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Working Paper

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Suggested Citation: Gnangnon, Sèna Kimm (2020) : Aid for Trade, Export Product Diversification and Import Product Diversification, ZBW – Leibniz Information Centre for Economics, Kiel, Hamburg

This Version is available at:

<https://hdl.handle.net/10419/223021>

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Aid for Trade, Export Product Diversification and Import Product Diversification

Sèna Kimm GNANGNON¹

Abstract

The literature on the effect of Aid for Trade (AfT) has shown that AfT flows can be associated with greater export product diversification in recipient-countries. However, the import product diversification effect of AfT interventions has received scant attention in this literature. The present article aims to fill this gap in the literature by investigating the effect of AfT flows on import product diversification, including when countries diversify their export product baskets. The empirical analysis has shown that AfT flows are associated with greater import product diversification in countries that diversify their export product baskets. This finding applies both to total AfT flows and to its three major components, namely AfT flows for economic infrastructure, AfT flows for productive capacity, and AfT flows for trade policy and regulation. Additionally, the magnitude of the positive effect of total AfT flows on import product diversification increases as recipient-countries enjoy a convergence of their export product structure towards the world's export product structure. On another note, the empirical analysis has revealed that AfT flows induce greater import product diversification in countries that further liberalize their trade policies. These results have important policy implications for both donors and recipient-countries.

Keywords: Aid for Trade; Export Product Diversification; Import Product Diversification.

Jel Classification: F35; F14.

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1. Introduction

Many studies² have now explored the macroeconomic determinants of export product diversification, but little attention has been paid to the macroeconomic determinants of import product diversification. Except from the work by Parteka and Tamberi (2013) - who have focused on the effect of economic development on import product diversification - there is to the best of our knowledge no other published empirical study³ that has used international panel data to examine the determinants of import product diversification.⁴ In the meantime, the economic implications of import product diversification have been well documented in the literature. Import product diversification can positively affect productivity through its enhancing competition effect: higher imports of new products from abroad allow domestic producers of close substitute to improve so as to remain competitive, and this helps ensure a better complementarity between imported inputs and domestic varieties (e.g., Fernandes, 2007; Harrisson, 1994; Krishna and Mitra, 1998; Levinsohn, 1993; Pavcnik, 2002; Trefler, 2004). The productivity effect of import product diversification also takes place through lower input prices, greater access to inputs of higher quality, and better access to new technologies (that is, via the learning effects of foreign technology) (e.g., Cadot et al., 2013). The key role of imported inputs - in particular import of varieties of inputs - for production and eventually exports has also been emphasized by many other authors⁵.

Developing countries, and Least developed countries (LDCs)⁶ among them are dependent on development aid for realizing their development objectives. To help these countries better participate and enjoy the benefits of international trade, Members of the World Trade Organization (WTO) set up in 2005 the Aid for Trade (AfT) Initiative. The main objective of this Initiative is contained in Paragraph 57 of the Hong Kong Ministerial Declaration⁷ (WTO, 2005), which states that the AfT Initiative aims to help developing countries, particularly LDCs build the supply-side capacity and trade-related infrastructure that they need to assist them to implement and benefit from WTO Agreements, and more broadly to expand their trade. AfT flows are indeed part of total development aid (also referred to as official development aid - ODA) and represent ODA allocated to the trade sector in recipient-countries. While there exists now many studies on

² See for example, Adityaa and Acharyya (2015); Agosin et al. (2012); Amighini and Sanfilipo (2014); Bahar and Santos (2018); Gnangnon and Roberts (2017); Gnangnon (2019a, 2019b, 2019c, 2019j); Harding and Javorcik (2012); Hausmann et al. (2007); Imbs and Wacziarg (2003); Mau, 2016; Osakwe et al. (2018); Parteka and Tamberi (2013); and Zhu and Fu (2013).

³ It is worth noting that the unpublished work by Mejia et al. (2016) has examined the determinants of import product diversification.

⁴ The study by Mityakov et al. (2016) has investigated the effect of international politics on import diversification, not by using an indicator of import diversification across a wide range of products per se, but by rather relying on oil imports (i.e., imports by U.S. private oil companies) versus other sectors' imports. Similarly, Jaimovic (2012) and Cadot et al. (2011) have used panel datasets not to explore the diversity of imported products in the context of development process, but rather to focus on the geographical side of imports diversification process (concerning concentration of imports across origin countries).

⁵ Cadot et al. (2013) have provided a literature review on this matter. Other studies include for example, Amiti and Konings (2007), Amador and Kabral (2009), Amighini and Sanfilipo (2014), Andersson (2016), Bas (2012), Bernard et al. (2003), Broda and Weinstein (2006), Castellani and Fassinio (2019); Colantone and Crino (2014); Chevassus-Lozza et al. (2013), Edwards et al., (2018), Goldberg et al. (2010), Halpern et al. (2015), Hummels et al. (2001), Kasahara and Lapham (2013), Kasahara and Rodrigue (2008), Melitz (2003), Romer (1994), Smeets and Frederic (2013), Sharma (2014), Sharma and Mishra (2015), Strauss-Kahn (2004), and Vogel and Wagner (2010).

⁶ According to the United Nations, the group of LDCs contains the poorest and most vulnerable countries in the world to economic and environmental shocks (for further information, see online at: <http://unohrrls.org/>).

⁷ This Declaration contains the outcome of the WTO Ministerial Conference held in Hong Kong China in 2005.

the effectiveness of AfT, notably in terms of recipient-countries' export performance (e.g., export volumes and export values), only very few studies (e.g., Gnanangnon, 2019a, 2019b; Kim, 2019) have considered the effect of AfT flows on export product diversification in recipient-countries. Additionally, we are not aware of any other study that has investigated the relationship between AfT flows and import product diversification in recipient-countries. In light of the above-mentioned importance of import product diversification for the importing countries, the present study aims to contribute to the literature on the trade diversification effect of AfT flows in recipient-countries, by investigating the effect of AfT flows on import product diversification. It additionally examines whether this effect (if any at all) depends on AfT recipient-countries' degree of export product diversification. The importance of addressing the question as to whether the effect of AfT flows on import product diversification depends on the degree of export product diversification lies on the fact that not only do AfT flows affect export product diversification, but more importantly growth in import variety is associated with export product diversification (e.g., Bas and Strauss-Kahn, 2015; Castellani and Fassio, 2019; Feng et al. 2016) – which highlights the closed relationship between export product diversification and import product diversification.

The empirical analysis has covered 128 countries over the period 1996-2016. Results based primarily on the two-step system Generalized Methods of Moments (GMM) have shown that taken separately, AfT flows (both total AfT flows and its components) and export product concentration induce greater import product concentration. However, considered jointly, AfT flows exert a greater import product diversification effect in countries that enjoy a higher level of export product diversification. On another note, the analysis has suggested that AfT flows promote import product diversification in countries that further liberalize trade policies.

The remaining part of the analysis is organized as follows. Section 2 discusses how AfT flows and export product concentration (including their interaction) can affect countries' import product concentration paths. Section 3 describes the model that helps address empirically the issue at the heart of the analysis, and Section 4 presents the econometric approach to estimate this model. Section 5 interprets the empirical outcomes, and Section 6 undertakes a robustness check analysis. Section 7 concludes.

2. Theoretical discussion on the relationship between AfT, export product diversification and import product diversification

The Organization of Economic Cooperation and Development (OECD) has classified AfT flows into three categories: AfT allocated for economic infrastructure, AfT allocated for building productive capacity, and AfT for trade policy and regulation (see Appendix 1 for more details on the sub-sectors contained in each of these categories). AfT for economic infrastructure helps build hard infrastructure (such as physical infrastructure, i.e., roads and ports and information and communication technology - ICT - tools). Likewise, AfT flows for strengthening productive capacity in recipient-countries aim to help the latter expand their productive capacity. The build-up of economic infrastructure and the expansion of their productive capacity in developing countries certainly require the importation of capital goods (e.g., machinery and equipment) and other inputs needed in the process of production of final exportable goods. If this involves imports of a limited number of inputs financed by part of AfT flows for economic infrastructure and AfT flows for productive capacity, then these two types of AfT flows would

result in import product concentration. In contrast, as recipient-countries might be willing to diversify their export product basket (given that for many developing countries, in particular LDCs, export product basket is primarily dependent on primary commodities), they would use part of AfT flows for economic infrastructure and AfT flows for productive capacity to import a variety of inputs (including sophisticated inputs and new inputs that are not produced domestically) to achieve their export product diversification objectives (we discuss below the key role of intermediate inputs for export product diversification). In this context, these two types of could be associated with greater import product diversification. Both AfT for economic infrastructure and AfT flows for productive capacity would particularly exert a higher import product diversification effect if governments of recipient-countries facilitated the importation of new varieties and sophisticated inputs by lowering trade barriers on these products. This signifies that these AfT flows would result in greater import product diversification as countries further liberalize their trade policies.

By helping to streamline the time, costs, and number of documents involved in export and import procedures (the so-called 'trade facilitation' in a narrow sense), AfT for trade policy and regulation can contribute to significantly improve the flows of traded goods across borders, including imported goods. This would add to the trade costs reduction effect of AfT flows related to economic infrastructure in recipient-countries (i.e., even though this type of AfT does not target any specific sector - see for example, Cirera and Winters, 2015). Indeed, many studies have underlined the positive trade performance effect of trade facilitation – considered in a larger sense - both through the build-up of hard and soft economic infrastructure (e.g., Anderson and Marcouiller, 2002; Busse et al., 2012; Cali and TeVelde, 2011; Limao and Venables, 2001; Portugal-Perez and Wilson, 2012; Wilson et al., 2003, 2005). On another note, AfT for trade policy and regulation also serves to enhance the capacity of policymakers in developing countries to devise trade policies that tally with their export development strategy, while being consistent with WTO Agreements and Decisions, as well as with countries' commitments at the WTO. In this context, it is not clear whether AfT interventions for trade policy and regulation would be associated with import product concentration or import product diversification, as this would ultimately depend on the trade policies set up by policymakers when implementing their export development strategy. Restrictive trade policies would likely inhibit the possible import product diversification effect that could be associated with AfT flows. In contrast, if policymakers of recipient-countries implement greater trade policy liberalization to facilitate the importation of a wide variety of products, then AfT for trade policy and regulation would ultimately lead to greater import product diversification (a discussion on the effect of trade policy liberalization on import product diversification is provided later).

Overall, we argue that higher AfT flows for economic infrastructure and AfT flows for building productive capacity could help promote import product diversification if governments of recipient-countries pursued the objective of diversifying their export product basket, which entails, *inter alia*, greater trade policy liberalization to facilitate the importation of intermediary inputs. Otherwise, the increase in these two categories of AfT inflows would likely be associated with greater import product concentration. On the other hand, we expect that AfT trade policy and regulation can be associated either with import product diversification or import product concentration. Nevertheless, Gnangnon (2018) has shown that total AfT flows, as well as its components, namely AfT interventions for economic infrastructure, for productive capacity as

well as AfT for trade policy and regulation are all associated with greater trade policy liberalization in the recipient-countries. Therefore, we postulate that countries that receive higher AfT flows and concurrently liberalize their trade policies would likely enjoy greater import product diversification.

With regard to the effect of export product diversification on import product diversification, Godlberg et al. (2010) have underlined that the significant rise in the production of a wide range of domestic varieties further to greater import product diversification, is not due to the decline of the prices of intermediate imported inputs, but rather to the greater access to new varieties of imported inputs. The introduction of more sophisticated intermediate inputs in the production process can help firms upgrade their product quality (e.g., Edwards et al., 2018). Developing countries could produce more sophisticated goods (including those produced for the export market) if they imported goods that are different from their own exports (e.g., Kugler and Verhoogen, 2009; Puga and Trefler, 2010), as such importation would be associated with a growth in the variety in external knowledge flows (e.g., Frenken, et al., 2007) and induce incremental innovation (see also Chen et al., 2017; Liu and Qiu, 2016). In particular, the quality of exported products is further enhanced if developing countries source a variety of inputs, including more sophisticated inputs from advanced markets (Fan et al., 2015; Verhoogen, 2008). Using product-level data on production and trade for 25 European countries, Colantone and Crino (2014) have shown that imported new inputs (which widens and improves the set of available intermediates) exerts a strong positive effect on product creation, and promotes growth in manufacturing output. Bas and Strauss-Kahn (2015) have used Chinese transaction data for 2000-2006 at the firm-HS6 product level to provide evidence that higher imports of intermediate inputs improve firms' total productivity and result in a large number of exports varieties. Castellani and Fassio (2019) have used a dataset on more than 14,000 Swedish manufacturing firms over the period 2001-2012 to examine the determinants of the propensity of firms to export new products. They have demonstrated empirically that the importation of new inputs (including intermediate inputs) is a critical determinant of the propensity of firms propensity to expand their export portfolio by adding new products, and this positive effect is particularly stronger for smaller firms. Feng et al. (2016) have obtained evidence for Chinese firms that the upgrading of products thanks to technology or quality embedded in imported inputs, has helped Chinese firms to increase the scale and breadth of their participation in export markets. In light of the foregoing, we hypothesize that as import product diversification is essential for export product diversification, countries that diversify their export product portfolio are likely those that import a diversity of products, including sophisticated intermediate inputs. Therefore, we expect greater export product diversification to be associated with greater import product diversification.

As for the interaction effect between AfT and export product concentration variables on import product concentration, we expect higher AfT flows to lead to greater import product diversification in countries that enjoy a higher degree of export product diversification. This hypothesis applies to both total AfT flows as well as its components.

3. Model specification

The empirical studies on the determinants of import product diversification are scarce. As noted above, only the study of Parteka and Tamberi (2013) has genuinely focused on the determinants of import product diversification, that is, the diversification of imports across a wide range of products. Specifically, the authors have considered the effect of economic development on import product diversification. Other studies such as Jaimovic (2012) and Cadot et al. (2011) have rather focused on import diversification from the geographical perspective. The unpublished work by Mejia et al. (2016) has also investigated the determinants of import product diversification.

In the current analysis, we primarily extend the model considered by Parteka and Tamberi (2013), to postulate a model that contains the AfT variables (i.e., total AfT flows (denoted "AfTTOT"), as well as its three categories described in section 2, namely Aid for trade related to economic infrastructure (denoted "AfTINFRA"), AfT for enhancing productive capacity (denoted "AfTPROD"), and AfT for trade policy and regulation (denoted "AfTPOL")), the export product diversification and the trade policy variables. A set of control variables have also been included in the model, and concern variables that are deemed to influence the effect of AfT and export product diversification on import product diversification. These variables include the real per capita income ("GDPC"), which is a proxy for countries' economic development level; the level of education (denoted "EDU"), the depth of financial development (denoted "FINDEV"), the institutional and governance quality (denoted "INST") and the total population size (denoted "POP").

Therefore, we postulate the following baseline model:

$$ICI_{it} = \alpha_0 + \alpha_1 ICI_{it-1} + \alpha_2 AfT_{it} + \alpha_3 GDPC_{it} + \alpha_4 GDPC_{it}^2 + \alpha_5 ECI_{it} + \alpha_6 TP_{it} + \alpha_7 EDU_{it} + \alpha_8 FINDEV_{it} + \alpha_9 INST_{it} + \alpha_{10} POP_{it} + \mu_i + \gamma_t + \omega_{it} \quad (1)$$

The analysis uses an unbalanced panel dataset of 128 countries over the period 1996-2016. Following the literature, we have used non-overlapping sub-periods of 3-year average data to smooth out the effect of business cycles on variables. These sub-periods include 1996-1998; 1999-2001; 2002-2004; 2005-2007; 2008-2010; 2011-2013; and 2014-2016. The subscript i refers to a given country, while the subscript t indicates each of the aforementioned seven sub-periods. α_0 to α_{10} are parameters to be estimated. μ_i are countries' fixed effects; γ_t are time dummies, which represent global shocks that affect all countries' import product diversification path together. ω_{it} is a well-behaving error term.

The dependent variable "ICI" is the Herfindahl-Hirschman index of import product concentration. It has been computed by the United Nations Conference on Trade and Development (UNCTAD), which has used data on products at 3-digit group level (using the SITC⁸ Revision 3 classification). The regressor "ECI" is the Herfindahl-Hirschman index of export product concentration, also computed by the UNCTAD using data on products at 3-digit group level (using the SITC Revision 3 classification). Values of both "ICI" and "ECI" indicators range between 0 and 1, and the higher these values, the greater is the degree of import product concentration, and the degree of export product concentration. Conversely, lower values of ICI

⁸ SITC refers to the Standard International Trade Classification.

and ECI reflect respectively greater import product diversification and greater export product diversification.

The variable "AfT" represents the AfT variable. It stands either for the real total gross disbursements AfT flows or one of its components described above. All AfT variables are expressed in constant US dollar, 2016 prices. The OECD/CRS (Creditor Reporting System) database provides data on the gross disbursements of AfT flows covering the period 2002 onwards. At the time the present study was being performed, AfT data available covered the period 2002-2016. As this dataset covers a relatively short period⁹, and does not necessary allow to capture the effects of variables of interest in the analysis on import product concentration over a relatively longer time-period, we expand the time-period coverage of this dataset to the period 1996-2016. To that effect, we adopt the approach proposed by Clemens et al. (2012) and Thiele et al. (2006), and also used by Selaya and Sunesen (2012). The approach assumes that the proportion of AfT actually disbursed to sector "x" (AfT_x) (for example, AfT disbursed for economic infrastructure; productive capacity building; and trade policies and regulations) during a given period is equal to the proportion of aid committed to sector x during this period, and is hence given by $AfT_x = \frac{Commit_x}{\sum_x Commit_x} \sum_x AfT_x$, where $Commit_x$ stands for the amount of real AfT commitments (constant US dollar 2016 prices) to sector x. $\sum_x AfT_x$ is the total amounts of AfT commitments and disbursements (constant US dollar 2016 prices) received during each period. There may be some concerns about using sectoral commitments to approximate sectoral disbursements, given the existence of differences in definitions and statistical record (see Clemens et al. 2012 for more details). However, Odedokun (2003) and Clemens et al. (2012) have noted that this problem is likely to be small since aid disbursements and commitments (both on the aggregate and sectoral levels) are highly correlated. Therefore, using this formula, and relying on AfT commitments and disbursements data (constant US dollar 2016 prices) extracted from the OECD/CRS database, we have computed for each country of the sample, and for each year (covering 1996 to 2001), data on gross disbursements of AfT for economic infrastructure, gross disbursements of AfT for productive capacity building, and gross disbursements of AfT for trade policies and regulations. This dataset has been merged with the available dataset on OECD/CRS database on these three types of AfT flows over the period 2002-2016, so as to obtain our final dataset of 128 countries over the period 1996-2016.

The variable "TP" is the indicator of trade policy, and is measured by the score of the freedom to trade internationally, computed by the Heritage Foundation (see Miller et al., 2019). It is a composite indicator of the absence of tariff and non-tariff barriers that affect imports and exports of goods and services. This score is graded on a scale of 0 to 100, with a rise in its value indicating lower trade barriers, i.e., higher trade liberalization, and lower values reflecting rising trade protectionism. According to Srinivasan and Bhagwati (1999), protection reduces efficiency by shielding domestic market from external competition, and restricting access to imported inputs and technologies. In the same vein, Cadot et al. (2013) have argued that trade liberalization has allowed countries to diversify their import products, including by increasing their imports at both the intensive margins (i.e., through a rise in the number of already existing imported products) and

⁹ It takes time for countries to diversify their export product basket. So, it can be useful to expand the AfT data backward so as to capture not only the effect of export product diversification on import product diversification, but also the extent to which the effect of AfT flows on import product diversification depends on the degree of export product diversification.

at the extensive margins (i.e., through a rise in imports of new goods/varieties). Kasahara and Lapham (2006) have shown that productivity gains arising from imports of intermediate goods (notably via the increasing returns to variety in production) may lead some importers to start exporting. Additionally, protecting imports could result in export destruction, in light of the complementarities between imports and exports. According to Ardelean and Lugovskyy (2010), the demand for imported varieties is highly sensitive to trade barriers, the greater is the within-country elasticity of substitution between varieties and in the similarity of domestic and imported varieties. Bas (2012) has employed detailed firm-level data from Argentina and provided empirical evidence that firms producing in industries that have experienced greater input tariff reductions have a greater probability of entering the export market. Fan et al. (2016) have shown theoretically and empirically that trade liberalization in imported output, results in opposite effects on firms' exporting behaviours compared with trade liberalization on imported intermediate inputs (which are conducive to promoting firms' exports). However, according to Rodrik (1992a, 1992b), there are no reasons to believe that protection discourages productivity improvement, as it is rather import liberalization that retards productivity growth by shrinking the domestic firm's sales and reducing incentives to invest in technological effort. Against this backdrop, we expect greater trade policy liberalization to facilitate the importation of a wide range of products, including intermediate inputs, and to lead to greater import product diversification. Furthermore, in light of the discussion laid out in the previous section concerning the effect of AfT on import product diversification, we hypothesize that AfT flows would exert a higher positive effect on import product diversification as countries further liberalize their trade policies.

To avoid concerns related to units of measurement of variables when interpreting estimations' results, we have standardized all variables contained in model (1) before running regressions. The standardization procedure involves calculating for each variable, the ratio of the difference between this variable and its mean (average) over the standard deviation of this variable. Another advantage of the standardization procedure is that standardized coefficients (that arise from regressions based on standardized variables) allow to compare variables in terms of their contribution to explaining countries' import product diversification path. Furthermore, in the present analysis, standardized variables eliminate all outliers problems that could plague the empirical analysis. The variables contained in model (1) have been described in Appendix 1, while descriptive statistics concerning unstandardized variables (i.e., non-transformed variables) and standardized variables have been respectively provided in Appendix 2a and Appendix 2b. The list of countries used in the empirical analysis has been provided in Appendix 3.

Discussion on the effect of other control variables on import product concentration.

The effect of real per capita income (denoted "GDPC") - which acts as a proxy for the economic development level - on import product diversification arises from the "love-for-variety" both in consumption and production sides. According to traditional international trade models, trade liberalization allows consumers to enjoy access to a wider range of goods at lower prices, and improves consumers' welfare. Hence, on the demand side, the love-of-variety argument reflects the fact that as real incomes increase, consumers show a "love-for-variety", i.e., wealthier individuals widen the set of varieties they consume by demanding a wide range of imported products if for some reasons (such as high fixed costs of production), countries cannot satisfy their

demand through domestic production. The seminal paper of Krugman (1979) has underlined the "love-for variety" element (in the sense of Dixit and Stiglitz, 1977) associated with greater import diversification (including through the rise in the imports of new varieties) in the context of trade liberalization. Some rare empirical works (e.g. Broda and Weinstein, 2006) have confirmed the love-for-variety argument for consumption. Broda and Weinstein (2006) have shown for the United States that greater access to a wider variety of imports has exerted a substantial consumer's welfare improvement (i.e., by 2.6 percent). Sauré (2012) has assumed that consumer's marginal utility from varieties is bounded, i.e., when consumers bear higher transport costs, they do not purchase foreign varieties. Based on this assumption, the author has concluded, *inter alia*, that while countries import only a small fraction of all traded varieties, the rise in per capita income is positively correlated with the number of imported varieties.

On the supply side, the love-of-variety in production arises from the fact that greater access to a wider variety of imports can enhance production supply through three channels: enhancement of competition (i.e., enhancing firms' productivity and competitiveness through the elimination of inefficiencies and the promotion of innovation) (e.g., Grossman and Helpman, 1991; Helpman and Krugman, 1985); access to better, cheaper, and domestically unavailable inputs and equipment, which lowers production costs, and encourages production of new profitable goods; and finally, access to foreign technology embedded in imported inputs and equipment (e.g., Aghion and Levitt, 1992; Coe and Helpman, 1995; Grossman and Helpman, 1991). Parteka and Tamberi (2013) have relied on highly disaggregated trade data (4963 product lines) for 163 countries over the period 1988-2010, to document, *inter alia*, that both imports and exports follow a similar path of evolution in the development process. Specially, countries experience a progressive diversification (de-specialisation) of their import and export structures as their real per capita income rises, although few specific countries (very rich, small ones, abundant in oil/petrol) can show a re-specialization. The possibility that as their income rises, countries diversify their imported products, but that some of them can re-specialize (i.e., a re-concentrate on a limited number of imported products) suggests the eventual existence of a non-linear relationship between countries' real per capita income and their level of import product diversification. We provide in Figure 1 the correlation pattern (i.e., scatter plot) between the unstandardized indicator of import product concentration and the unstandardized real per capita income. The left-hand side graph of this Figure shows a negative correlation between these two variables, while the right-hand side graph indicates existence of a non-linear relationship in the form of a U-curve between the two variables. Nevertheless, this is a correlation pattern, as in terms of causality, we may find a different non-linear pattern. In the present study, we test the existence of a non-linear relationship between real per capita income and import product diversification by including in model (1) both the real per capita income variable and its squared term. In so doing, we bear in mind that as the present study focuses on developing countries (whereas Parteka and Tamberi (2013) have focused on both developed and developing countries), we might eventually obtain a non-linear pattern different from the one obtained by Parteka and Tamberi (2013).

The population size variable ("POP") aims to capture the size of a given country, and may therefore complement the real per capita income in capturing the love-for variety argument. Thus, we can expect a rise in the population size to be positively associated with import product diversification.

As for other control variables introduced in model (1), the variable representing the education level aims to capture the import product diversification effect of an improvement in the education level. As the latter is essential for export product diversification (e.g., Jetter and Hassan, 2015) and given the close link between import product diversification and export product diversification, it is likely that an improvement in the education level also influences import product diversification. This is particularly true because countries with well-educated citizen might be better capable of taking full advantage of the technology and knowledge embedded in the imported intermediate goods than can do countries with less educated citizen. Therefore, we expect an improvement in the education level to be positively associated with import product diversification. The depth of financial development is another factor that could affect countries' path of import product diversification. However, this effect would depend on whether the credit obtained by investors from financial institutions, including banks is used (at least partially) to finance the import of new varieties - in which case, financial development would contribute to promoting import product diversification - or whether it is used to finance the importation of a limited number of (selected) products used in the production process- in which case, financial development would be associated with a rise in import product specialization.

Finally, the institutional and governance quality variable aims to capture the institutional and governance setting in which importing countries operate. In light of the positive association between the institutional and governance quality and export product diversification (e.g., Hausmann et al., 2007; Omgba, 2014; Zhu and Fu, 2013), we postulate that an improvement in the institutional and governance quality would help promote the diversification of imported products.

Before turning to the discussion on the empirical method used to estimate model (1), we present in Figure 2 the development of the three main variables of interest in the analysis (unstandardized variables) - that is total AfT, export product concentration and import product concentration - over the 128 countries and using the non-overlapping sub-periods (average values of these variables have been computed). Figure 3 shows the correlation pattern between the three indicators. Figure 2 shows that the import product concentration index has exhibited a rising trend from 1996-1998 to 2011-2013, moving from 0.116 in 1996-1998 to 0.16 in 2011-2013. However, from 2011-2013 to 2014-2016, it has declined to reach the value 0.13 (which reflects a tendency for import product diversification). Meanwhile, "ECI" has declined very slightly over the entire period, thereby suggesting that, on average, countries have not really enjoyed a significant extent of export product diversification (although this may hide different patterns across countries in the sample). As for total AfT flows, AfT amounts have significantly declined from US dollars 285.3 million in 1996-1998 to US dollars 90.98 million in 2002-2004. Since 2005-2007, these resource flows have shown a strong upward trend to reach US dollars 258.1 million in 2014-2016. This increase in AfT flows is likely explained by the effectiveness of the AfT Initiative in boosting AfT flows that accrue to developing countries (see Gnanangnon, 2019c). The left-hand graph of Figure 3 shows a negative correlation pattern between total AfT flows and import product concentration, while the right-hand graph in the same Figure indicates a positive correlation pattern between export product concentration and import product concentration.

4. Empirical methodology

Several regressors contained in model (1) can be subject to endogeneity concerns due to the reverse causality from the dependent variable to each of these regressors. These regressors include AfT variables, export product concentration, trade policy, education level, financial development depth, and institutional and governance quality. For example, the reverse causality issue can arise from the fact that countries that experience a high degree of import product concentration (i.e., those that focus on a few number of imported products) might receive higher amounts of AfT as donors may wish to incentivize them to expand their import products basket, including by sourcing these imports from donor-countries. Hühne et al. (2014) have obtained empirical evidence that AfT flows lead to a rise in recipients' exports to donors as well as to recipients' imports from donors, with the first effect dominating the latter effect. Meanwhile, countries with a high degree of import product concentration and that wish to diversify their import product baskets with a view to promoting economic diversification (including export product diversification) may adopt appropriate measures to reduce trade barriers, improve the education level, promote financial development (if the latter is expected to spur import product diversification by providing credit to trading firms), and provide an institutional and governance environment conducive to business development.

In light of the nature of the panel dataset used in the present analysis (small time-period and relatively large number of countries), model (1) could also suffer from the endogeneity bias, i.e., the Nickell bias (Nickell, 1981) associated with the correlation between the one-period lag of the dependent variable and countries' specific effects, if this model were to be estimated using the standard fixed effects and random effects estimators. Given the difficulties encountered in finding appropriate instruments that would help address all the above-mentioned endogeneity concerns, and in light of the importance of considering the dynamic specification of model (1) (i.e., with the lagged dependent variable as a regressor) to capture the mean reversion in import product concentration, we estimate model (1) and its variants described below using the two-step system Generalized Methods of Moments (GMM) estimator proposed by Arellano and Bover (1995) and Blundell and Bond (1998). This estimator is particularly useful when series under analysis, in particular the dependent variable, exhibit a strong persistence over time. In addition, the two-step system GMM is more appropriate than the first-difference GMM estimator in the context of unbalanced panel dataset, as the first-difference GMM estimator has a weakness of magnifying gaps (e.g., Roodman 2009). The use of the two-step system GMM estimator involves the estimation of a system of equations in level and in differences, where lagged values are used as instruments for the first-differenced regressors, and first-differences as instruments for the equation levels. We use three diagnostic tests to examine the consistency of this estimator, and the estimator is consistent if we fail to reject the null hypothesis of each of these tests. These tests include the Arellano-Bond (AB) test of presence of first-order serial correlation in the error term (denoted AR(1)), the Arellano-Bond (AB) test of no second-order autocorrelation in the residuals (denoted AR(2)), and the Sargan/Hansen test of over-identifying restrictions (OID). Incidentally, while researchers have the freedom to specify the lag structure for the instruments used in the regressions (i.e., in using the second (or third) lag of the instrumented variables up to the n^{th} lag ($n \geq 2$)), it is equally important to ensure that the number of instruments should be lower than the number of countries. Otherwise, results would be biased towards outcomes based on the ordinary least squares estimations (Roodman, 2009), and the diagnostic tests may lose power (e.g., Bowsher,

2002; Roodman, 2009). As a result, we have used 3 lags of the dependent variable as instruments and 2 lags of endogenous variables as instruments in the regressions to ensure that this rule of thumb is met. AfT variables and the variables ECI, "TP", "EDU", "FINDEV" and "INST" have been considered as endogenous in the regressions, and the technique by Windmeijer (2005) has been applied to correct standard errors of estimates.

Against this backdrop, the empirical analysis based on the two-step system GMM estimator goes as follows. Table 1 displays the outcomes arising from the estimations of different specifications of model (1) that contain each AfT variable, namely variables capturing the total AfT flows, as well as each of its three components. Results in Table 2 allow examining the net effect of AfT variables and of export product concentration on import product concentration in LDCs versus NonLDCs. These outcomes arise from the estimation of different other variants of model (1) that include a dummy variable denoted "LDC" (which takes the value "1" when a country is considered as an LDC, and "0", otherwise) and the interaction between this dummy and each AfT variable, on the one hand, and between this dummy and the export product concentration variable, on the other hand. Table 3 displays the estimations' outcomes that allow exploring the extent to which the effect of AfT flows on import product concentration depends on importing countries' level of export product concentration. To perform this analysis, we estimate four different variants of model (1), which include each AfT variable that is interacted with the export product concentration variable. In Table 4, we report the estimates that allow assessing whether the effect of AfT flows on import product concentration depends on countries' level of trade policy liberalization. This involves estimating four other specifications of model (1) in which we introduce (once) the interaction between each AfT variable and the trade policy variable.

5. Empirical results

The outcomes of the diagnostic tests that allow checking the consistency of the two-step system GMM approach are reported at the bottom of all four Tables. All these outcomes are satisfactory as the null hypothesis of each of these tests is always rejected. In addition, the positive and statistical significance of the coefficient of the one-period lag of the dependent variable confirms the mean reversion of countries' import product concentration path, and hence the relevance of considering the dynamic specification of model (1). On the basis of these, we conclude that the two-step system GMM estimator is appropriate for conducting the empirical analysis.

We now take up results reported in Tables 1 to 4. Starting with Table 1, we note across the four columns that higher AfT flows are positively and significantly (at the 1% level) associated with import product concentration. In particular, a 1 standard deviation increase in total AfT flows is associated with a 0.14 standard deviation increase in the index of import product concentration. Likewise, a 1 standard deviation increase in AfT flows for economic infrastructure, AfT flows for productive capacity, and AfT flows for trade policy and regulation are respectively associated with an increase in the standard deviation of import product concentration by 0.20, 0.087, and 0.118 standard. Thus, among components of total AfT, AfT related to economic infrastructure appears to exert the highest positive effect on import product concentration. This type of AfT flows is followed by AfT for trade policy and regulation and finally by AfT for productive capacity (which exerts the lowest positive effect on import product concentration). As discussed in section 2 above, these positive effects of AfT flows on import product concentration may highlight the fact the

effect of AfT flows on import product concentration might depend on other factors such as the level of export product concentration and trade policies implemented. We will consider these, later in the analysis. We also obtain across the four columns of Table 1 that export product concentration is positively and significantly (at the 1% level) associated with import product concentration. This suggests that countries that diversify their export products are those that also diversify their import products, and the greater the level of export product diversification, the higher is the magnitude of the positive effect of export product diversification on import product diversification. Trade policy liberalization induces a greater degree of import product concentration, which contradicts our theoretical expectation, and may suggest that the import product concentration effect of trade policies might eventually also depend on the amount of AfT received, because as noted above, AfT flows also influence recipient-countries' trade policies. Among other variables, we observe that the real per capita income variable and its squared term are both statistically significant at the 1% level, with the former being positive and the latter being negative. Thus, real per capita income exerts a non-linear effect - in the form of an inverted U shape (see results in column [1] of Table 1), whereby at their earlier stages of development, countries tend to experience greater import product concentration, but above a certain threshold of the real per capita income, they tend to diversify their import products basket. This threshold¹⁰ of the real per capita income amounts to US\$ 5641.27 [= (0.100/0.345)*4750.850 + 4264.215], where the coefficients 0.100 and 0.345 are the estimates respectively of the variable "GDPC" and its squared term (see column 1 of Table 1), and the numbers 4750.85 and 4264.215 (expressed in US\$) stand respectively for the standard deviation and the mean (average) of the (non-standardized) real per capita income variable (see Appendix 2a). Hence, countries with a real per capita income lower than US\$ 5641.3 tend to experience a positive effect of the real per capita income on import product concentration, while countries that enjoy a real per capita income higher than US\$ 5641.3 tend to diversify their import products basket. Education does not exert a significant effect (at the conventional levels) on import product concentration, while a higher depth of financial development influences positively and significantly import product concentration. Finally, a rise in the population size and an improvement in the quality of institutions and governance lead to greater import product diversification. Based on results in column [1] of Table 2, we observe that among all regressors (except for the real per capita income variable and its squared term), the institutional and governance quality appears to be the one that contributes the most to explaining countries' level of import product concentration. This is because compared to other variables, the coefficient of "INST" exhibits the highest coefficient (in absolute value). This regressor is followed (in the descending order) by the variables capturing respectively export product concentration, trade policy, the population size, total AfT flows, and financial development depth. This ranking, therefore, indicates that even though AfT flows do not appear to be among the most two/three important factors that affect countries' import product concentration path, they do influence import product diversification, and as noted above, their impact might depend on some of the major key factors that affect import product concentration.

Turning now to results in Table 2, we find across the four columns of this Table that AfT variables exert a lower positive and significant effect on import product concentration in LDCs

¹⁰ The computation of this threshold is derived from the formula (described above) used to calculate the standardized variables.

than in NonLDCs. For LDCs, the net effects of the each of the four AfT variables, namely total AfT flows, AfT flows for economic infrastructure, AfT flows for productive capacity, and AfT flows for trade policy and regulation on import product concentration amount respectively to 0.07 (= 0.220-0.150), 0.114 (= 0.296-0.182), 0.028 (= 0.151-0.123), and 0.073 (= 0.295-0.222). It appears, once again, that among the three components of total AfT, AfT for economic infrastructure is the one that shows the highest positive effect on import product concentration in LDCs. This is followed by AfT for trade policy and regulation, and AfT flows for productive capacity. For NonLDCs, the net effects of total AfT flows, AfT for economic infrastructure, AfT for productive capacity, and AfT for trade policy and regulation on import product concentration are given respectively by 0.22, 0.296, 0.151, and 0.295. These show that for NonLDCs, AfT flows for economic infrastructure and AfT flows for trade policy and regulation exert a similar positive effect (in terms of magnitude) on import product concentration. Concerning the export product concentration variable, we find across the four columns of Table 2 that it exerts a lower (and significant) positive effect (although with different magnitudes) on import product concentration in LDCs than in NonLDCs. Based on results in column [1] of Table 2, we find that the net effects of export product concentration on import product concentration in LDCs and NonLDCs amount respectively to -0.15 (= 0.419-0.570) and 0.419. These indicate that export product concentration induces import product diversification in LDCs, but is positively associated with import product concentration in NonLDCs. For LDCs, this outcome may reflect the fact that as LDCs' export products are heavily concentrated on few primary commodities, these countries tend to diversify their import product basket with a view to diversifying later their set of exported products (although in spite of doing so, their export product diversification patterns have not substantially changed). The result obtained for NonLDCs is consistent with the theoretical prediction. The estimates related to the control variables are consistent with those obtained in Table 1, in particular in column [1] of this Table. However, here improvement in the education level is significantly associated (at the 1% level) with import product diversification, whereas in column [1] of Table 1, the education variable exerts no significant effect on import product concentration.

Taking up now results in Table 3, we obtain that the coefficient of each of the AfT variables (see columns [1] to [4] of the Table) is always positive and significant at the 1% level, while the interaction term (associated with the interaction variable capturing the interaction between the concerned AfT variable and the export product concentration variable) is always positive and significant at the 1% level. Taking together, these two outcomes suggest that AfT flows induce greater import product diversification in countries that diversify their export products. In addition, the greater the level of export product diversification, the higher is the magnitude of the positive effect of AfT flows on import product diversification. Similarly, the positive effect of AfT flows on import product concentration rises as the degree of export product concentration increases. These findings apply to both total AfT flows as well as to each of its three components. Once again, estimates of control variables are consistent with those provided in Table 1.

Results in Table 4 show across the four columns that the coefficients of AfT variables are positive and significant at the 1% level, whereas the interaction terms of the interaction variables (between the concerned AfT variable and the trade policy variable) are all negative and significant at the 1% level. These suggest that AfT variables (both total AfT flows and each of its three components) exert a positive effect on import product diversification once the degree of trade

policy liberalization exceeds a certain threshold. This threshold of "TP" associated with each AfT variable is reported at the bottom of columns of Table 4. Above these thresholds, AfT variables influence positively import product diversification, and the magnitude of this positive effect rises as countries further liberalize their trade policies. These thresholds amount to 71.3; 94.7; 71.75; and 76.55 respectively for the import product concentration effect of the total AfT flows, AfT flows for economic infrastructure, AfT flows for productive capacity, and AfT flows for trade policy and regulation. It is worth noting values of "TP" (unstandardized trade policy variable) range between 0 and 89.2 (see Appendix 2a). Therefore, we conclude that AfT flows (total AfT, AfT for productive capacity, and AfT for trade policy and regulation) induce greater import product diversification when recipient-countries significantly reduce their trade barriers. However, it appears for AfT for economic infrastructure that the related threshold of "TP" exceeds the maximum value of "TP". Based on this outcome, we could be tempted to conclude that on average over the full sample, AfT flows for economic infrastructure are always associated with import product concentration, irrespective of the level of trade policy liberalization. However, as this outcome reflects an average effect across all countries in the full sample, it likely hides differentiated effects (in terms of statistical significance, sign and magnitude across countries in the sample) of AfT flows for economic infrastructure on import product concentration for varying levels of trade policy liberalization. We get a better picture on this effect by providing in present in Figure 4, at the 95 per cent confidence intervals, the developments of the marginal impact of AfT flows for economic infrastructure on import product concentration, for varying degrees of trade policy liberalization. The Figure suggests that apart from very low levels of trade policy liberalization (and for which AfT for economic infrastructure is associated with import product concentration), AfT interventions for economic infrastructure always induce greater import product diversification, with the magnitude of this positive effect rising as countries further liberalize their trade policies. Similar graphs concerning the effect of the other AfT variables for varying levels of trade policy liberalization could be obtained upon request. We can also make another interpretation of these results by considering the coefficient of the trade policy variable, and the interaction term related to the interaction variable between each AfT variable and the trade policy variable. We note here that the coefficient of "TP" is always positive and significant at the 1% level across all columns of Table 4. Combined with the positive interaction terms (of the interaction variable between AfT and the trade policy variables), we can conclude that trade policy liberalization induces a higher import product concentration when AfT flows are below a certain amount, and above this amount (for each AfT variable), trade policy becomes positively associated with import product diversification. The turning points of values of AfT variables are reported at the bottom of all columns of Table 4. Finally, and consistent with previous findings, export product diversification is positively associated with import product diversification.

6. Robustness check analysis

We check the robustness of findings in Table 3, particularly the ones in column [1] of this Table by running several variants of model (1) using the two-step system GMM approach in which the variable "ICI" has been replaced with the total number of imported products, and where the index of export product concentration has been replaced with an index of export product diversification. It is important to underline here that the index of export product diversification is not the inverse of the index of export product concentration used so far in the analysis. Rather,

the export product diversification index (denoted "FKIEDI") reflects for a given country (and for a given year) the absolute deviation of its export structure from world's export product structure. The indicator "FKIEDI" has been developed by the UNCTAD using the modified measure of similarity in trade proposed by Finger-Kreinin (1979). Values of this index range between 0 and 1, with lower values reflecting a convergence of a country's export structure towards the world's export structure. In other words, the concerned country is improving its competitiveness in the world export market. In contrast, higher values of this index indicate an increasing dissimilarity between a given country's export structure and the world export structure. In this case, the country's level of export product concentration would increase, and its export product structure would diverge from the world's export structure.

To perform this robustness check analysis whose results are provided in Table 5, we estimate two different variants of model (1). The first variant entails model (1) and uses "ICI" as the dependent variable, and where "ECI" is replaced with "FKIEDI". Additionally, we include in this model the interaction variable between "FKIEDI" and total AfT flows. Results of the estimation of this model are reported in column [1] of Table 5. Column [2] of this Table contains results arising from the estimation of the second variant of model (1) where the dependent variable is the total number of imported products (denoted "NUMBIMP") and where "ECI" is replaced with "FKIEDI". In this specification of model (1), "FKIEDI" is interacted with the total AfT flows variable.

The results of the diagnostic tests that help check the usefulness of the two-step system GMM estimator for estimating these two variants of model (1) are provided at the bottom of the two columns of this Table. As expected, these results are fully satisfactory. Concerning the estimates obtained, we note from column [1] of the Table that the coefficient of "AfTTOT" and the interaction term of the variable ["AfTTOT*FKIEDI"] are both positive and significant at the 1% level. The combination of these two results indicates that total AfT flows exert a positive effect on import product concentration as countries' export structure diverge from the world's export structure: the greater this divergence (or the lower this divergence), the higher is the magnitude of the positive effect of total AfT flows on import product concentration (import product diversification). Estimates in column [2] show a negative and significant (at the 1% level) coefficient of "AfTTOT" and a negative and significant (at the 5% level) interaction term associated with the variable ["AfTTOT*FKIEDI"]. These two outcomes show that total AfT flows reduce the number of imported products as countries' export structure diverges from the world's export structure. In other words, as countries' export structure converges towards the world's export structure, total AfT flows promote import product diversification, and the greater this convergence, the higher is the magnitude of the positive effect of total AfT flows on import product diversification.

7. Conclusion

The present article has examined the effect of AfT flows on import product diversification, including when countries diversify their export product baskets. The analysis has covered a set of 128 countries over the period 1996-2016. The findings have shown that considered separately, AfT variables (both total AfT and its three components) and export product concentration influence positively import product concentration. However, AfT flows lead to a higher degree of import product diversification in countries that diversify their export product baskets. These

findings apply to both total AfT flows as well as to each of its three components. The findings are also confirmed by the fact that the magnitude of the positive effect of total AfT flows on import product diversification increases as importing countries (i.e., AfT recipients) enjoy a convergence of their export product structure towards the world's export product structure. Incidentally, AfT flows variables induce greater import product diversification as countries further liberalize their trade policies.

Summing-up, in light of the positive potential economic implications of import product diversification, this analysis suggests that if higher AfT flows were to promote import product diversification, recipient-countries should not only devise export strategies that aim to diversify their export product baskets, but they should also further liberalize their trade policies to encourage the import of a wide range of new varieties of products. While scaling up AfT flows is highly desirable, donor-countries might also need to facilitate the importation by recipient-countries of a variety of imported products, including sophisticated products (e.g., capital goods as well as other intermediate inputs) that are key for export product diversification in these countries. This is particularly relevant, in light of the finding that developing countries significantly improve their export products quality when they source a variety of inputs, including more sophisticated inputs from advanced countries.

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TABLES and APPENDICES

Table 1: Effect of AfT and export product concentration on import product concentration

Estimator. Two-step system GMM

Variables	ICI	ICI	ICI	ICI
	(1)	(2)	(3)	(4)
ICI _{t-1}	0.309*** (0.0219)	0.309*** (0.0218)	0.297*** (0.0209)	0.300*** (0.0217)
AfTTOT	0.141*** (0.0304)			
AfTINFRA		0.204*** (0.0384)		
AfTPROD			0.0872*** (0.0319)	
AfTPOL				0.118*** (0.0380)
ECI	0.245*** (0.0302)	0.226*** (0.0279)	0.183*** (0.0321)	0.225*** (0.0299)
TP	0.228*** (0.0396)	0.302*** (0.0351)	0.229*** (0.0422)	0.348*** (0.0517)
GDPC	0.100*** (0.0324)	0.0571** (0.0284)	0.153*** (0.0340)	0.0144 (0.0449)
GDPC ²	-0.345*** (0.0248)	-0.343*** (0.0294)	-0.297*** (0.0269)	-0.262*** (0.0302)
EDU	-0.0421 (0.0414)	-0.0768* (0.0403)	-0.0608 (0.0424)	-0.0829* (0.0439)
FINDEV	0.0808*** (0.0294)	0.0507** (0.0256)	0.0637* (0.0360)	0.103*** (0.0358)
INST	-0.362*** (0.0428)	-0.366*** (0.0420)	-0.361*** (0.0403)	-0.322*** (0.0401)
POP	-0.177*** (0.0379)	-0.196*** (0.0357)	-0.190*** (0.0413)	-0.160*** (0.0355)
Constant	0.311*** (0.0226)	0.317*** (0.0251)	0.273*** (0.0197)	0.241*** (0.0291)
Observations - Countries	632 - 128	632 - 128	632 - 128	602 - 125
AR1 (P-Value)	0.0000	0.0000	0.0000	0.0000
AR2 (P-Value)	0.2222	0.2717	0.1271	0.0906
OID (P-Value)	0.1315	0.1937	0.1787	0.1985

*Note: *p-value<0.1; **p-value<0.05; ***p-value<0.01. Robust Standard Errors are in parenthesis. In the two-step system GMM estimations, the variables "AfTTOT", "AfTINFRA", "AfTPROD", "AfTPOL", "ECI", "TP", "EDU", "FINDEV", "INST" and the interaction variables have been considered as endogenous. The regressions have used 3 lags of the dependent variable as instruments, and 2 lags of endogenous variables as instruments. All variables have been standardized.*

Table 2: Effect of AfT and export product concentration on import product concentration in LDCs versus NonLDCs

Estimator. Two-step system GMM

Variables	ICI	ICI	ICI	ICI
	(1)	(2)	(3)	(4)
ICI _{t-1}	0.300*** (0.0228)	0.300*** (0.0230)	0.297*** (0.0217)	0.306*** (0.0219)
AfT [*] TOT	0.220*** (0.0382)			
AfT [*] TOT*LDC	-0.150*** (0.0570)			
AfTINFRA		0.296*** (0.0478)		
AfTINFRA*LDC		-0.182*** (0.0623)		
AfTPROD			0.151*** (0.0415)	
AfTPROD*LDC			-0.123** (0.0617)	
AfTPOL				0.295*** (0.0437)
AfTPOL*LDC				-0.222*** (0.0545)
ECI*LDC	-0.570*** (0.0600)	-0.530*** (0.0618)	-0.472*** (0.0598)	-0.557*** (0.0479)
ECI	0.419*** (0.0338)	0.407*** (0.0341)	0.337*** (0.0359)	0.392*** (0.0444)
LDC	0.0985 (0.0828)	0.120 (0.0790)	0.0796 (0.0842)	-0.0724 (0.0754)
TP	0.234*** (0.0360)	0.310*** (0.0330)	0.238*** (0.0414)	0.296*** (0.0459)
GDPC	0.0919** (0.0361)	0.0707** (0.0334)	0.143*** (0.0361)	0.0236 (0.0395)
GDPC ²	-0.371*** (0.0271)	-0.370*** (0.0304)	-0.309*** (0.0255)	-0.310*** (0.0291)
EDU	-0.103** (0.0443)	-0.152*** (0.0454)	-0.124*** (0.0423)	-0.130*** (0.0451)
FINDEV	0.0862*** (0.0302)	0.0284 (0.0280)	0.0846** (0.0401)	0.105*** (0.0379)
INST	-0.370*** (0.0429)	-0.368*** (0.0429)	-0.366*** (0.0436)	-0.326*** (0.0431)
POP	-0.142*** (0.0415)	-0.154*** (0.0406)	-0.171*** (0.0428)	-0.133*** (0.0354)
Constant	0.286*** (0.0354)	0.284*** (0.0336)	0.255*** (0.0325)	0.285*** (0.0359)
Observations - Countries	632 - 128	632 - 128	632 - 128	602 - 125
AR1 (P-Value)	0.0000	0.0000	0.0000	0.0000

AR2 (P-Value)	0.3028	0.3393	0.1858	0.3408
Sargan (P-Value)	0.4184	0.3932	0.2749	0.3953

Note: * p -value<0.1; ** p -value<0.05; *** p -value<0.01. Robust Standard Errors are in parenthesis. In the two-step system GMM estimations, the variables "AfTTOT", "AfTINFRA", "AfTPROD", "AfTPOL", "ECI", "TP", "EDU", "FINDEV", "INST" and the interaction variables have been considered as endogenous. The regressions have used 3 lags of the dependent variable as instruments and 2 lags of endogenous variables as instruments. All variables have been standardized.

Table 3: Effect of AfT on import product concentration for varying levels of export product concentration

Estimator. Two-step system GMM

Variables	ICI	ICI	ICI	ICI
	(1)	(2)	(3)	(4)
ICI _{t-1}	0.293*** (0.0208)	0.331*** (0.0271)	0.301*** (0.0197)	0.320*** (0.0186)
AfT [*] TOT	0.137*** (0.0253)			
AfT [*] TOT*ECI	0.231*** (0.0218)			
AfTINFRA		0.173*** (0.0439)		
AfTINFRA*ECI		0.346*** (0.0577)		
AfTPROD			0.0998*** (0.0258)	
AfTPROD*ECI			0.132*** (0.0378)	
AfTPOL				0.176*** (0.0245)
AfTPOL*ECI				0.273*** (0.0245)
ECI	0.238*** (0.0257)	0.253*** (0.0432)	0.205*** (0.0280)	0.195*** (0.0239)
TP	0.228*** (0.0304)	0.338*** (0.0543)	0.229*** (0.0351)	0.356*** (0.0294)
GDPC	0.139*** (0.0253)	0.0953** (0.0441)	0.163*** (0.0303)	0.0476* (0.0252)
GDPC ²	-0.303*** (0.0195)	-0.313*** (0.0318)	-0.267*** (0.0235)	-0.264*** (0.0194)
EDU	-0.0173 (0.0246)	-0.190*** (0.0646)	-0.0754** (0.0333)	-0.0662 (0.0412)
FINDEV	-0.0325* (0.0194)	0.0429 (0.0408)	0.0348 (0.0238)	0.0162 (0.0252)
INST	-0.336*** (0.0348)	-0.403*** (0.0452)	-0.363*** (0.0319)	-0.270*** (0.0287)
POP	-0.116*** (0.0341)	-0.219*** (0.0544)	-0.154*** (0.0331)	-0.174*** (0.0165)

Constant	0.286***	0.302***	0.253***	0.258***
	(0.0158)	(0.0284)	(0.0177)	(0.0176)
Observations - Countries	632 - 128	632 - 128	632 - 128	602 - 125
AR1 (P-Value)	0.0000	0.0000	0.0000	0.0000
AR2 (P-Value)	0.1854	0.2236	0.1232	0.1087
OID (P-Value)	0.2158	0.1311	0.3305	0.3879

*Note: *p-value<0.1; **p-value<0.05; ***p-value<0.01. Robust Standard Errors are in parenthesis. In the two-step system GMM estimations, the variables "AftTOT", "AftINFRA", "AftPROD", "AftPOL", "ECI", "TP", "EDU", "FINDEV", "INST" and the interaction variables have been considered as endogenous. The regressions have used 3 lags of the dependent variable as instruments, and 2 lags of endogenous variables as instruments. All variables have been standardized.*

Table 4: Effect of AfT on import product concentration for varying degrees of trade policies
Estimator. Two-step system GMM

Variables	ICI	ICI	ICI	ICI
	(1)	(2)	(3)	(4)
ICI _{t-1}	0.303*** (0.0157)	0.318*** (0.0123)	0.269*** (0.0173)	0.292*** (0.0206)
AfTTOT	0.0849*** (0.0223)			
AfTTOT*TP	-0.181*** (0.0235)			
AfTINFRA		0.164*** (0.0238)		
AfTINFRA*TP		-0.0748** (0.0326)		
AfTPROD			0.0595** (0.0262)	
AfTPROD*TP			-0.119*** (0.0306)	
AfTPOL				0.152*** (0.0314)
AfTPOL*TP				-0.178*** (0.0337)
ECI	0.201*** (0.0324)	0.207*** (0.0279)	0.148*** (0.0233)	0.192*** (0.0205)
TP	0.188*** (0.0322)	0.206*** (0.0330)	0.265*** (0.0354)	0.293*** (0.0236)
GDPC	0.138*** (0.0265)	0.102*** (0.0206)	0.168*** (0.0285)	0.0631** (0.0302)
GDPC ²	-0.318*** (0.0202)	-0.329*** (0.0245)	-0.272*** (0.0208)	-0.269*** (0.0207)
EDU	-0.0473* (0.0262)	-0.0441 (0.0307)	-0.0131 (0.0273)	-0.0322 (0.0308)
FINDEV	0.0564** (0.0224)	0.0356* (0.0214)	0.0278 (0.0259)	0.0812*** (0.0255)
INST	-0.292*** (0.0282)	-0.312*** (0.0311)	-0.357*** (0.0319)	-0.348*** (0.0334)
POP	-0.122*** (0.0319)	-0.166*** (0.0318)	-0.193*** (0.0317)	-0.137*** (0.0345)
Constant	0.298*** (0.0182)	0.315*** (0.0186)	0.245*** (0.0152)	0.252*** (0.0214)
Threshold of "TP"	71.3 = [(0.0849/0.181)*13.571 + 64.966]	94.7 = [(0.164/0.0748)*13.571 + 64.966]	71.75 = [(0.0595/0.119)*13.571 + 64.966]	76.55 = [(0.152/0.178)*13.571 + 64.966]
Threshold of "AfT variable" (in millions of US dollars)	598.8 = [(0.188/0.181)* 3.83e+08 + 2.01e+08]	785 = [(0.206/0.0748)* 2.44e+08 + 1.13e+08]	515.6 = [(0.206/0.0748)* 1.57e+08 + 8.32e+07]	37.416 = [(0.206/0.0748)* 1.22e+07 + 3817410]

Observations - Countries	632 - 128	632 - 128	632 - 128	602 - 125
AR1 (P-Value)	0.0000	0.0000	0.0000	0.0000
AR2 (P-Value)	0.2766	0.2500	0.1733	0.1336
OID (P-Value)	0.3164	0.2832	0.3896	0.4136

*Note: *p-value<0.1; **p-value<0.05; ***p-value<0.01. Robust Standard Errors are in parenthesis. In the two-step system GMM estimations, the variables "AftTOT", "AftINFRA", "AftPROD", "AftPOL", "ECI", "TP", "EDU", "FINDEV", "INST" and the interaction variables have been considered as endogenous. The regressions have used 3 lags of the dependent variable as instruments, and 2 lags of endogenous variables as instruments. All variables have been standardized.*

Table 5: Robustness check analysis - Effect of AfT on import product concentration ("EDI")
Estimator. Two-step system GMM

Variables	ICI	NUMBIMP
	(1)	(2)
One-period lag of the dependent variable	0.303***	0.276***
	(0.0244)	(0.0117)
AfTTOT	0.0775***	-0.0956***
	(0.0261)	(0.0151)
AfTTOT*EDI	0.157***	-0.0430**
	(0.0305)	(0.0197)
FKIEDI	-0.139***	-0.138***
	(0.0237)	(0.0188)
TP	0.143***	0.230***
	(0.0324)	(0.0201)
GDPC	0.128***	0.345***
	(0.0249)	(0.0197)
GDPC ²	-0.349***	-0.173***
	(0.0177)	(0.0171)
EDU	-0.0122	0.0595***
	(0.0304)	(0.0209)
FINDEV	-0.0939***	0.0522***
	(0.0253)	(0.0169)
INST	-0.190***	-0.0772***
	(0.0267)	(0.00982)
POP	-0.0717*	0.0585**
	(0.0397)	(0.0234)
Constant	0.330***	0.197***
	(0.0174)	(0.0147)
Observations - Countries	632 - 128	632 - 128
AR1 (P-Value)	0.0000	0.0001
AR2 (P-Value)	0.2739	0.8954
AR3 (P-Value)	0.4386	0.9202
OID (P-Value)	0.1788	0.4352

Note: *p-value<0.1; **p-value<0.05; ***p-value<0.01. Robust Standard Errors are in parenthesis. In the two-step system GMM estimations, the variables "AfTTOT", "ECI", "TP", "EDU", "FINDEV", "INST" and the interaction variables have been considered as endogenous. The regressions have used 3 lags of the dependent variable as instruments, and 2 lags of endogenous variables as instruments. All variables have been standardized.

APPENDICES

Appendix 1: Definition and Source of variables

Variables	Definition	Sources
ICI	This is the import product concentration index. It is calculated using the Herfindahl-Hirschmann Index and its values are normalized so that they range between 0 and 1. An index value closer to 1 indicates whether a country's imports are highly concentrated on a few products. On the contrary, values closer to 0 reflect imports are more homogeneously distributed among a series of products. The indicator is computed using import products data at the 3-digit level of SITC, Revision 3.	United Nations Conference on Trade and Development (UNCTAD) Database. See online: http://unctadstat.unctad.org/wds/TableView/tableView.aspx?ReportId=120
NUMBIMP	Number of products exported (or imported) at the 3-digit SITC, Revision 3 level.	United Nations Conference on Trade and Development (UNCTAD) Database.
AfTTOT, AfTINFRA, AfTPROD, AfTPOL	<p>"AfTTOT" is the total real gross disbursements of Aid for Trade (expressed in constant prices 2016, US Dollar).</p> <p>"AfTINFRA" is the real gross disbursements of Aid for Trade allocated to the buildup of economic infrastructure (expressed in constant prices 2016, US Dollar). "AfTPROD" is the real gross disbursements of Aid for Trade for building productive capacities (expressed in constant prices 2016, US Dollar).</p> <p>"AfTPOL" is the real gross disbursements of Aid allocated for trade policies and regulation (expressed in constant prices 2016, US Dollar).</p>	<p>Author's calculation based on data extracted from the database of the OECD/DAC-CRS (Organization for Economic Cooperation and Development/Donor Assistance Committee)-Credit Reporting System (CRS). Aid for Trade data cover the following three main categories (the CRS Codes are in brackets):</p> <p><u>Aid for Trade for Economic Infrastructure ("AfTINFRA")</u>, which includes: transport and storage (210), communications (220), and energy generation and supply (230);</p> <p><u>Aid for Trade for Building Productive Capacity ("AfTPROD")</u>, which includes banking and financial services (240), business and other services (250), agriculture (311), forestry (312), fishing (313), industry (321), mineral resources and mining (322), and tourism (332); and</p> <p><u>Aid for Trade policy and regulations ("AfTPOL")</u>, which includes trade policy and regulations and trade-related adjustment (331).</p>

ECI	This is the export product concentration index. It is calculated using the Herfindahl-Hirschmann Index and its values are normalized so that they range between 0 and 1. An index value closer to 1 indicates whether a country's exports are highly concentrated on a few products. On the contrary, values closer to 0 reflect exports are more homogeneously distributed among a series of products. The indicator is computed using export products data at the 3-digit level of SITC, Revision 3.	United Nations Conference on Trade and Development (UNCTAD) Database.
FKIEDI	The export diversification index is computed by measuring the absolute deviation of the export structure of a country from world export structure. This index is a modified Finger-Kreinin measure of similarity in trade. The diversification index takes values between 0 and 1. A value closer to 1 indicates greater divergence from the world pattern. Data used are export products data at the 3-digit level of SITC, Revision 3.	United Nations Conference on Trade and Development (UNCTAD) Database.
TP	This is the index of trade policy. It is measured by the score of the freedom to trade internationally. This is a component of the Economic Freedom Index. It is composite measure of the absence of tariff and non-tariff barriers that affect imports and exports of goods and services. This score is graded on a scale of 0 to 100, with a rise in its value indicating lower trade barriers, i.e., higher trade liberalization, while a decrease in its value reflects rising trade protectionism.	Heritage Foundation (see Miller et al., 2019)
EDU	This is the measure of the education level. It is calculated as the average of the gross primary school enrolment rate (in percentage), the secondary school enrolment rate (in percentage) and the tertiary school enrolment rate (in percentage).	World Development Indicators (WDI)
FINDEV	This is the measure of the depth of financial development. It is measured by the domestic credit to private sector (% of	WDI

	GDP), where missing values have been replacing with the domestic credit to private sector by banks (% of GDP).	
GDPC	Per capita Gross Domestic Product (constant 2010 US\$)	WDI
POP	This is the measure of the total Population	WDI
INST	<p>This is the variable representing the institutional and governance quality in a given country. It has been computed by extracting the first principal component (based on factor analysis) of the following six indicators of governance. These include a measure of political stability and absence of violence/terrorism; the regulatory quality; an index of rule of law index; the government effectiveness index; the index of voice and accountability; and the index of corruption. Higher values of this index are associated with better governance and institutional quality, while lower values reflect worse governance and institutional quality.</p>	<p>Data on the components of the variable "INST" has been collected from World Bank Governance Indicators (WGI) developed by Kaufmann, Kraay and Mastruzzi (2010) and recently updated.</p>

Appendix 2a: Descriptive statistics on unstandardized (non-transformed) variables

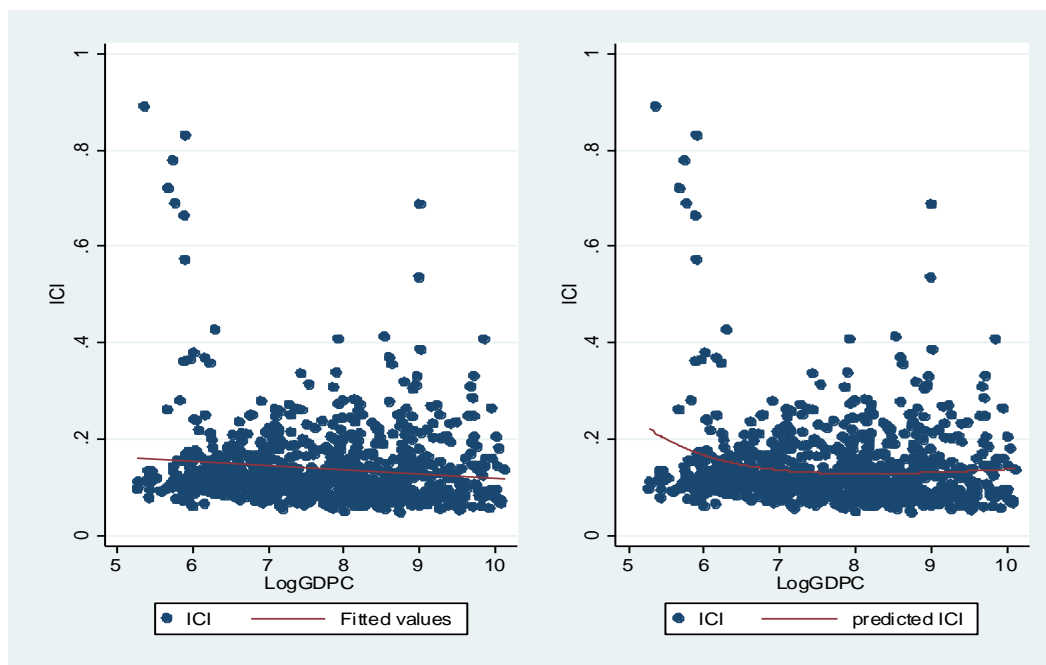
Variable	Observations	Mean	Standard deviation	Minimum	Maximum
ICI	904	0.138	0.084	0.047	0.890
FKIIDI	904	0.453	0.090	0.239	0.881
NUMBIMP	904	212.942	39.363	47.000	258.667
AfTTOT	875	2.01e+08	3.83e+08	10851.5	3.65e+09
AfTINFRA	855	1.13e+08	2.44e+08	10851.5	3.04e+09
AfTPROD	861	8.32e+07	1.57e+08	16521.67	1.96e+09
AfTPOL	741	3817410	1.22e+07	-28318	2.64e+08
ECI	904	0.378	0.213	0.071	0.975
FKIEDI	904	0.716	0.112	0.372	0.922
TP	820	64.966	13.571	0.000	89.200
EDU	861	69.465	22.541	1.912	138.724
FINDEV	883	32.951	28.507	0.186	155.407
GDPC	900	4264.215	4750.813	194.926	24892.790
INST	901	-0.982	1.511	-4.806	3.345
POP	909	4.06e+07	1.54e+08	69749.67	1.37e+09

Appendix 2b: Descriptive statistics on standardized variables

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
ICI	890	-1.28e-09	0.926	-2.187	2.222
FKIIDI	890	-6.59e-09	0.926	-2.113	2.147
AfTTOT	861	3.13e-09	0.923	-1.761	2.226
AfTINFRA	855	-3.79e-10	0.923	-1.573	2.266
AfTPROD	861	1.21e-09	0.923	-1.888	2.245
AfTPOL	739	-4.01e-10	0.912	-1.632	2.267
ECI	890	1.91e-08	0.926	-2.151	2.197
FKIEDI	890	-3.09e-08	0.926	-2.115	2.242
NUMBIMP	890	-3.46e-07	0.926	-2.193	2.158
TP	810	2.75e-07	0.918	-2.231	1.883
EDU	850	3.33e-08	0.922	-2.203	2.248
FINDEV	871	-1.26e-08	0.924	-1.736	2.166
GDPC	892	-2.84e-09	0.926	-2.207	2.066
INST	887	-1.03e-08	0.926	-2.175	2.236
POP	895	3.18e-08	0.926	-1.958	1.851

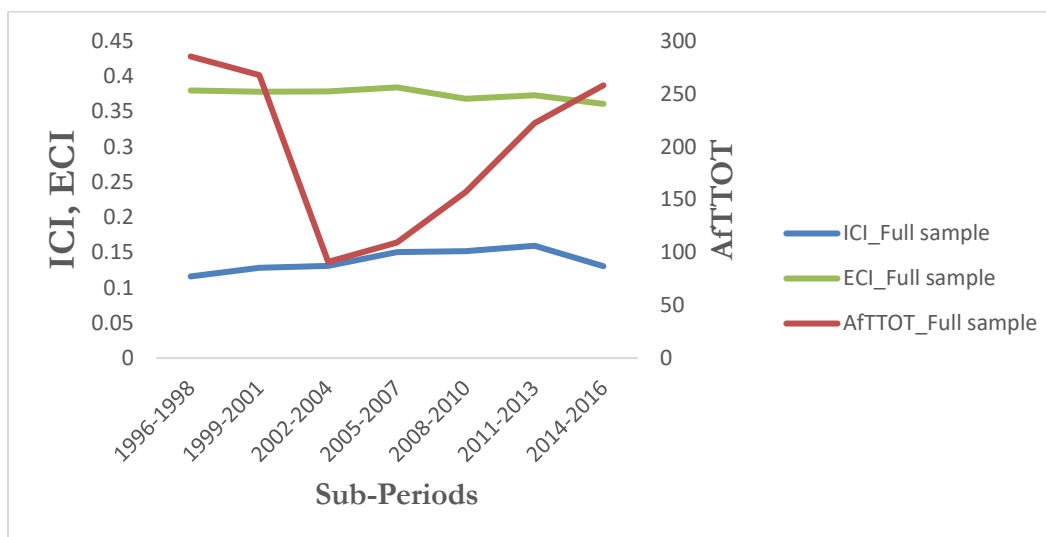
FIGURES

Figure 1: Correlation pattern between GDPC and ICI over the full sample



Source: Author

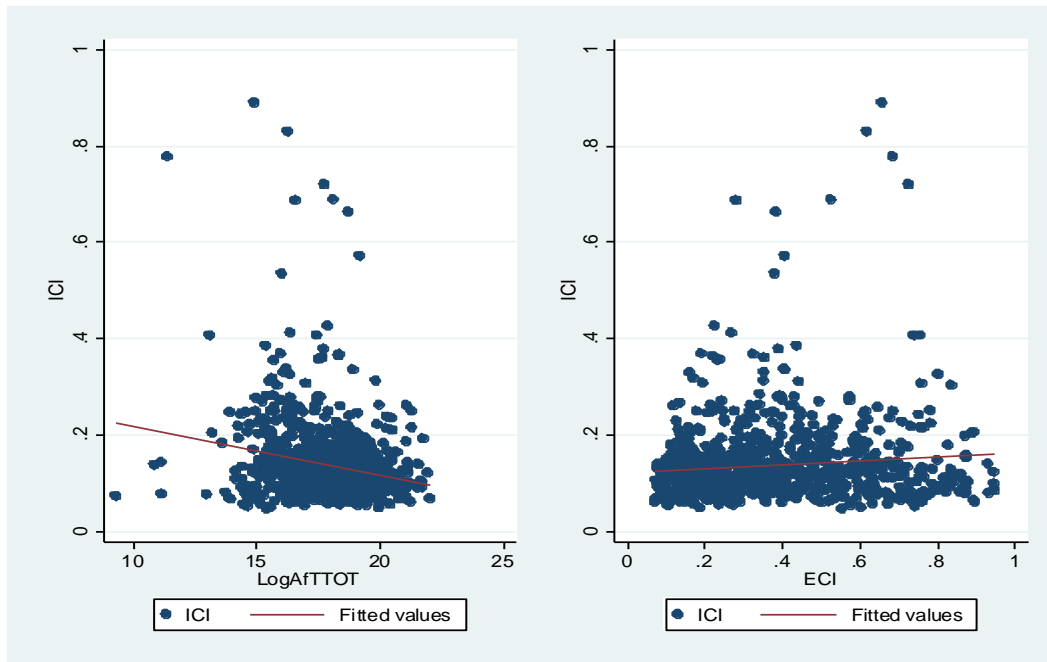
Figure 2: Evolution of AfT, ECI, and ICI



Source: Author

Note: Total Aid for Trade (AfTTOT) is expressed in Millions of US Dollars, constant 2016 prices.

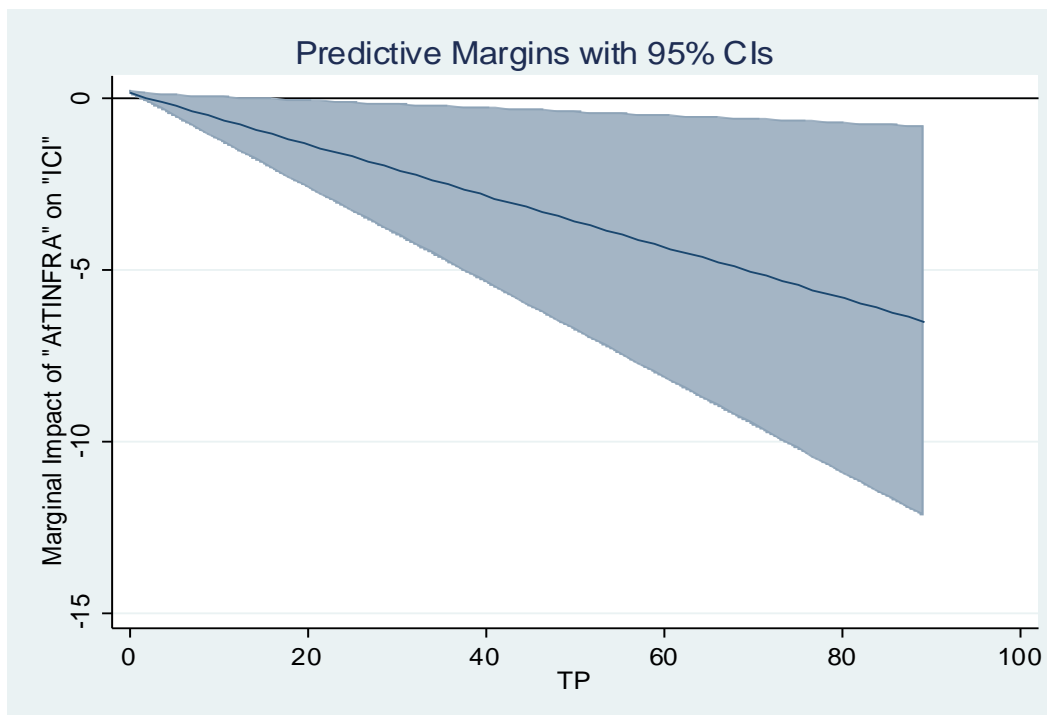
Figure 3: Linear correlation patterns between "AfTTOT", "ECI" and "ICI" over the full sample



Source: Author

Note: In the graph with the variable labelled "Log(AfTTOT)" represents the natural logarithm of total Aid for Trade, which is expressed in US Dollars, constant 2016 prices.

Figure 4: Marginal Impact of "AfTINFRA" on "ICI" for varying degrees of trade policy liberalization



Source: Author