7 show, in general, similar patterns (although with different estimates) to those reported in the upper part of the Table, that we discussed above. Thus, the same conclusions derived above apply here as well.

## **6. Conclusion**

Few papers in the empirical literature have examined the effect of the membership in the GATT/WTO on economic growth and poverty. The present paper complements these works by examining the effect of the duration of the membership in the GATT/WTO (and not the simple membership in the GATT/WTO) on citizens' welfare, measured by their human development level. It has postulated that through its positive effect on export product upgrading, the duration of the membership in the GATT/WTO would reduce economic growth volatility, and consequently promote human development. Export product upgrading is measured in several ways, i.e., through the overall export product diversification, including export product diversification both at the intensive and extensive margins, the improvement of the quality of export products, and greater economic complexity. The analysis has used an unbalanced panel dataset of 148 developed and developing countries, with data spanning the period from 1990 to 2019. It has established several findings. Regardless of countries' level of economic growth volatility, the membership duration leads to a higher growth of human development. Countries with lower levels of economic growth volatility experience a higher citizens' welfare than those with a higher volatility of economic growth. As also expected, the effect of the membership duration on the growth of human development works through the export product upgrading channel. The membership duration exerts a positive effect on the growth rate of human development in countries that enjoy a high level of export product upgrading.

The analysis has also revealed heterogenous effects of the membership duration on the growth rate of human development across countries. Old-industrialized countries (qualified as 'developed countries') experience a lower positive effect of the membership duration on the growth rate of human development. Article 26 member states enjoy a slightly higher positive effect of the membership duration on the growth rate of human development than Article 12 member states, while non-Article 26 member states experience a larger positive effect of the membership duration on the growth rate of human development than Article 26 member states. While the membership duration exerts a negative effect on the growth rate of human development in Article 26 LDC member states, this effect is rather positive and of equal magnitude for both Article 26 LDC member states, and for non-Article 12 LDC member states.

In a nutshell, the present analysis sheds light on the major role played by the membership in the GATT/WTO over time, and in this regard, adds to previous studies on the positive effect of this membership on economic growth, and its poverty reduction effect.

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## TABLES and APPENDICES

**Table 1:** Effect of the duration of membership in the GATT/WTO on human development growth\_Over the full sample  
**Estimator.** FEDK

Variables	HDIR (1)	HDIR (2)	HDIR (3)	HDIR (4)	HDIR (5)
HDIR <sub>t-1</sub>	0.239*** (0.0534)	0.237*** (0.0534)	0.239*** (0.0532)	0.233*** (0.0536)	0.236*** (0.0532)
DUR <sub>t-5</sub>	0.0206*** (0.00630)	0.0216*** (0.00616)	0.0166*** (0.00600)	0.0313*** (0.00925)	0.0617 (0.0439)
[DUR <sub>t-5</sub> ]*[Log(GRVOL1) <sub>t-1</sub> ]		-0.000804 (0.000811)			
Log(GRVOL1) <sub>t-1</sub>		0.110*** (0.0379)			
[DUR <sub>t-5</sub> ]*[TRADE <sub>t-5</sub> ]			4.93e-05*** (1.30e-05)		
[DUR <sub>t-5</sub> ]*[FISCRED <sub>t-5</sub> ]				-0.000970*** (0.000323)	
[DUR <sub>t-5</sub> ]*[Log(GDPC) <sub>t-5</sub> ]					-0.00157 (0.00151)
TRADE <sub>t-5</sub>	-0.00211** (0.000820)	-0.00211** (0.000822)	-0.00342*** (0.00106)	-0.00158** (0.000772)	-0.00214** (0.000827)
Log(GDP) <sub>t-5</sub>	-0.946*** (0.154)	-0.947*** (0.163)	-0.945*** (0.151)	-0.988*** (0.154)	-0.931*** (0.152)
INFL <sub>t-5</sub>	-0.0225 (0.0213)	-0.0327 (0.0215)	-0.0231 (0.0211)	-0.0266 (0.0211)	-0.0219 (0.0215)
FISCRED <sub>t-5</sub>	-0.0334** (0.0132)	-0.0416*** (0.0144)	-0.0398*** (0.0136)	0.0211 (0.0188)	-0.0275** (0.0111)
GCONS <sub>t-5</sub>	-0.00893 (0.0130)	-0.00877 (0.0127)	-0.00829 (0.0130)	-0.0108 (0.0132)	-0.00849 (0.0130)
DEM <sub>t-5</sub>	0.00123 (0.00565)	0.00194 (0.00560)	0.00205 (0.00568)	0.000171 (0.00549)	0.00122 (0.00566)
Log(POP)	0.00198 (0.182)	0.0433 (0.205)	-0.0113 (0.187)	-0.195 (0.167)	-0.0569 (0.154)
Constant	24.00*** (3.802)	23.33*** (3.640)	24.33*** (3.732)	27.81*** (4.187)	24.50*** (3.709)
Observations - Countries	2,948 - 148	2,948 - 148	2,948 - 148	2,948 - 148	2,948 - 148
Within R <sup>2</sup>	0.1487	0.1534	0.1496	0.1516	0.1495

Note: \**p*-value<0.1; \*\**p*-value<0.05; \*\*\**p*-value<0.01. Robust Standard Errors are in parenthesis.

**Table 2:** Effect of the duration of membership in the GATT/WTO on human development growth\_Over the full sample

**Estimator.** FEDK

Variables	HDIR (1)	HDIR (2)	HDIR (3)	HDIR (4)
HDIR <sub>t-1</sub>	0.203*** (0.0505)	0.201*** (0.0518)	0.176*** (0.0410)	0.143*** (0.0342)
DUR <sub>t-5</sub>	0.0196*** (0.00660)	0.0198*** (0.00670)	0.0152** (0.00585)	0.0117** (0.00507)
EPC <sub>t-5</sub>	0.176*** (0.0417)			
EPCINT <sub>t-5</sub>		0.194*** (0.0445)		
EPCEXT <sub>t-5</sub>		0.0430 (0.123)		
QUAL <sub>t-5</sub>			-0.608** (0.268)	
ECI <sub>t-5</sub>				0.0794 (0.0782)
TRADE <sub>t-5</sub>	-0.00283*** (0.000925)	-0.00286*** (0.000906)	-0.00136 (0.000965)	-0.00191** (0.000891)
Log(GDP) <sub>t-5</sub>	-1.021*** (0.169)	-1.033*** (0.174)	-1.022*** (0.162)	-0.983*** (0.139)
INFL <sub>t-5</sub>	-0.0208 (0.0218)	-0.0195 (0.0211)	-0.0302 (0.0226)	-0.0134 (0.0230)
FISCRED <sub>t-5</sub>	-0.0394*** (0.0142)	-0.0388*** (0.0143)	-0.0196 (0.0125)	-0.0250** (0.0120)
GCONS <sub>t-5</sub>	-0.00973 (0.00773)	-0.0105 (0.00781)	-0.0136 (0.00836)	-0.00606 (0.00902)
DEM <sub>t-5</sub>	0.00335 (0.00653)	0.00383 (0.00638)	0.00681 (0.00638)	0.00679 (0.00487)
Log(POP)	0.150 (0.192)	0.0716 (0.211)	0.184 (0.203)	0.576*** (0.201)
Constant	23.08*** (4.102)	24.65*** (5.148)	23.57*** (3.241)	16.00*** (3.263)
Observations - Countries	2,926 - 146	2,926 - 146	2,790 - 139	2,370 - 113
Within R <sup>2</sup>	0.1579	0.1590	0.1489	0.1313

Note: \*p-value<0.1; \*\*p-value<0.05; \*\*\*p-value<0.01. Robust Standard Errors are in parenthesis.

**Table 3:** Effect of the duration of membership in the GATT/WTO on human development growth through the transmission channels\_Over the full sample

**Estimator.** FEDK

Variables	HDIR (1)	HDIR (2)	HDIR (3)	HDIR (4)
HDIR <sub>t-1</sub>	0.198*** (0.0518)	0.198*** (0.0528)	0.176*** (0.0411)	0.142*** (0.0338)
DUR <sub>t-5</sub>	0.0321*** (0.00835)	0.0308*** (0.00812)	0.0110 (0.0194)	0.0122** (0.00511)
[DUR <sub>t-5</sub> ]*[EPC <sub>t-5</sub> ]	-0.00454** (0.00181)			
[DUR <sub>t-5</sub> ]*[EPCINT <sub>t-5</sub> ]		-0.00382** (0.00169)		
[DUR <sub>t-5</sub> ]*[EPCEXT <sub>t-5</sub> ]		-0.00677* (0.00406)		
[DUR <sub>t-5</sub> ]*[QUAL <sub>t-5</sub> ]			0.00469 (0.0167)	
[DUR <sub>t-5</sub> ]*[ECI <sub>t-5</sub> ]				-0.00224 (0.00192)
EPC <sub>t-5</sub>	0.236*** (0.0486)			
EPCINT <sub>t-5</sub>		0.239*** (0.0516)		
EPCEXT <sub>t-5</sub>		0.178 (0.110)		
QUAL <sub>t-5</sub>			-0.704** (0.304)	
ECI <sub>t-5</sub>				0.134 (0.102)
TRADE <sub>t-5</sub>	-0.00275*** (0.000909)	-0.00278*** (0.000906)	-0.00139 (0.000938)	-0.00180** (0.000902)
Log(GDP) <sub>t-5</sub>	-1.057*** (0.177)	-1.065*** (0.180)	-1.024*** (0.160)	-0.978*** (0.139)
INFL <sub>t-5</sub>	-0.0188 (0.0213)	-0.0186 (0.0208)	-0.0295 (0.0223)	-0.0138 (0.0229)
FISCRE <sub>t-5</sub>	-0.0386*** (0.0139)	-0.0392*** (0.0131)	-0.0202* (0.0113)	-0.0200 (0.0140)
GCONS <sub>t-5</sub>	-0.0101 (0.00768)	-0.0104 (0.00787)	-0.0136 (0.00834)	-0.00612 (0.00909)
DEM <sub>t-5</sub>	0.00197 (0.00656)	0.00255 (0.00641)	0.00675 (0.00649)	0.00643 (0.00475)
Log(POP)	0.312 (0.198)	0.258 (0.210)	0.203 (0.171)	0.520*** (0.182)
Constant	21.14*** (3.981)	22.24*** (4.834)	23.41*** (3.213)	16.76*** (2.841)
Observations - Countries	2,926 - 146	2,926 - 146	2,790 - 139	2,370 - 113
Number of groups	146	146	139	113
Within R <sup>2</sup>	0.1610	0.1618	0.1490	0.1317

Note: \*p-value<0.1; \*\*p-value<0.05; \*\*\*p-value<0.01. Robust Standard Errors are in parenthesis.

**Table 4:** Effect of the duration of membership in the GATT/WTO on human development growth\_Over the full sample  
*Estimator.* SGMM

Variables	HDIR (1)	HDIR (2)	HDIR (3)	HDIR (4)	HDIR (5)
HDIR <sub>t-1</sub>	0.338*** (0.0213)	0.355*** (0.0182)	0.351*** (0.0197)	0.360*** (0.0120)	0.344*** (0.0225)
DUR	<b>0.0112***</b> <b>(0.00183)</b>	<b>0.00910***</b> <b>(0.00159)</b>	0.0105*** (0.00231)	<b>0.0129***</b> <b>(0.00200)</b>	-0.0411** (0.0160)
DUR*[Log(GRVOL2)]		<b>-0.00282***</b> <b>(0.000838)</b>			
[DUR]*[TRADE]			<b>1.50e-05</b> <b>(2.16e-05)</b>		
DUR*FISCRED				<b>-8.49e-05</b> <b>(0.000118)</b>	
DUR*Log(GDP)					0.00207*** (0.000624)
Log(GRVOL2)		-0.0468 (0.0409)			
TRADE	0.00219*** (0.000760)	0.00146* (0.000750)	0.00147 (0.00111)	0.00181*** (0.000491)	0.00154** (0.000729)
Log(GDP)	-0.517*** (0.0467)	-0.368*** (0.0389)	-0.483*** (0.0433)	-0.441*** (0.0255)	-0.509*** (0.0446)
INFL	0.0536 (0.0416)	0.0816** (0.0364)	0.0785** (0.0390)	0.0796*** (0.0235)	0.0604* (0.0333)
FISCRED	0.0537*** (0.00792)	0.0308*** (0.00563)	0.0507*** (0.00781)	0.0402*** (0.00558)	0.0393*** (0.00766)
GCONS	0.00735 (0.00457)	-0.00349 (0.00402)	0.00205 (0.00361)	-0.00365 (0.00269)	0.00297 (0.00367)
DEM	-0.0165* (0.00913)	-0.0111 (0.00713)	-0.0213*** (0.00802)	-0.0209*** (0.00625)	-0.0204** (0.00874)
Log(POP)	0.552*** (0.0796)	0.261*** (0.0606)	0.497*** (0.0688)	0.377*** (0.0485)	0.427*** (0.0594)

Observations - Countries	616 - 148	615 -148	616 - 148	616 - 148	616 - 148
Number of Instruments	72	88	80	<b>104</b>	<b>80</b>
AR1 (P-Value)	0.0000	0.0001	0.0000	0.0000	0.0000
AR2 (P-Value)	0.1373	0.1946	0.1451	0.1439	0.1413
OID (P-Value)	0.1821	0.2114	0.2579	0.10	0.3474

*Note: \*p-value<0.1; \*\*p-value<0.05; \*\*\*p-value<0.01. Robust Standard Errors are in parenthesis. The variables "DUR", "TRADE", "GDP", "INFL", "DEM", "FISCRED", "GCONS", and the interaction variable have been treated as endogenous. The variable "POP" has been considered as exogenous. Time dummies have been included in the regressions. The latter have used 2 lags of endogenous variables as instruments.*



**Table 5:** Effect of the duration of membership in the GATT/WTO on human development growth

**Estimator.** SGMM

Variables	HDIR (1)	HDIR (2)	HDIR (3)	HDIR (4)
HDIR <sub>t-1</sub>	0.437*** (0.0337)	0.456*** (0.0309)	0.479*** (0.0384)	0.388*** (0.0210)
DUR	<b>0.00515*</b> <b>(0.00270)</b>	<b>0.00623**</b> <b>(0.00263)</b>	<b>0.00448</b> <b>(0.00290)</b>	<b>0.00614***</b> <b>(0.00129)</b>
EPC	<b>0.127**</b> <b>(0.0509)</b>			
EPCINT		<b>0.139***</b> <b>(0.0502)</b>		
EPCEXT		<b>0.0351</b> <b>(0.125)</b>		
QUAL			<b>-0.0605</b> <b>(0.665)</b>	
ECI				<b>-0.0458</b> <b>(0.0581)</b>
TRADE	-0.00170 (0.00121)	-0.00180* (0.00100)	-0.000670 (0.00131)	0.00181** (0.000867)
Log(GDP)	-0.239*** (0.0495)	-0.221*** (0.0487)	-0.305*** (0.0556)	-0.443*** (0.0419)
INFL	0.214*** (0.0566)	0.255*** (0.0555)	0.209*** (0.0636)	-0.0143 (0.0257)
FISCRED	0.0145 (0.00907)	0.00980 (0.00912)	0.0167* (0.00980)	0.0339*** (0.00561)
GCONS	0.0442*** (0.0123)	0.0466*** (0.0124)	0.0521*** (0.0130)	0.0247*** (0.00752)
DEM	0.00189 (0.0116)	0.00715 (0.0127)	-0.00313 (0.0130)	0.00784 (0.00623)
Log(POP)	0.144* (0.0870)	0.122 (0.0856)	0.219** (0.0954)	0.462*** (0.0541)
Observations - Countries	502 - 146	502 - 146	482 - 139	499 - 118
Number of Instruments	60	66	60	80
AR1 (P-Value)	0.0000	0.0001	0.0001	0.0000
AR2 (P-Value)	0.5351	0.6040	0.6533	0.2539
OID (P-Value)	0.8465	0.8347	0.8564	0.2423

*Note: \*p-value<0.1; \*\*p-value<0.05; \*\*\*p-value<0.01. Robust Standard Errors are in parenthesis. The variables "DUR", "TRADE", "GDP", "INFL", "DEM", "FISCRED", "GCONS", "GRVOL2" and the export upgrading variables have been treated as endogenous. The variable "POP" has been considered as exogenous. Time dummies have been included in the regressions. The latter have used 2 lags of endogenous variables as instruments.*

**Table 6:** Effect of the duration of membership in the GATT/WTO on human development growth through the transmission channels\_Over the full sample

*Estimator.* SGMM

Variables	HDIR (1)	HDIR (2)	HDIR (3)	HDIR (4)
HDIR <sub>t-1</sub>	0.491*** (0.0315)	0.437*** (0.0302)	0.473*** (0.0240)	0.371*** (0.0180)
<b>DUR</b>	<b>0.0226***</b> <b>(0.00660)</b>	<b>0.0196***</b> <b>(0.00594)</b>	<b>-0.0131</b> <b>(0.00882)</b>	<b>0.00392***</b> <b>(0.000956)</b>
DUR*EPC	<b>-0.00514***</b> <b>(0.00173)</b>			
DUR*EPCINT		<b>-0.00452***</b> <b>(0.00168)</b>		
DUR*EPCEXT		<b>0.00298</b> <b>(0.00486)</b>		
DUR*QUAL			<b>0.0199*</b> <b>(0.0104)</b>	
DUR*ECI				<b>0.00220*</b> <b>(0.00127)</b>
EPCINT		0.287*** (0.0615)		
EPCEXT		-0.158 (0.176)		
EPC	0.243*** (0.0636)			
QUAL			-0.446 (0.468)	
ECI				-0.0324 (0.0506)
TRADE	0.000418 (0.00113)	-0.000630 (0.00101)	-0.00102 (0.00102)	0.00135* (0.000719)
Log(GDP)	-0.234*** (0.0433)	-0.285*** (0.0411)	-0.328*** (0.0330)	-0.412*** (0.0368)
INFL	0.279*** (0.0493)	0.210*** (0.0465)	0.193*** (0.0368)	0.0104 (0.0224)
FISCRED	0.0116 (0.00865)	0.0151* (0.00811)	0.0137** (0.00695)	0.0242*** (0.00573)
GCONS	0.0302*** (0.00985)	0.0311*** (0.00852)	0.0485*** (0.00842)	0.0136** (0.00593)
DEM	0.00584 (0.0116)	0.0104 (0.0109)	-0.00580 (0.00906)	0.00954* (0.00530)
Log(POP)	0.105 (0.0819)	0.205*** (0.0712)	0.205*** (0.0578)	0.407*** (0.0485)
Observations - Countries	502 - 146	502 - 146	482 - 139	499 - 118
Number of Instruments	67	78	84	88
AR1 (P-Value)	0.0001	0.0001	0.0001	0.0000
AR2 (P-Value)	0.7030	0.6469	0.6339	0.2344
OID (P-Value)	0.8006	0.7863	0.4611	0.4175

*Note: \*p-value<0.1; \*\*p-value<0.05; \*\*\*p-value<0.01. Robust standard errors are in parenthesis. The variables "DUR", "TRADE", "GDP", "INFL", "DEM", "FISCRED", "GCONS", "GRVOL2", the export upgrading variables and the interaction variables have been treated as endogenous. The variable "POP" has been considered as exogenous. Time dummies have been included in the regressions. The latter have used 2 lags of endogenous variables as instruments.*

**Table 7:** Effect of the duration of membership in the GATT/WTO on human development growth across sub-samples based on the development level\_Over the full sample

Dependent variable: HDIR								
<i>Estimator: FEDK</i>								
Variable for the interaction "INTER"								
Variables	ART26	ART12	NonART26	OLDIND	LDC	LDC_ART12	LDC_ART26	LDC_NonART26
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DUR <sub>t-5</sub>	0.0190*** (0.00583)	0.0211*** (0.00634)	0.0237** (0.0111)	0.0254*** (0.00800)	0.0214*** (0.00633)	0.0212*** (0.00639)	0.0212*** (0.00639)	0.0212*** (0.00639)
[DUR <sub>t-5</sub> ]*INTER	0.0102 (0.00940)	-0.0107** (0.00487)	-0.00390 (0.00855)	-0.0130** (0.00590)	-0.0356*** (0.0102)	-0.00878 (0.0257)	-0.0429*** (0.0121)	0.00515 (0.00999)
Net effect of "DUR <sub>t-5</sub> "	+0.0190	+0.0104	+0.0237	+0.0124	-0.0142	+0.0212	-0.0217	+0.0212

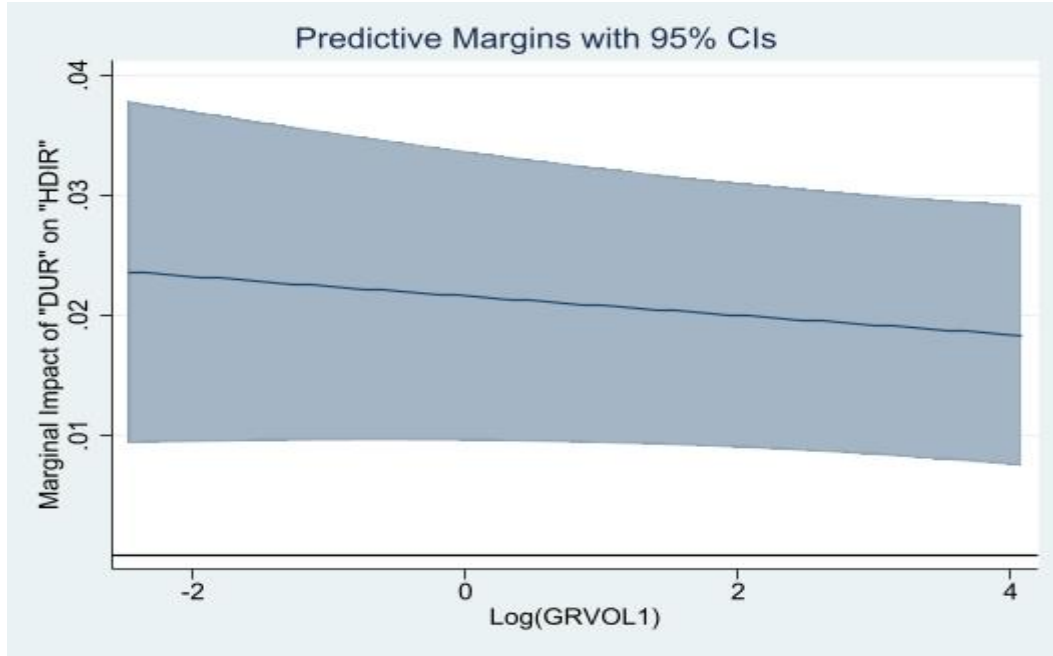
  

Dependent variable: HDIR								
<i>Estimator: SGMM</i>								
Variable for the interaction "INTER"								
	ART26	ART12	NonART26	OLDIND	LDC	LDC_ART12	LDC_ART26	LDC_NonART26
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DUR <sub>t</sub>	0.0138*** (0.00261)	0.0138*** (0.00261)	0.00576** (0.00230)	0.0106*** (0.00213)	0.0121*** (0.00200)	0.0113*** (0.00222)	0.0113*** (0.00222)	0.0113*** (0.00222)
[DUR <sub>t</sub> ]*INTER	-0.00916** (0.00424)	-0.0115** (0.00587)	0.0152*** (0.00381)	0.00232 (0.00355)	-0.0178*** (0.00514)	0.0128 (0.0163)	-0.0259*** (0.00748)	0.00826 (0.0125)
Net effect of "DUR <sub>t</sub> "	+0.00464	+0.0023	+0.02096	+0.0106	-0.0057	+0.0113	-0.0146	+0.0113

Note: \*p-value<0.1; \*\*p-value<0.05; \*\*\*p-value<0.01. Robust Standard Errors are in parenthesis. The variable "INTER" is the variable that is interacted with each of the indicator of the duration of membership in the GATT/WTO. In the regressions performed by means of the SGMM estimator, and whose full outcomes could be obtained upon request, the variables "DUR", "TRADE", "GDP", "INFL", "DEM", "FISCRED", "GCONS", "GRVOL2" as well as the interaction variables have been treated as endogenous. The variable "POP" has been considered as exogenous. Time dummies have been included in the regressions. The latter have used 2 lags of endogenous variables as instruments. All model specifications whose results are reported here are correctly specified, as all requirements for the validity of GMM estimator are met. Additionally, in these model specifications, the coefficients of the one-period lag of the dependent variable are positive and significant at the 1% level. The estimates of the control variables are consistent with those obtained in Tables 1 and 4 respectively for the regressions based on the FEDK estimator, and for those based on the SGMM estimator.

## FIGURES

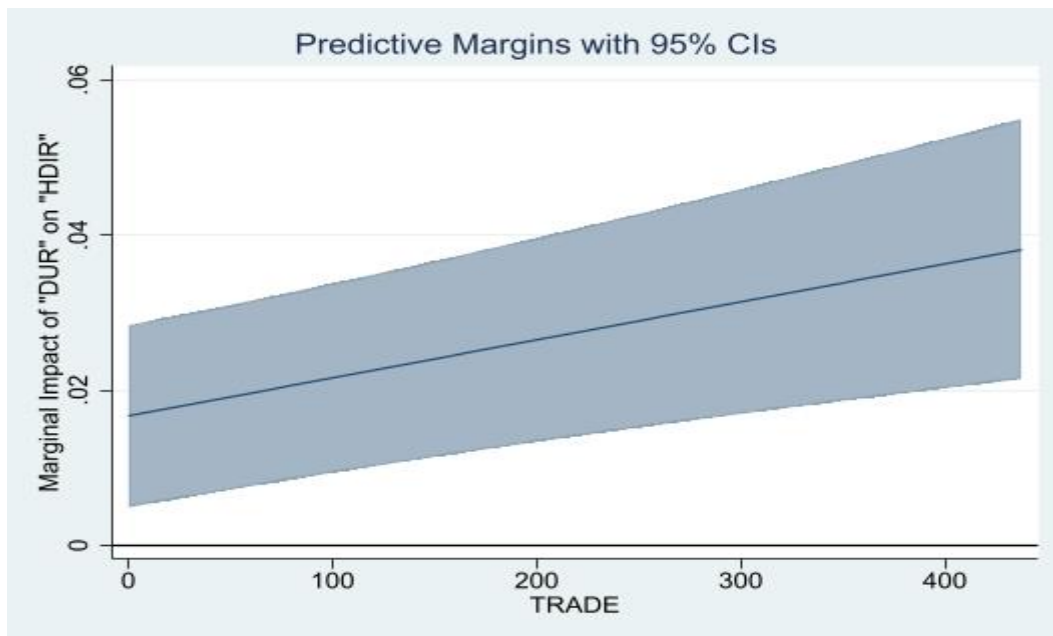
**Figure 1:** Marginal Impact of "DUR" on "HDIR" conditioned on the economic growth volatility



*Source: Author*

*Note: The variable "Log(GRVOL1)" has been lagged at  $t-5$ .*

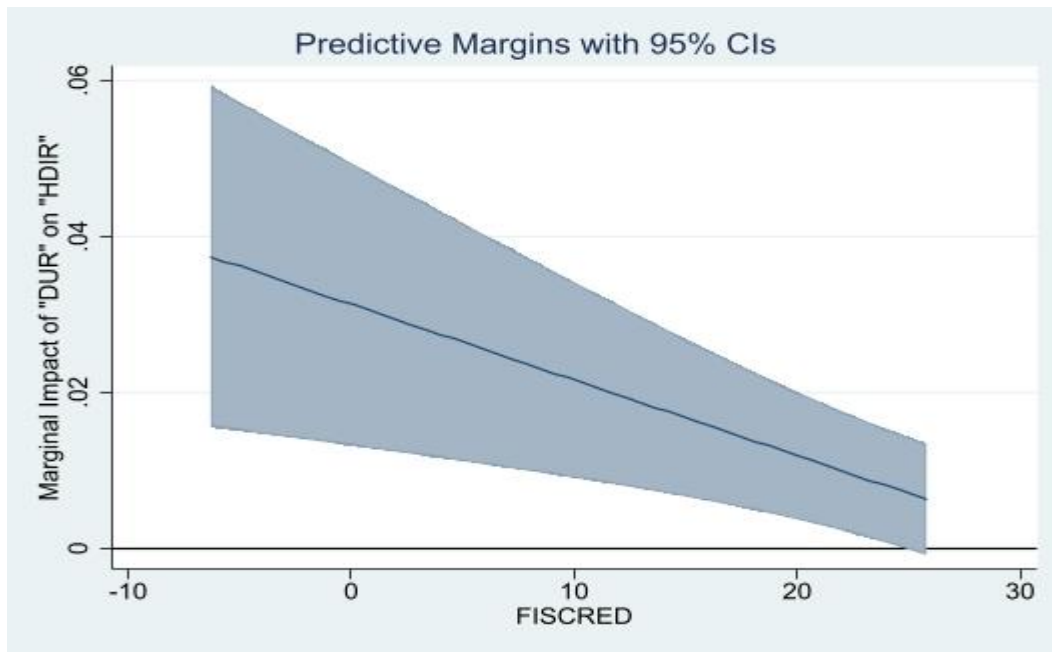
**Figure 2:** Marginal Impact of "DUR" on "HDIR" conditioned on the level of trade openness



*Source: Author*

*Note: The variable "TRADE" has been lagged at  $t-5$ .*

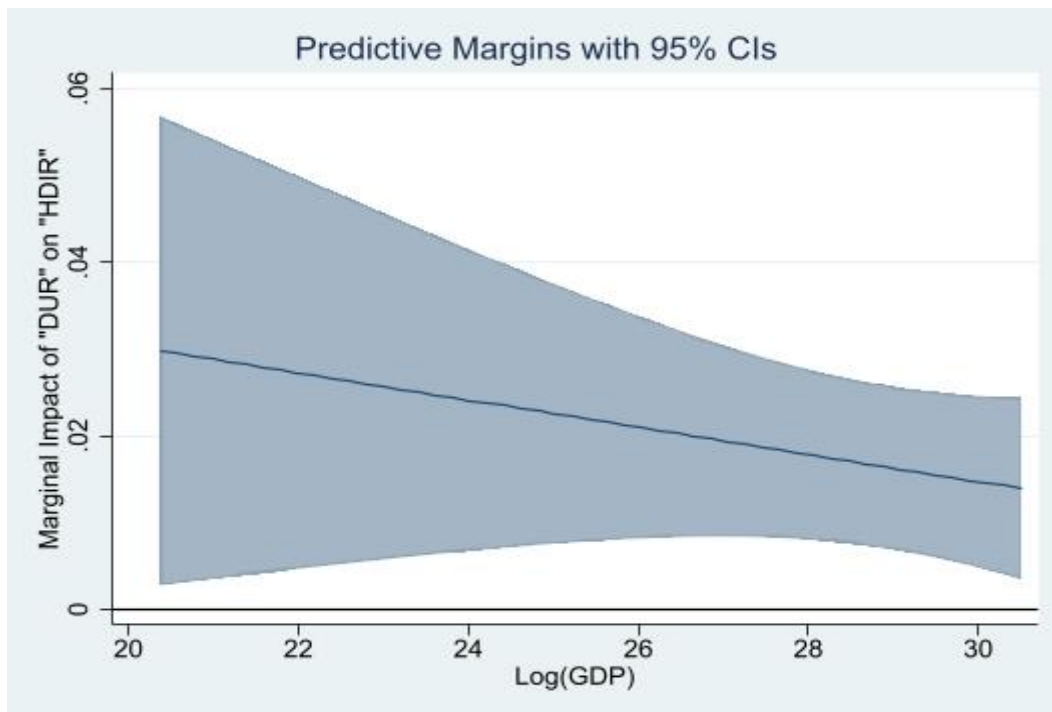
**Figure 3:** Marginal Impact of "DUR" on "HDIR" conditioned on the magnitude of fiscal redistribution



*Source: Author*

*Note: The variable "FISCRED" has been introduced at t-5.*

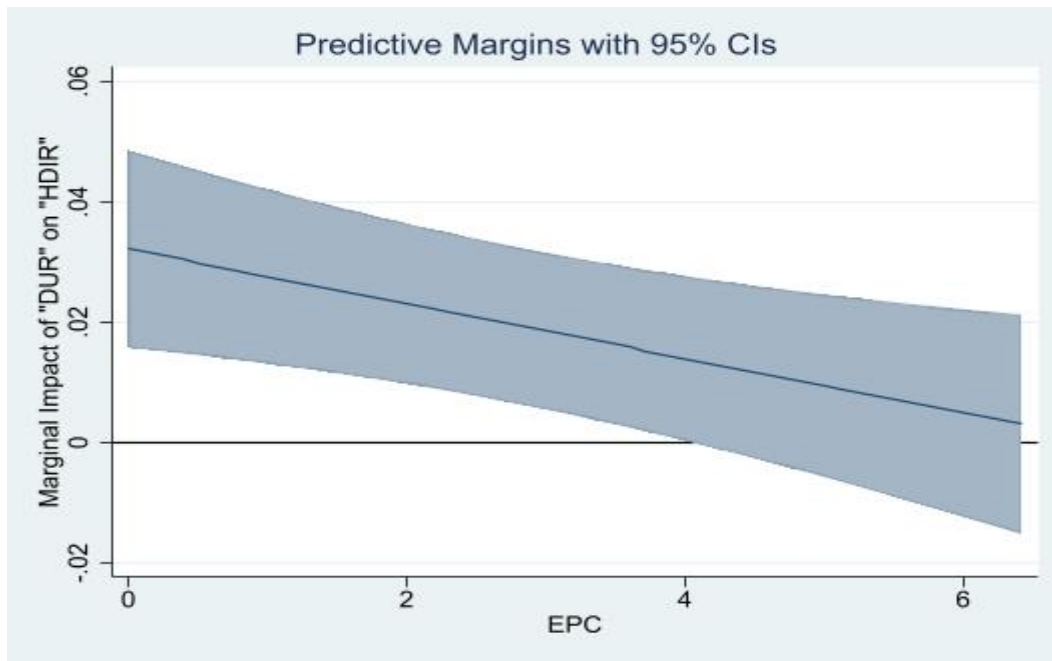
**Figure 4:** Marginal Impact of "DUR" on "HDIR" conditioned on the real income



*Source: Author*

*Note: The variable "Log(GDP)" has been introduced at t-5.*

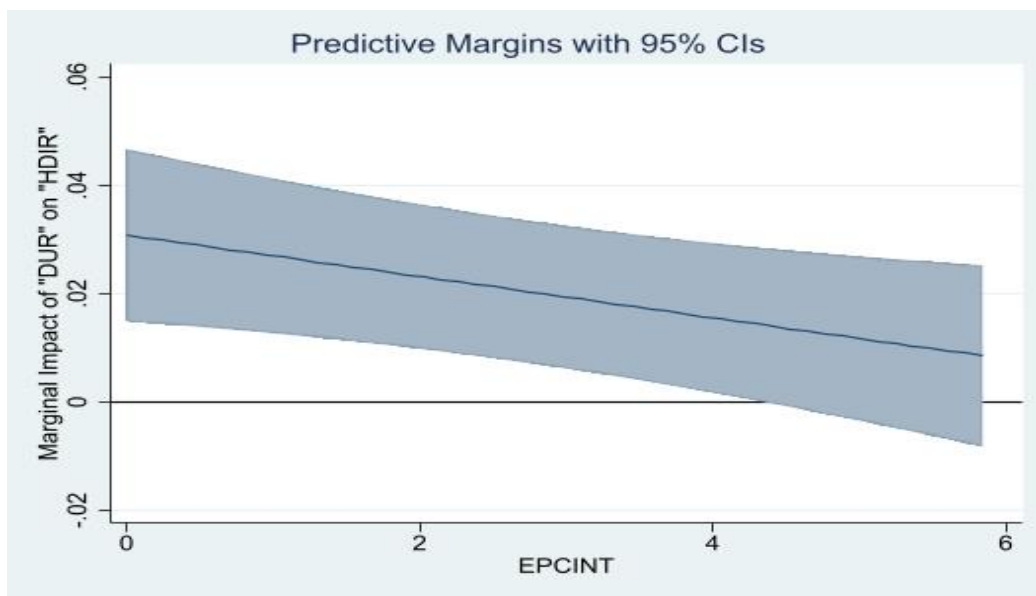
**Figure 5:** Marginal Impact of "DUR" on "HDIR" conditioned on the overall export product concentration



Source: Author

Note: The variable "EPC" has been introduced at year  $t-5$ .

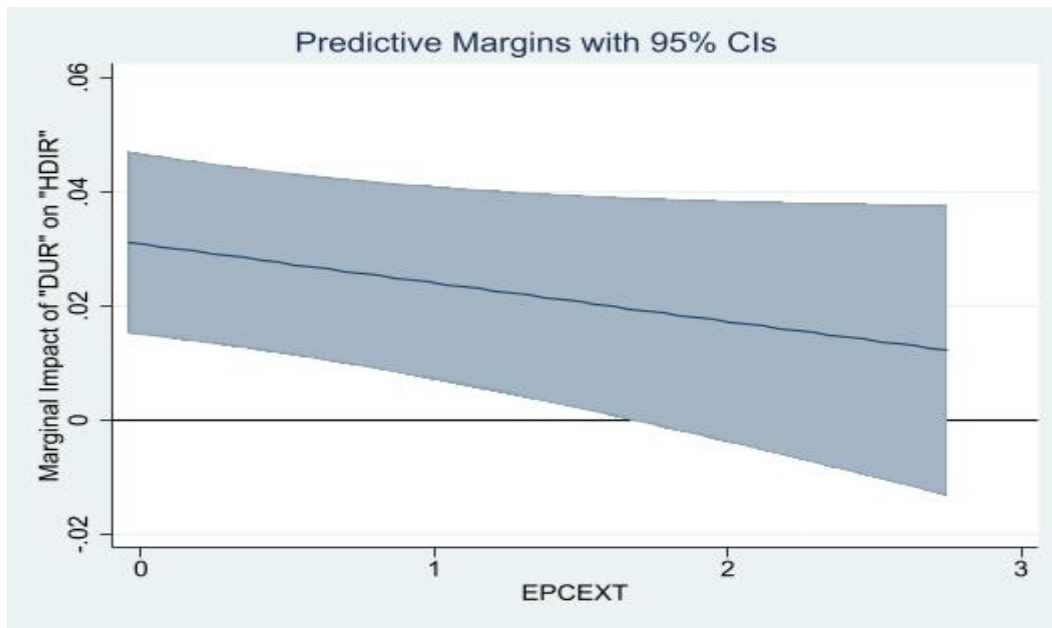
**Figure 6:** Marginal Impact of "DUR" on "HDIR" conditioned on the export product concentration at the intensive margins



Source: Author

Note: The variable "EPCINT" has been introduced at year  $t-5$ .

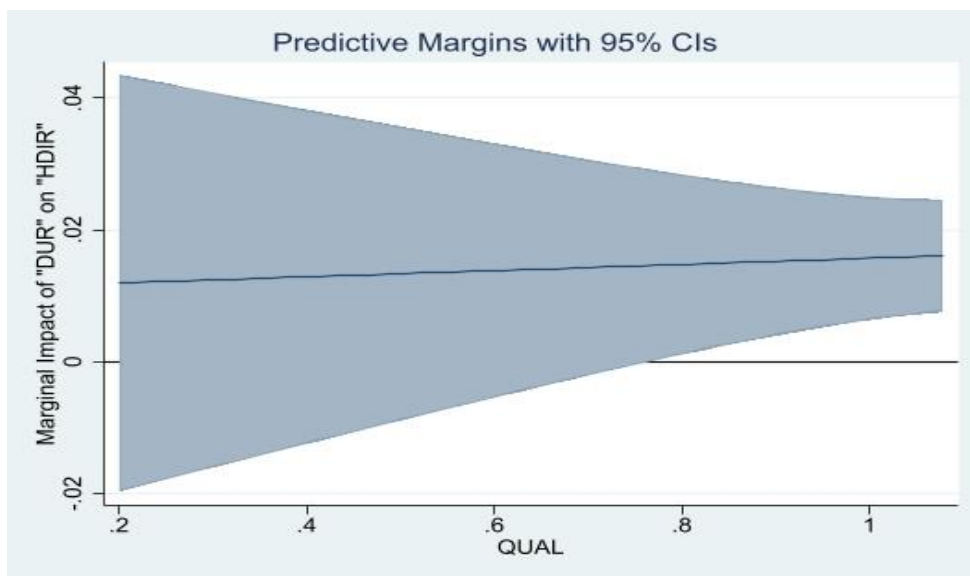
**Figure 7:** Marginal Impact of "DUR" on "HDIR" conditioned on the export product concentration at the extensive margins



Source: Author

Note: The variable "EPCEXT" has been introduced at year  $t-5$ .

**Figure 8:** Marginal Impact of "DUR" on "HDIR" conditioned on the quality of export products

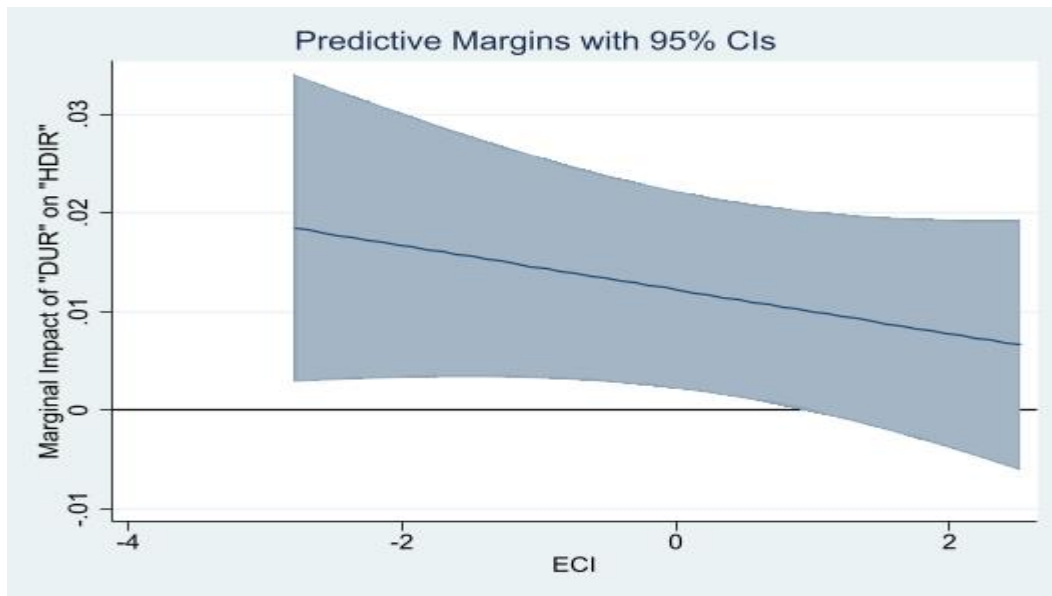


Source: Author

Note: The variable "QUAL" has been introduced at year  $t-5$ .



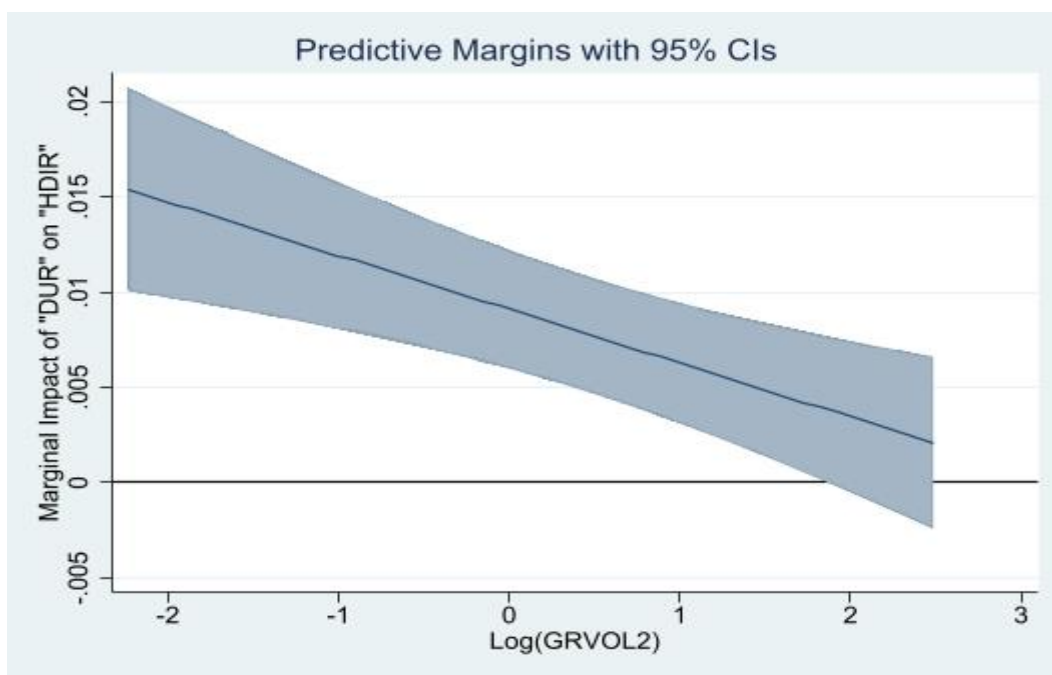
**Figure 9:** Marginal Impact of "DUR" on "HDIR" conditioned on the level of economic complexity



Source: Author

Note: The variable "ECI" has been introduced at year  $t-5$ .

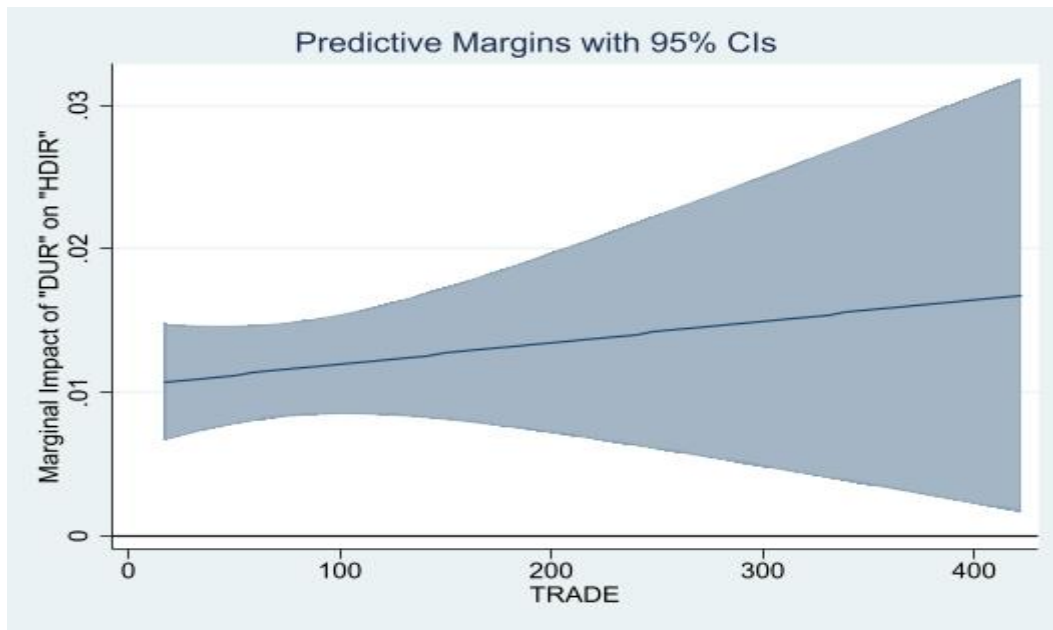
**Figure 10:** Marginal Impact of "DUR" on "HDIR" conditioned on the economic growth volatility



Source: Author

Note: The variable "Log(GRVOL2)" has been introduced at year  $t$ .

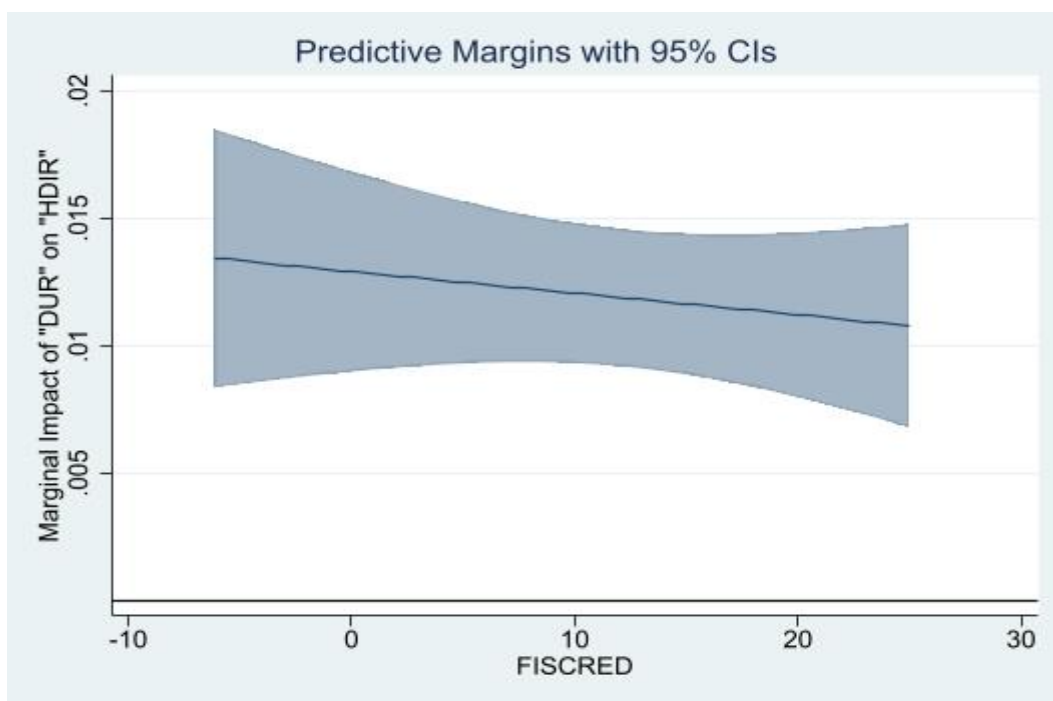
**Figure 11:** Marginal Impact of "DUR" on "HDIR" conditioned on the level of trade openness



*Source: Author*

*Note: The variable "TRADE" has been introduced at year  $t$ .*

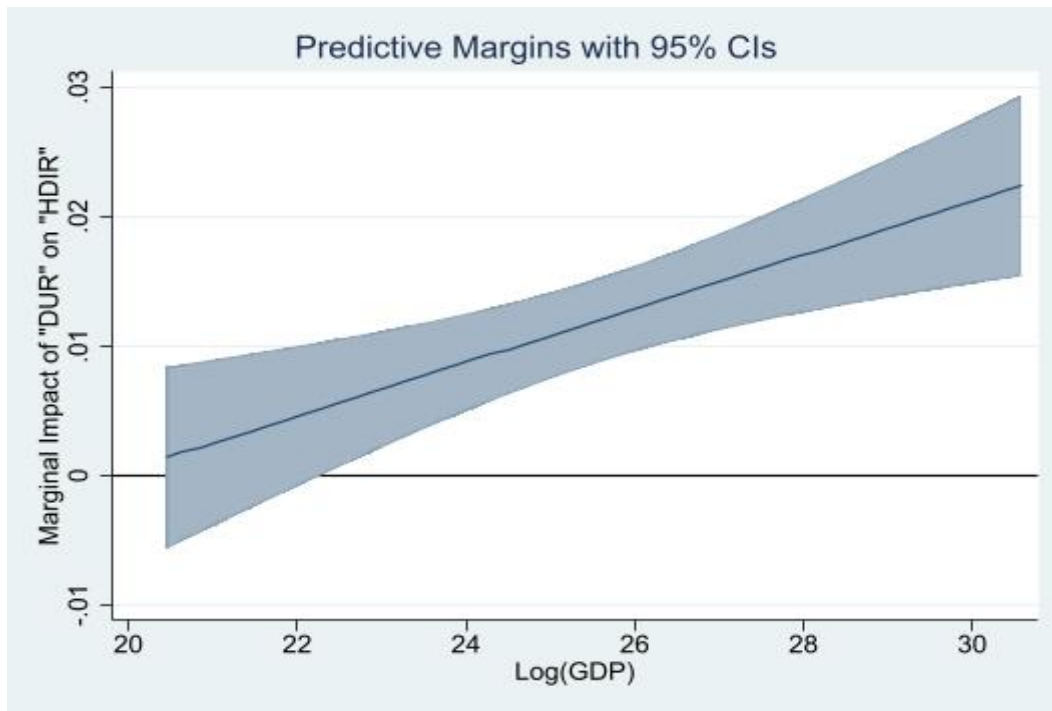
**Figure 12:** Marginal Impact of "DUR" on "HDIR" conditioned on the magnitude of fiscal redistribution



*Source: Author*

*Note: The variable "FISCRED" has been introduced at year  $t$ .*

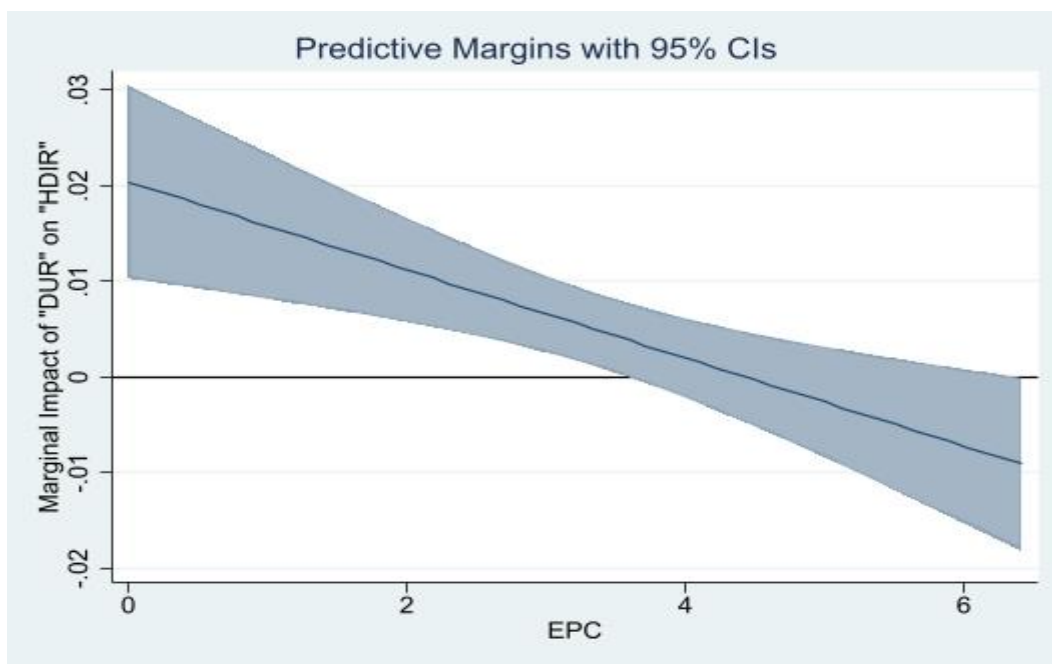
**Figure 13:** Marginal Impact of "DUR" on "HDIR" conditioned on the real income



Source: Author

Note: The variable "Log(GDP)" has been introduced at year  $t$ .

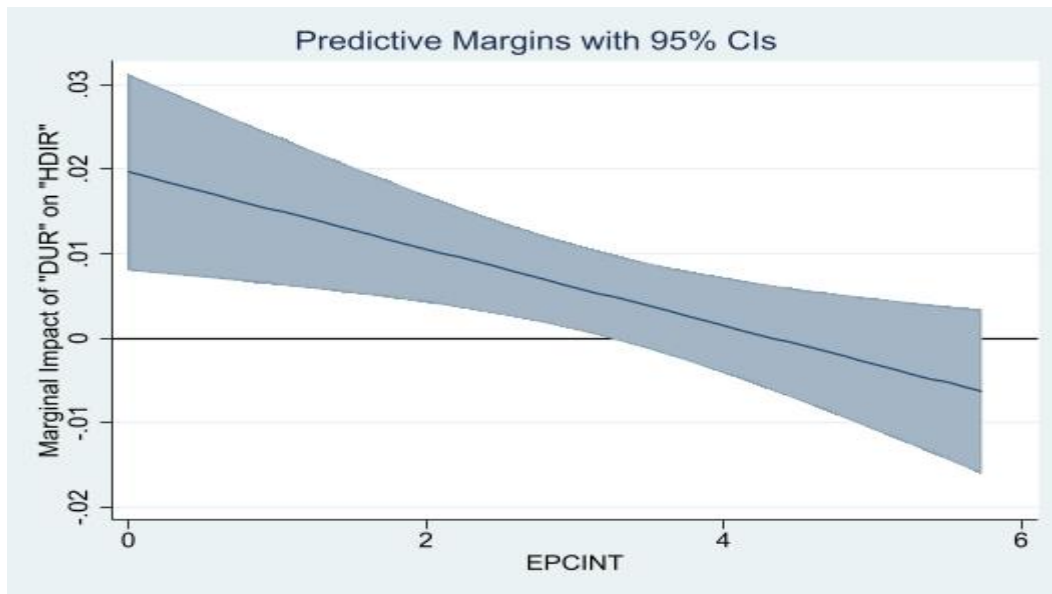
**Figure 14:** Marginal Impact of "DUR" on "HDIR" conditioned on the overall export product concentration



Source: Author

Note: The variable "EPC" has been introduced at year  $t$ .

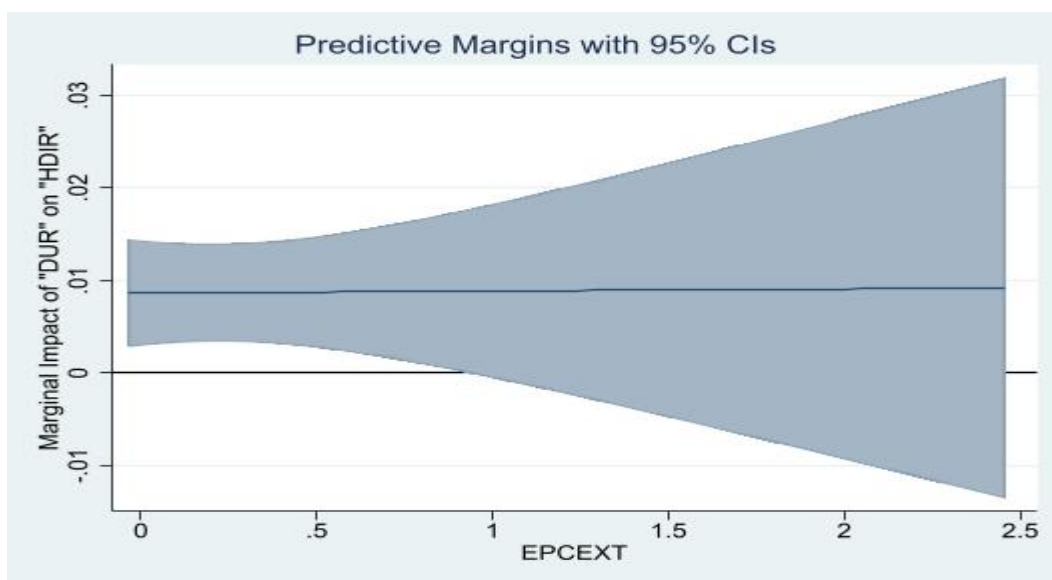
**Figure 15:** Marginal Impact of "DUR" on "HDIR" conditioned on the export product concentration at the intensive margins



Source: Author

Note: The variable "EPCINT" has been introduced at year  $t$ .

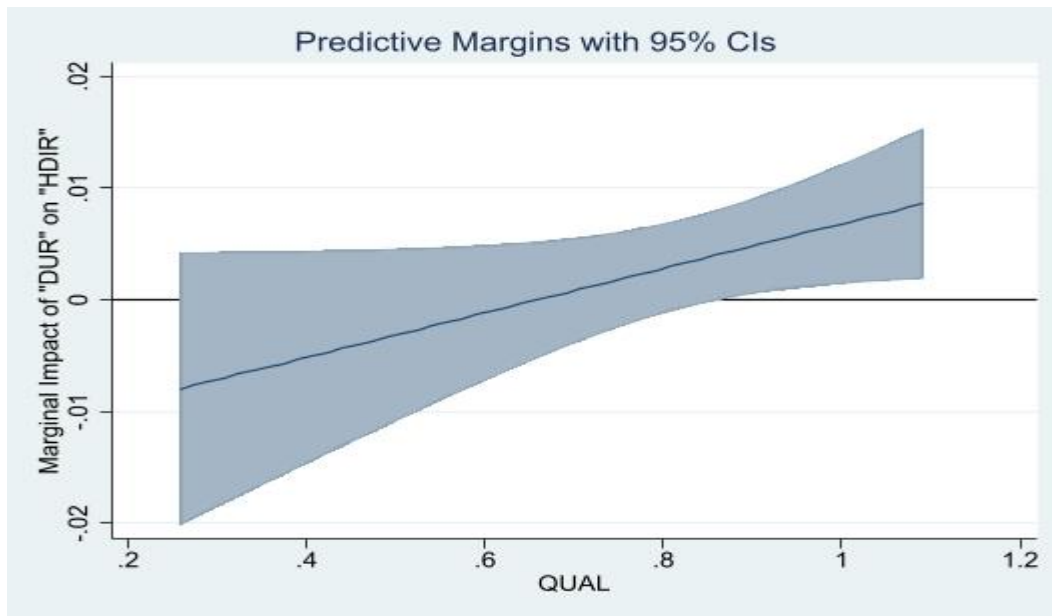
**Figure 16:** Marginal Impact of "DUR" on "HDIR" conditioned on the export product concentration at the extensive margins



Source: Author

Note: The variable "EPCEXT" has been introduced at year  $t$ .

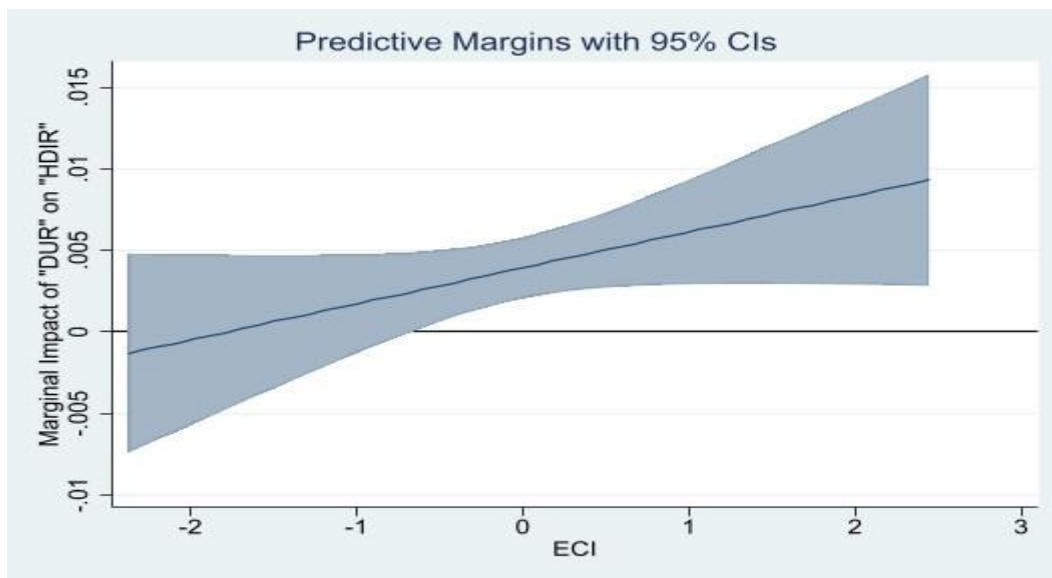
**Figure 17:** Marginal Impact of "DUR" on "HDIR" conditioned on the quality of export product



Source: Author

Note: The variable "QUAL" has been introduced at year  $t$ .

**Figure 18:** Marginal Impact of "DUR" on "HDIR" conditioned on the level of economic complexity



Source: Author

Note: The variable "ECI" has been introduced at year  $t$ .

## Appendix 1: Definition and source of variables

Variables	Definition	Source
HDIR	This is the growth rate (in percentage) of human development. It is measured by the growth rate of the UNDP's human development index.	Author's calculation based on data on the human development index of the United Nations Development Programme. Data is available online at: <a href="https://hdr.undp.org/data-center/documentation-and-downloads">https://hdr.undp.org/data-center/documentation-and-downloads</a>
DUR	This is the indicator of the duration of membership in the GATT/WTO.	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: <a href="https://www.wto.org/english/thewto_e/gattmem_e.htm">https://www.wto.org/english/thewto_e/gattmem_e.htm</a>  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: <a href="https://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm">https://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm</a>
TRADE	This is the indicator of trade openness. It is measured by the share of sum of exports and imports of goods and services in GDP.	WDI
EPC	This is the variable capturing the overall export product concentration. It is calculated using the Theil Index and following the definitions and methods used in Cadot et al. (2011). The overall Theil index of export product concentration is the sum of the intensive and extensive components of the "EPC" variable. Indeed, export product diversification can occur either over product narrowly defined or trading partners. It can be broken down into the extensive and intensive margins of concentration. In fact, extensive export diversification reflects an increase in the number of export products or trading partners, while intensive export diversification considers the shares of export volumes across active products or trading partners. This index has been computed using a classification of products into "Traditional", "New", or "Non-Traded" products categories. A rise in the values of "ECI" signifies an increase in the level of overall export product concentration, while a decrease in the values of this index reflects a rise in the degree of overall export product diversification (that is, greater export product diversification).	Details on the methodology used to calculate this index can be found in Henn, Papageorgiou, and Spatafora (2013, 2015). Data are available from the International Monetary Fund's Diversification Toolkit (see: <a href="https://www.imf.org/external/np/res/dfidimf/diversification.htm">https://www.imf.org/external/np/res/dfidimf/diversification.htm</a> )

EPCINT	This the index of export product concentration at the intensive margins. Higher values of this index indicate a rise in the level of export product concentration at the intensive margins, while declining values of this index reflect lower levels of concentration at the intensive margins, i.e., greater diversification of export products at the intensive margins.	Details on the methodology used to calculate this index can be found in Henn et al. (2013, 2015). Data are available from the International Monetary Fund's Diversification Toolkit (see: <a href="https://www.imf.org/external/np/res/dfidimf/diversification.htm">https://www.imf.org/external/np/res/dfidimf/diversification.htm</a> )
EPCEXT	This the index of export product concentration at the extensive margins. Higher values of this index indicate greater export product concentration at the extensive margins, while declining values of this index reflect a lower concentration at the extensive margins, i.e., greater diversification of export products at the extensive margins.	Details on the methodology used to calculate this index can be found in Henn et al. (2013, 2015). Data are available from the International Monetary Fund's Diversification Toolkit (see: <a href="https://www.imf.org/external/np/res/dfidimf/diversification.htm">https://www.imf.org/external/np/res/dfidimf/diversification.htm</a> )
QUAL	This is the indicator of export product quality. Higher values of this index reflect an improvement in the export product quality. This indicator has been computed using a large trade dataset, which is a significantly extended version of the UN-NBER dataset containing 45.3 million observations on bilateral trade values and quantities at the SITC 4-digit level and covers the 1962–2010 period. The calculation relies on an estimation methodology which derives quality from unit values, whereby export quality is measured by the average quality (unit value) demanded in an exporter's present destination markets for any product. The trade dataset contains information on trade prices, values and quantities as well as information on preferential trade agreements, and other gravity variables.	Details on the methodology used to calculate this index can be found in Henn et al. (2013, 2015). Data are available from the International Monetary Fund's Diversification Toolkit (see: <a href="https://www.imf.org/external/np/res/dfidimf/diversification.htm">https://www.imf.org/external/np/res/dfidimf/diversification.htm</a> )
ECI	This is the economic complexity index. It reflects the diversity and sophistication of a country's export structure, and hence indicates the diversity and ubiquity of that country's export structure. It has been estimated using data connecting countries to the products they export, and applying the methodology in described in Hausmann and Hidalgo (2009). Higher values of this index reflect greater economic complexity.	MIT's Observatory of Economic Complexity ( <a href="https://oec.world/en/rankings/eci/hs6/hs96">https://oec.world/en/rankings/eci/hs6/hs96</a> )
GRVOL1	This is the first indicator of the volatility of the economic growth rate (constant 2015 US\$). It has relied on yearly data, and been computed as the standard deviation over 5-year rolling windows (that is, from t-4, ..., t-1, t) of the growth rate of real per capita income (constant 2015 US\$) (see also Bekaert et al. 2006; Ebeke and Ehrhart, 2012).	Author's calculation based on data extracted from the World Development Indicators (WDI)
GRVOL2	This is the second indicator of the volatility of the economic growth rate (constant 2015 US\$). It has been computed as the standard deviation over non-overlapping sub-periods of 5-year of the growth rate of real per capita income (constant 2015 US\$).	Author's calculation based on data extracted from the World Development Indicators (WDI)

GDP	Real Gross Domestic Product (constant 2015 US\$).	WDI
FISCRED	This is the measure of the magnitude (size) of fiscal redistribution. It is the difference between the market Gini (Gini of incomes before taxes and transfers) and the net Gini of incomes (Gini of incomes after taxes and transfers). The Gini indices range between 0 and 100, with higher values reflecting a more unequal income distribution. Thus, values of the size of fiscal redistribution range from 0 to 100, with lower values indicating a lower size of fiscal redistribution, and higher values showing a greater magnitude of fiscal redistribution.	Author's calculation based on data on Gini of incomes retrieved from the Standardized World Income Inequality Database (SWIID) - SWIID Version 8.0, February 2019 (see Solt, 2019). Available online at: <a href="https://fsolt.org/swiid/">https://fsolt.org/swiid/</a>
GCONS	This is the measure of the general government final consumption expenditure. It is the ratio (in percentage) of the general government final consumption expenditure to GDP.	WDI
INFL	The variable "INFL" has been calculated using the following formula (see Yeyati et al. 2007): $INFL = sign(INFLATION) * \log(1 +  INFLATION )$ (2), where $ INFLATION $ refers to the absolute value of the annual inflation rate (%), denoted "INFLATION". The annual inflation rate (%) is based on Consumer Price Index -CPI- (annual %) where missing values has been replaced with values of the GDP Deflator (annual %).	Authors' calculation based on data from the WDI.
DEM	This variable is an index extracted from Polity IV Database (Marshall et al., 2018). It represents the degree of democracy based on competitiveness of political participation, the openness and competitiveness of executive recruitment and constraints on the chief executive. Its values range between -10 and +10, with lower values reflecting autocratic regimes, and greater values indicating democratic regimes. Specifically, the value +10 for this index represents a strong democratic regime, while the value -10 stands for strong autocratic regime.	Polity IV Database (Marshall et al., 2018)
POP	Total Population	WDI



**Appendix 2:** Duration (in years) of the GATT and WTO membership as at 2019 (end-year of the period under analysis)

Country	Membership Duration	Country	Membership Duration	Country	Membership Duration	Country	Membership Duration
Albania	19.333	Djibouti	25.083	Kuwait	56.667	Philippines	40.083
Algeria	0.000	Dominican Republic	69.667	Kyrgyz Republic	21.083	Poland	52.250
Angola	25.750	Ecuador	24.000	Lao PDR	6.917	Portugal	57.667
Argentina	52.250	Egypt, Arab Rep.	49.667	Latvia	20.917	Qatar	25.750
Armenia	16.917	El Salvador	28.667	Lebanon	0.000	Romania	48.167
Australia	72.000	Estonia	20.167	Lesotho	32.000	Russian Federation	7.417
Austria	68.250	Eswatini	26.833	Liberia	3.500	Saudi Arabia	14.083
Azerbaijan	0.000	Ethiopia	0.000	Libya	0.000	Senegal	56.333
Bangladesh	47.083	Fiji	26.167	Lithuania	18.667	Serbia	0.000
Belarus	0.000	Finland	69.667	Luxembourg	60.000	Sierra Leone	58.667
Belgium	72.000	France	72.000	Madagascar	56.667	Singapore	46.417
Benin	56.333	Gabon	56.667	Malaysia	62.250	Slovak Republic	26.750
Bhutan	0.000	Gambia, The	54.917	Mali	27.000	Slovenia	25.750
Bolivia	29.333	Georgia	19.583	Mauritania	56.333	Solomon Islands	25.083
Botswana	32.417	Germany	68.250	Mauritius	49.333	South Africa	71.583
Brazil	71.500	Ghana	62.250	Mexico	33.417	Spain	56.417
Bulgaria	23.083	Greece	69.833	Moldova	18.500	Sri Lanka	71.500
Burkina Faso	56.667	Guatemala	28.250	Mongolia	23.000	Sudan	0.000
Burundi	54.833	Guinea	25.083	Montenegro	7.750	Suriname	41.833
Cabo Verde	11.500	Guinea-Bissau	25.833	Morocco	32.583	Sweden	59.750
Cambodia	15.250	Guyana	53.500	Mozambique	27.500	Switzerland	53.417
Cameroon	56.667	Haiti	70.000	Myanmar	71.500	Syrian Arab Republic	0.000
Canada	72.000	Honduras	25.750	Namibia	27.333	Tajikistan	6.833
Central African Republic	56.667	Hungary	46.333	Nepal	15.750	Tanzania	58.083
Chad	56.500	India	71.500	Netherlands	72.000	Thailand	37.167
Chile	70.833	Indonesia	69.917	New Zealand	71.500	Timor-Leste	0.000
China	18.083	Iran, Islamic Rep.	0.000	Nicaragua	69.667	Togo	55.833
Colombia	38.250	Iraq	0.000	Niger	56.083	Tunisia	29.417
Comoros	0.000	Ireland	52.083	Nigeria	59.167	Turkey	68.250
Congo, Dem. Rep.	48.333	Israel	57.500	North Macedonia	16.750	Uganda	57.250
Congo, Rep.	56.667	Italy	69.667	Norway	71.500	Ukraine	11.667
Costa Rica	29.167	Jamaica	56.083	Oman	19.167	United Kingdom	72.000
Cote d'Ivoire	56.083	Japan	64.333	Pakistan	71.500	United States	72.000
Croatia	19.167	Jordan	19.750	Panama	22.667	Uruguay	66.083
Cyprus	56.500	Kazakhstan	4.167	Papua New Guinea	25.083	Vietnam	13.000
Czech Republic	26.750	Kenya	55.917	Paraguay	26.000	Zambia	37.917
Denmark	69.667	Korea, Rep.	52.750	Peru	68.250	Zimbabwe	71.500

**Appendix 3a:** Descriptive statistics on variables used in the analysis\_over the panel dataset of 148 countries over the annual period from 1990 to 2019

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
HDIR	2,948	0.861	0.895	-4.724	8.531
DUR	2,948	32.681	22.061	0.000	72.000
EPC	2,288	3.053	1.163	0.000	6.316
EPCINT	2,288	2.736	1.020	0.000	5.960
EPCEXT	2,288	0.318	0.458	-0.043	2.788
QUAL	2,201	0.827	0.165	0.200	1.096
ECI	2,180	0.130	1.004	-2.791	2.625
GRVOL1	2,948	2.585	2.788	0.084	68.361
TRADE	2,923	83.316	50.206	14.772	437.327
INFLATION	2,948	6.858	23.609	-8.525	1058.374
DEM	2,824	4.913	5.784	-10.000	10.000
FISCRED	2,640	7.640	7.675	-6.300	25.800
GCONS	2,913	15.643	6.707	2.047	115.933
GDP	2,948	475,000	1,660,000	799	20,000,000
POP	2,948	50.9	165	0.4086	1400

*Note: The variable "GDP" is expressed in US dollar million. The variable "POP" is expressed in million.*

**Appendix 3b:** Descriptive statistics on variables used in the analysis\_over the panel dataset of 148 countries over the non-overlapping sub-periods of 5-year average of the period from 1990 to 2019

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
HDIR	616	0.892	0.704	-1.890	4.551
DUR	616	31.543	22.223	0.000	70.000
EPC	502	3.111	1.176	0.000	6.411
EPCINT	502	2.774	1.006	0.000	5.854
EPCEXT	502	0.336	0.472	-0.036	2.510
QUAL	482	0.821	0.166	0.257	1.092
ECI	499	0.118	1.003	-2.373	2.544
GRVOL2	615	2.468	2.061	0.107	11.998
TRADE	616	84.203	51.649	17.090	430.451
INFLATION	616	7.930	17.081	-5.180	252.656
DEM	616	4.862	5.760	-10.000	10.000
FISCRED	616	7.285	7.477	-6.180	25.600
GCONS	616	15.699	6.594	4.588	93.557
GDP	616	471000	1670000	759	19100000
POP	616	49.5	162	0.419495	1390

*Note: The variable "GDP" is expressed in US dollar million. The variable "POP" is expressed in million.*

#### Appendix 4: Countries in the sub-samples

Article XXVI5(c) member states	Article XII member states	non-Article XXVI5(c) member states		OLDIND	LDCs		Non-GATT/WTO states
Angola	Albania	Argentina	Korea, Rep.	Australia	Angola	Sudan	Algeria
Benin	Armenia	Australia	Luxembourg	Austria	Bangladesh	Tanzania	Azerbaijan
Botswana	Bulgaria	Austria	Mexico	Belgium	Benin	Timor-Leste	Belarus
Burkina Faso	Cabo Verde	Bangladesh	Morocco	Canada	Bhutan	Togo	Bhutan
Burundi	Cambodia	Belgium	Myanmar	Denmark	Burkina Faso	Uganda	Comoros
Cameroon	China	Bolivia	Netherlands	Finland	Burundi	Zambia	Ethiopia
Central African Republic	Croatia	Brazil	New Zealand	France	Cambodia		Iran, Islamic Rep.
Chad	Ecuador	Canada	Nicaragua	Germany	Central African Republic		Iraq
Congo, Rep.	Estonia	Chile	Norway	Greece	Chad		Lebanon
Cote d'Ivoire	Georgia	Colombia	Pakistan	Ireland	Comoros		Libya
Cyprus	Jordan	Congo, Dem. Rep.	Paraguay	Italy	Congo, Dem. Rep.		Serbia
Djibouti	Kazakhstan	Costa Rica	Peru	Japan	Djibouti		Sudan
Eswatini	Kyrgyz Republic	Czech Republic	Philippines	Luxembourg	Ethiopia		Syrian Arab Republic
Fiji	Lao PDR	Denmark	Poland	Netherlands	Gambia, The		Timor-Leste
Gabon	Latvia	Dominican Republic	Portugal	New Zealand	Guinea		
Gambia, The	Liberia	Egypt, Arab Rep.	Romania	Norway	Guinea-Bissau		
Ghana	Lithuania	El Salvador	Slovak Republic	Portugal	Haiti		
Guinea	Moldova	Finland	Slovenia	Spain	Lao PDR		
Guinea-Bissau	Mongolia	France	South Africa	Sweden	Lesotho		
Guyana	Montenegro	Germany	Spain	Switzerland	Liberia		
Indonesia	Nepal	Greece	Sri Lanka	United Kingdom	Madagascar		
Jamaica	North Macedonia	Guatemala	Sweden	United States	Mali		
Kenya	Oman	Haiti	Switzerland		Mauritania		
Kuwait	Panama	Honduras	Thailand		Mozambique		
Lesotho	Russian Federation	Hungary	Tunisia		Myanmar		
Madagascar	Saudi Arabia	India	Turkey		Nepal		
Malaysia	Tajikistan	Ireland	United Kingdom		Niger		
Mali	Ukraine	Israel	United States		Senegal		
Mauritania	Vietnam	Italy	Uruguay		Sierra Leone		
Mauritius		Japan	Zimbabwe		Solomon Islands		

Notes: "non-GATT/WTO states" are states that are not at all GATT/WTO members. "non-Article XXVI5(c) member states" are those states that are neither Article XXVI5(c) member states, nor Article XII member states. This group of countries does not include non-GATT/WTO states.