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Trade dependence, liberalization and exports diversification in developing countries

Abstract

This paper explores the relationship between trade, trade liberalization and exports diversification in developing countries. The paper uses non-parametric and parametric techniques in a sample of 144 developing countries over the period 1970-2015. The non-parametric analyses indicate that countries that are more open to trade tend to have more diversified exports structures than those less open to trade. The results from the panel data estimations suggest that on average, trade and trade liberalization are drivers of exports diversification both in the short and in the long run. The empirical analyses also show that human capital, GDP per capita, institutions, geography and infrastructure play a role in exports diversification.

Key words: Exports diversification; trade policy; trade openness; structural economic transformation; SSA

JEL classification numbers: C33, F63, O19, O55



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1. Introduction

Developing countries have traditionally depended on a narrow range of primary products and a relatively small number of markets for their exports. The development implications of exports concentration on products, sectors, and markets are potentially significant. Concentration in sectors with limited scope to ignite productivity and product quality could result in low growth and may preclude the possibilities of achieving sustained employment creation and income upgrading. Furthermore, lack of diversification may increase vulnerability to adverse external shocks, and hence affect exports earnings and macroeconomic stability.

This paper examines the role of trade and trade policy in the diversification process in developing countries. It employs both parametric and non-parametric techniques to shed light on the relationship between trade, trade policy and diversification in a sample of 144 developing countries. It also incorporates the roles of other structural and policy variables that may affect exports diversification, controlling for the direct impact of the studied relationships in Sub-Saharan Africa (SSA). This study is important in at least two respects. The first is that although the role of trade and trade policy in the development process is well documented, there is less research on their roles in fostering export diversification or structural transformation, particularly in Africa and the Least Developed Countries (LDCs). Unlike existing studies, this paper employs both non-parametric and parametric techniques to examine the nexus between trade and diversification. Export diversification and upgrading is particularly crucial for developing countries in Africa and LDCs in general: the prevalent high concentration of resources in a few sectors based on commodities involves dealing with cycles of volatile prices and exports earnings, with potentially adverse consequences for overall economic performance. The second reason why this study is important is that over the past three decades, African countries and LDCs have increased their dependence on trade and have also adopted more liberal trade regimes than in the past.¹ Yet, they have not made any significant progress in terms of diversifying their export structure, suggesting that the realization of any potential benefits of trade for diversification is not necessarily automatic and may depend on domestic policies and the macroeconomic environment facing a country. In this context, there is the need to provide empirical evidence on the role of trade in the diversification process.

Theoretically, the relationship between trade and diversification depends on the model or framework considered. Traditional trade models suggest that trade fosters specialization via efficient reallocation of employment, capital and resources across sectors, in line with a country's comparative advantage. But more recent theoretical models suggest that trade can facilitate diversification. For example, Teigner (2018) shows that changes in productivity and reductions in trade barriers affect sectoral relocation and hence growth and transformation. Using a general equilibrium framework, Dessy et. al. (2010) also demonstrate that trade can promote diversification and transformation in developing countries. These models suggest plausible linkages between trade and structural change, but their prediction on the nature of the relationship is fundamentally different.

Empirical research shows that diversification in exports and in domestic production have been conducive to economic growth, although a vast heterogeneity is observed amongst developing country groups and regions. Increased diversification is also associated with lower output volatility and greater macroeconomic stability (e.g. Agosin et al, 2012). Therefore, trade can potentially play a central role in developing countries' development prospects. But whether trade fosters or hinders diversification in developing countries is a question that has to be answered at the empirical level. To this end, the present paper attempts to shed new light on the question using a variety of econometric techniques. The paper proceeds as follows. Section 2 provides a brief survey of the literature. Section 3 examines the trends in trade and exports diversification in the sample. Sections 4 and 5 present the empirical analyses. Section 5 concludes.

¹ In the LDCs for example, total trade as a percentage of GDP increased from an average of about 61 percent in the period 1970-74 to 83 percent in the period 2006-2010. However, the diversification of their exports (measured by the Theil index) changed marginally from 4.6 to 4.4 over the same period.

2. What does the literature say about trade and diversification in developing countries?

Concerns about the harmful effects of high dependence on primary commodity exports are founded on the assumption that primary commodity exporters are affected by the secular deterioration in their terms of trade, which in turn lead to high price volatility and low productivity growth (Prebisch, 1950, 1959; Singer, 1950). Sachs and Warner (2001) argue that the so-called Dutch-disease leads to concentration in resource exports, implying fewer possibilities for productivity growth, hence representing a transfer of income from developing to developed countries.² In this setting, import substitution and export promotion policies have been adopted by governments of developing countries, with varying degrees of success, as strategies to reduce exports concentration and promote manufacturing sector development.

The literature shows that diversification has the potential to positively contribute to growth and development through several channels. First, increased investment in a broad range of activities and sectors enhance the sources of income and contributes to mitigating the adverse effects of export instability and fluctuations in the terms of trade - particularly in Africa and the LDCs (Edwards, 2009). Second, diversification can serve as a distributional instrument to channel revenues from mineral and resource-based sectors to other sectors of the economy, thus building the foundation for a stable inflow of revenues while accounting for intergenerational equity (Page, 2008). Third, the diversification of exports is also associated with reduced fluctuations in foreign exchange earnings, increases in GDP and employment, higher value addition and improvements in the quality of manufactured products (Hausmann et al 2006; Osakwe, 2007; Elhiraika and Mbate, 2014).

Empirical research confirms the theoretical predictions that international trade in goods and factor services is explained by differences in comparative advantages across countries. Some authors argue that without a minimum level of development, the benefits of exports promotion and diversification will not be realized (e.g. Edwards, 1993, Imbs and Wacziarg, 2003). Exports diversification entails not only increasing the variety of goods exported but also moving into goods of higher quality and new markets (Bernard et al, 2004; Hausmann et al, 2007; Brenton and Newfarmer, 2009). In this context, the growth miracle of some successful economies, such as Korea and other South East Asian countries, could be explained by the role of trade in diversification and structural change (Teignier, 2018).

More sophisticated exports baskets and higher technology intensity are more likely to act as catalysts for broad-based economic growth. Sectors that observe high sophistication or high-technology intensity are likely to act as an engine of growth and promote inter-sectoral and extra-sectoral linkages, rather than isolated enclaves, provided the right macroeconomic conditions and structural factors are in place (Anand et al, 2012; Hausmann, Hwang, and Rodrik 2007). However, these linkages are complex, particularly in low-income countries, where challenges such as a low-skilled labour force, poor macroeconomic management and institutional constraints persist (Santos-Paulino, 2017).

Some studies suggest that there are higher positive externalities associated with the manufacturing sector when compared with other sectors (e.g., Greenaway, Morgan, and Wright; 1999; Levine and Raut, 1997). For instance, Fosu (1990) provides evidence of the positive effects of manufacturing exports on growth for developing countries as compared to primary sector exports. But, export industries in low-income countries are small in scale and unsophisticated, and they often specialize in products that cannot be produced easily or competitively in the developed world (Nicita and Rolo, 2015), hence the importance of diversifying and upgrading their economic structures and exports baskets.

Hausmann et al (2007) show that diversification into new production and export activities, as well as improving the quality (and sophistication) of export baskets determine economic growth across countries. For Africa,

² The Dutch disease refers to the negative impact the expanding primary-commodity sector may have on other tradable sectors. It also might lead to deindustrialization as industries other than commodities or resources exploitation transfer to cheaper locations due to higher costs inflation and currency appreciation.

Osakwe (2007) examines the determinants of export diversification in African countries. The empirical estimates suggest that aid, the quality of infrastructure, resource endowments, and in some cases institutional factors, determine diversification in the region. Contrary to existing evidence, the study does not find a significant impact of geography on diversification. The paper also highlights the role of regional integration and cooperation particularly for infrastructure development, which in turn could be conducive to diversification. The paper provides policy recommendations on how governments can enhance the diversification efforts in the region, notably the importance of managing natural resources and foreign aid to avoid Dutch-disease type effects (see also Elhiraika and Mbate, 2014 for a related discussion). Elhiraika and Mbate (2014) empirically explore the long-run determinants of export diversification for a sample of 53 African countries for 1995-2011. System GMM panel data estimates provide robust evidence supporting the importance of per capita income, infrastructure, public investment, human capital and the institutional framework as significant drivers of export diversification and transformation.

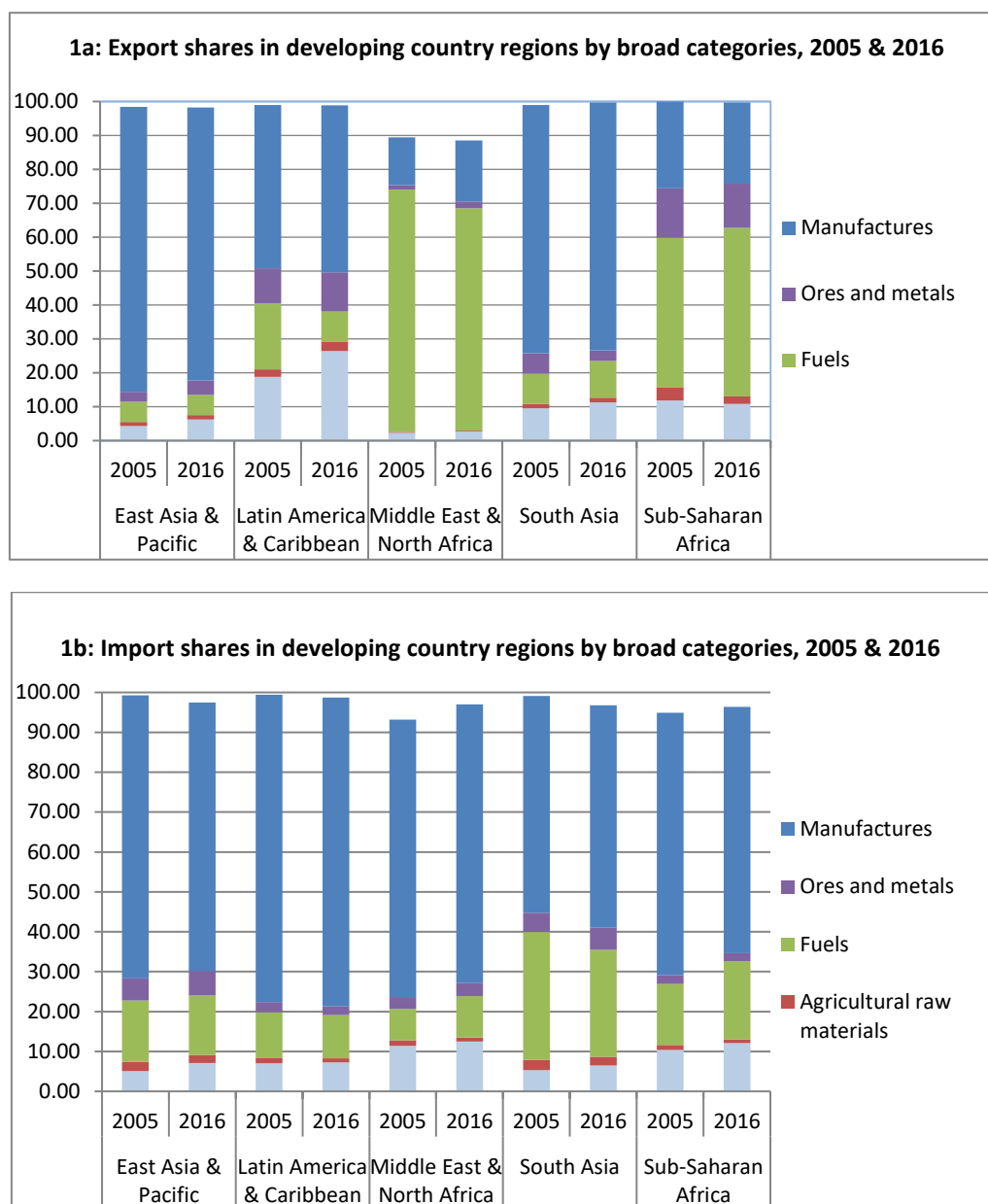
Finally, the study by Cleto Fochamnyo and Akame (2017) captures the impact of trade openness – not trade policy – on exports diversification in SSA. The paper finds that in SSA, exports diversification is determined by trade openness, value added in agriculture and manufacturing, and FDI. Also, foreign aid, official exchange rates and gross domestic investment promoted export diversification in selected economies.

3. Trade and diversification trends in developing countries: An overview

The link between diversification and trade is not evident. There is significant heterogeneity across developing countries in terms of trade and exports specialization patterns. Despite significant openness to trade and ongoing liberalization efforts, a number of developing countries, notably African countries and LDCs, have not succeeded in diversifying production and exports, and in transforming their economies (UNCTAD, 2004). This contrasts with the situation of emerging economies in Asia and Latin America where higher trade has been associated with higher export diversification. Apart from the emerging economies, the export structures of most developing countries have remained largely unchanged, and highly concentrated on primary commodities. For example, Figure 1a shows that the exports of Sub-Saharan African countries consist mostly of fuels, ores and metals. In addition to concentration, there are concerns about the increasing deindustrialization trend in some developing countries - where the share of manufacturing value added in GDP is declining - and the negative impact on the potential for structural transformation (see Soderbum, 2017). In contrast to their export patterns, developing countries tend to import larger shares of manufacturing goods, which has more potential to contribute to enhancing productivity, and serve as means of technology and knowledge transfer (Figure 1b).³

³ We also used manufactures value added share to GDP as an alternative proxy for diversification, but the results were not statistically consistent.

Figure 1. Export and import shares in developing country regions by broad categories, 2005 and 2016



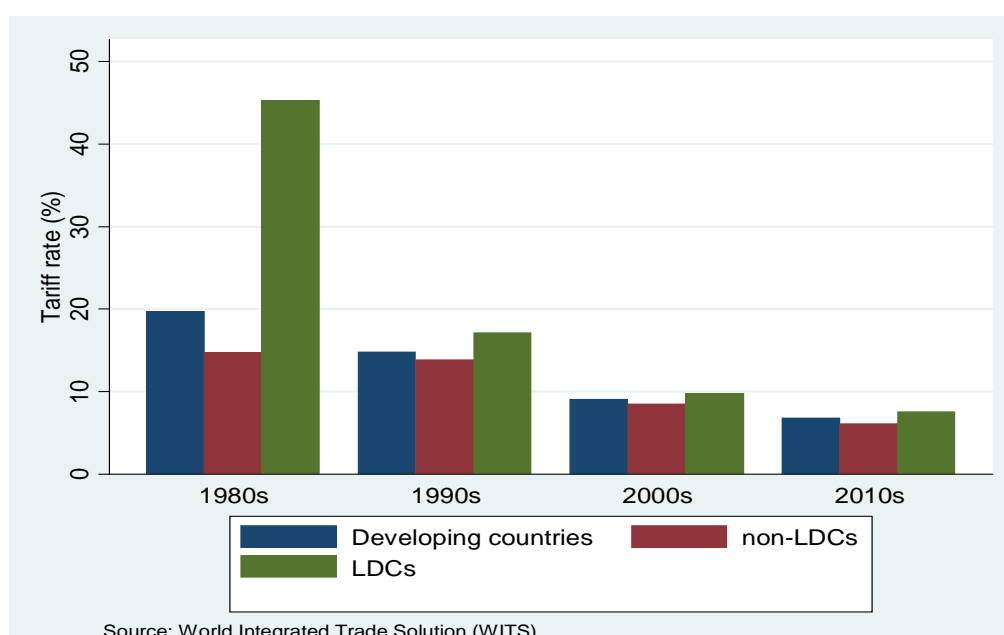
Source: Authors' elaboration based on UNCTAD Comtrade data (2017).

In this study, we cover a large group of developing economies, comprising a total of 144 countries. The sample displays significant differences in levels of development during the period 1970-2015, as well as important structural variances in terms of trade and production. The differences in the mean values of trade specialization, growth, and other key economic variables, are noticeable in the descriptive statistics presented in Tables A2 and A3 in the Appendix. The Theil export diversification index represents the sum of measures of diversity across sectors (i.e. the vertical diversity or extensive margin, implying new exported products or new export destinations) and diversity within sectors (horizontal diversity or intensive margin, meaning a larger volume of exports of old products). For instance, the exports diversification index ranges between 1.5 and 6.4 across

developing countries, with a median value of 3.18. The exports diversification index shows a slight decline in the period studied from around 4.2 in early 1970s to 3.6 in 2010, which indicates a relatively higher diversification of exports in developing countries.

The data shows significant increase in trade openness and trade liberalization over the sample period. It is worth noting that an important driver of trade liberalization in these economies has been the significant reductions in tariff rates driven by autonomous trade reforms as well as bilateral and multilateral commitments (see Figure 2). There are also noticeable differences between developing-country groups in terms of macroeconomic indicators and other structural variables such as human capital, income per capita and infrastructure.

Figure 2. Changes in tariff rates across developing countries

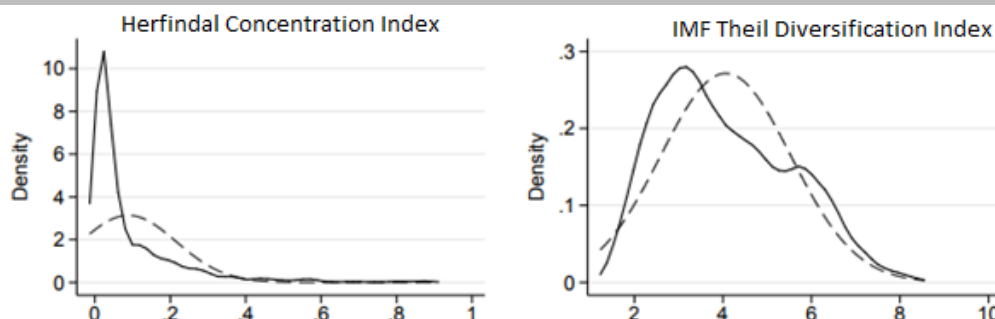


4. Some facts on trade and exports diversification within countries: Non-parametric analysis

This section uses non-parametric tests to analyse the patterns and the links between trade, trade policy and the diversification of exports. Parametric tests assume that the outcome or variable under consideration is approximately normally distributed in the population. This assumption makes sense when the sample size is large. However, for smaller samples it may or may not hold, so it is useful, for robustness, to perform non-parametric (or distribution-free) tests, to complement the regression analysis.

Figure 3 depicts the distributional patterns of the exports concentration and export specialization indices. The first panel showing the Herfindhal Concentration Index indicates that many developing countries observe high concentration of exports, particularly those at the bottom of the per capita income bundle. The second panel shows the Theil index of exports diversification, which displays a pattern closer to a normal distribution - we use this indicator in the remaining empirical part of the paper.

Figure 3. Distribution of concentration and diversification measures 1995-2010



Estimated based on UNCTAD Comtrade (HHI) and the IMF Theil index.

To better tease out the connection between trade and diversification using non-parametric tests, developing countries in the sample are classified as “more open to trade” and “less open to trade” depending on their level of total trade in GDP compared to the sample average. Then, we also compute the median export diversification indices for both groups and ask whether there are any significant differences in export diversification between the groups. Over the period 1995-2010, the median trade ratio for the countries more open to trade was 80 percent and for those less open to trade it was 29 percent. Regarding exports diversification, the median index for the countries more open to trade was about 3.8 while for those countries less open to trade it was about 4.0. This suggests that countries more open to trade are marginally more diversified than those less open to trade. We also conducted a robustness check of the result using other diversification indicators and the Kruskal-Wallis non-parametric test was used to assess if there are any statistically significant differences between the medians of the two groups across the different diversification indicators. That is, we test if countries that are more open to trade observe higher diversification of exports.⁴ Table 1 presents the results of the tests for the various indicators of export diversification. The tests results indicate statistically significant differences in exports diversification patterns between countries that are more open to trade and those that are less open to trade.

We also test whether the parameters follow a normal distribution, using two well-known tests: the Skewness Kurtosis test and the Shapiro- Wilk test. Table 2 reveals that the parameters are not normally distributed, i.e. there are significant differences in the means and medians of the variables, which could also be observed in the summary statistics across country groups. In summary, the non-parametric analysis shows that a difference in diversification between more open and less open economies in the sample exists, where more open countries appear to be more diversified. However, the non-parametric tests do not provide causal evidence on why this is the case. Thus, we undertake panel data econometric analysis in the subsequent section to further examine the relationship.

⁴ The testing hypothesis is that the medians of both groups are equal for each indicator (i.e. that exports diversification and trade openness or intensity is the same across groups), and the alternative hypothesis is that the medians are not equal. It should be borne in mind that this method provides one data point per country. Thus, the small data size is not appropriate for distributional assumptions.

Table 1. Non-parametric tests using different indicators of diversification

Variable	Indicator	Kruskal-Wallis tests. (Chi_2)
Export diversification	Manufacturing value added (% of GDP)	101.058 (0.001)
	UNCTAD diversification index	98.583 (0.001)
	Manufacturing exports (% of total exports)	88.875 (0.001)
	IMF Theil index	99.17 (0.002)

Notes:

- p -values are presented in parenthesis.

- The *Kruskal-Wallis* tests for significant differences on a continuous variable among different groups. It is an H test where the test statistic is computed as follows: $H = \left[\frac{12}{n(n+1)} \sum_{j=1}^c \frac{T_j^2}{n_j} \right] - 3(n+1)$, where n stands for the sum of sample sizes in all samples, c is the number of samples (groups), and T_j is sum of ranks in the j^{th} sample.

Table 2. Test for normal distribution of parameters

Indicator	Test (p -values)	
	<i>Skewness Kurtosis Test</i>	<i>Shapiro- Wilk Test</i>
Manufacturing value added (% of GDP)	0.0185	0.00148
UNCTAD diversification index	0.000	0.00001
Manufacturing exports (% of total exports)	0.000	0.00001
Theil index	0.000	0.00001

5. Cross-Country and Panel Data Estimations

5.1 Empirical Specification

Trade has the potential to contribute to the diversification of production and exports, but the realization of this potential benefit will vary from country to country, reflecting differences in initial conditions and country-specific policies that affect the performance of production and trade sectors. In this context, this section examines the link between trade, trade policy and export diversification across developing countries, after controlling for a set of trade-related factors and other structural and policy indicators such as human capital, macroeconomic conditions, investment and infrastructure. Although our full sample covers the period 1970-2015, the empirical estimates in this section rely on data for the period 1970-2010 (encompassing 144 countries) because data for the Theil export diversification index is available only until 2010. The starting point for the empirical analysis is the following estimating equation (see for example Hausmann et al, 2007; Osakwe 2007; and Agosin et al, 2012):

$$ED_{it} = \alpha + \beta_0 ED_{t-1} + \beta_1 X_{it} + \beta_2 Trade_{it} + \eta_i + \lambda_t + \varepsilon_{it} \quad (1)$$

Where ED_{it} represents various measures of exports diversification: the IMF Theil export diversification index and the share of manufacturing exports in total exports; X_{it} is a matrix of explanatory variables including human capital, per capita income, real exchange rate indices, and infrastructure; $Trade_{it}$ is a set of trade and trade policy indicators (trade intensity and tariff rates, depending on the specification); it are country and time specific effects; η_i, λ_t are country and time specific effects; and ε_{it} is an idiosyncratic error term. Detailed variables definitions are provided in the appendix. The empirical models are estimated using dynamic panel data and system generalized method of moments (GMMs), to control for unobserved time-invariant heterogeneity and the endogeneity of the regressors (see Arellano and Bover 1995; and Arellano and Bond 1991; Blundell and Bond 1998).

5.2 Results

Before undertaking formal econometric analysis for all countries across the sample period, we present correlation coefficients between exports diversification and other explanatory variables considered in the analysis. Results are presented in Table 3. The correlations and signs of the coefficients are in the expected directions, in general. With regard to trade and diversification, the results indicate that higher trade dependence is associated with higher export diversification. Furthermore, an increase in tariffs is associated with lower diversification.

Table 3. Correlation matrix

Variables	Tariff	Institutions	Human capital	REER	ER-Vol	ER-Vol*	Remote	GDP_PC	XDIV	Trade
Tariff	1									
Institutions	-0.1628	1								
Human capital	-0.0308	0.1785	1							
REER	0.0012	-0.1415	-0.0440	1						
ER-Vol	-0.0672	0.2861	0.1869	-0.0026	1					
ER-Vol*	-0.0149	-0.1897	-0.0781	0.6254	-0.0480	1				
Remote	-0.0193	0.2185	0.2425	-0.0567	0.2383	-0.1065	1			
GDP_PC	-0.1860	-0.2257	0.1092	-0.0923	-0.1592	-0.1065	0.2585	1		
XDIV	0.1997	-0.3432	-0.0694	0.0304	-0.2194	0.0535	-0.2353	-0.1398	1	
Trade	-0.2643	0.0041	-0.1392	-0.0849	0.4090	-0.1260	0.0491	0.2426	-0.0363	1

Note: REER refers to Real effective exchange rates; ER-Vol is the annual change in exchange rates (%); ER-Vol* is the exchange rate volatility (5-year period); Remote is the distance to frontiers score; GDP PC is real GDP per capita; and XDIV refers to exports diversification. Detailed definitions of the variables are provided in the Appendix.

To further validate the correlation estimates, we begin by estimating a cross-country regression specification, by Ordinary Least Squares (OLS), which provide relatively long-term results. The findings are reported in Tables 4 and 5. In terms of the fitness of models, using the *Theil export diversification index* as an indicator of diversification provides more statistically sound results than other proxies of concentration or diversification. The estimations also use total trade (as share of GDP) and tariffs as indicators of trade intensity and trade policy, as well as other ancillary variables.⁵

⁵ The reported results in Tables 5 and 6 exclude outliers in the sample and appear to be empirically more robust than with the inclusion of such countries.

Table 4. Cross-section results

The dependent variable is exports diversification (Theil Index): 1970-2010				
	(1)	(2)	(3)	(4)
	With trade	With tariff	With trade	With tariff
GDP per capita	0.00001** (2.39)	0.00001** (2.13)	-0.00004 (-0.35)	-0.00004 (-0.03)
Human capital	-0.00991*** (-4.93)	-0.00851*** (-3.52)	-0.00890*** (-4.14)	-0.00772*** (-3.00)
Remoteness	-0.00017*** (-4.02)	-0.00019*** (-3.52)	-0.00017*** (-4.09)	-0.00019*** (-3.56)
Access to electricity	-0.00203 (-1.15)	-0.00082 (-0.40)	-0.00187 (-1.05)	-0.00067 (-0.33)
Institutions	-0.03020*** (-3.73)	-0.03740*** (-3.88)	-0.02960*** (-3.70)	-0.03670*** (-3.81)
Trade/ Tariff	-0.00262** (-2.43)	0.00809** (2.07)	-0.00241** (-2.17)	0.00765* (1.92)
GDP per capita (Square)			2.64e-10 (1.31)	2.06e-10 (0.92)
Constant	6.074*** (14.51)	5.740*** (11.64)	6.058*** (14.56)	5.748*** (11.71)
Observations	435	332	435	332
F-test	34.15	27.08		
R-squared	0.2980	0.3080	0.3004	0.3096

Note: *** Significant at 1% level, ** 5% level and *10% level respectively; t values in parenthesis (with robust standard errors); lower values of the Theil index imply higher diversification. Regressions reported exclude outliers defined in terms of trade concentration and other structural variables relative to economic size; countries excluded from the regressions are: Hong Kong, Singapore, Equatorial Guinea, Guyana, Maldives and Lesotho. “ ζ ” refers to the change in real effective exchange rates.

Table 5. Cross-section results including regional dummy for SSA

The dependent variable is exports diversification (Theil Index): 1970-2010				
	(1)	(2)	(3)	(4)
	With trade	With tariff	With trade	With tariff
SSA	0.164 (0.97)	0.0177 (0.09)		
GDP per capita	0.00001** (2.47)	0.00001* (1.91)	0.00001** (2.45)	0.00001** (1.99)
Human capital	-0.00895*** (-4.16)	-0.00842*** (-3.47)	-0.00937*** (-4.63)	-0.00838*** (-3.50)
Remoteness	-0.00015*** (-2.69)	-0.00018** (-2.54)	-0.00016*** (-3.05)	-0.00018*** (-2.71)
Access to electricity	-0.00207 (-1.19)	-0.00083 (-0.41)	-0.00200 (-1.13)	-0.00085 (-0.42)
Institutions	-0.03140*** (-3.86)	-0.03760*** (-3.75)	-0.03140*** (-3.78)	-0.03760*** (-3.87)
Trade/ Tariff	-0.00249** (-2.31)	0.00824** (1.98)	-0.00278** (-2.55)	0.00825** (2.07)
SSA*Trade/ SSA*Tariff			0.00162 (0.83)	0.00278 (0.19)
Constant	5.742*** (9.41)	5.703*** (7.57)	5.879*** (10.99)	5.681*** (8.44)
Observations	435	332	435	332
F-test	33.12	25.33	31.14	25.96
R-squared	0.3003	0.3080	0.2995	0.3081

Notes: *** Significant at 1% level, ** 5% level and *10% level respectively; t values in parenthesis (with robust standard errors); lower values of the Theil index imply higher diversification. Regressions reported exclude outliers defined in terms of trade concentration and other structural variables relative to economic size; countries excluded from the regressions are: Hong Kong, Singapore, Equatorial Guinea, Guyana, Maldives and Lesotho. “ ζ ” refers to the change in real effective exchange rates.

The findings from the cross-country regressions in Table 4 show that higher GDP per capita is associated with exports specialization in the long run. The estimated coefficient for human capital is statistically significant across specifications, which implies that higher human capital is associated with exports diversification. Although geography is exogenous to an economy, geographical distance to trade partners is an important variable in the analysis of exports diversification and trade. The results show that distance to world markets (i.e. remoteness) seems to lead to exports diversification in the long run. This finding is in line with previous findings (e.g. Dutt et al 2013); however, the findings should be interpreted with caution since our empirical analysis is performed at the aggregate level.

Previous findings in the literature show that remoteness is associated with diversification via firms' productivity, that is, only the most productive firms export in remote countries and only the most productive foreign firms can sell in these remote countries (Dutt et al 2013). Also, institutions are associated with exports diversification, and the results are statistically robust. The findings also confirm that trade intensity is conducive to exports diversification whereas trade restrictiveness is found to lead to exports concentration. Other studies that have looked at the impacts of reform processes such as trade openness and other factors yield similar results (e.g. Agosin et al 2012). Access to electricity, used as a proxy for infrastructure, is not statistically significant but has the expected sign. We also test for non-linear impact of GDP on exports diversification in the long run, but the inverted-U hypotheses of the relationship between income and exports diversification cannot be verified.⁶

The evidence established so far has been for the total sample of developing countries. The question arises if the impact of trade on diversification holds for sub-sample of Sub-Saharan African countries. Thus, further estimations were performed, using a dummy variable for SSA, to gauge the extent to which the estimated coefficients differ for such a group compared to the other countries in the sample. Table 5 extends the estimations reported in Table 4, also controlling for the impact of trade and trade policy on SSA. The findings of the augmented models provide support to those in Table 4 concerning structural factors as well as the indicators of trade and trade policy, confirming that trade intensity leads to diversification and that more restrictive trade regimes lead to higher specialization of exports. This echoes theoretical and empirical literature which suggests that trade liberalization is associated with exports diversification (e.g. Cadot et al 2011, Schott 2004, and Xiang 2007 for a related discussion). A direct impact of trade or tariffs on SSA is not statistically confirmed but, the direction of the impact of both trade and trade policy in SSA is the same as in other developing countries on average.

To examine the robustness of the long run results yielded by the cross-country estimates, we account for the endogenous regressors by undertaking dynamic panel estimations using Generalized Methods of Moments (GMM) estimators. It should be noted that the consistency of the GMM estimator depends on the validity of the assumption that the error term is not serially correlated, and on the validity of the instruments. The estimated parameters of the basic model using system GMM are close to those of OLS modelling. The diagnostics statistics reported in Table 6 support the empirical validity of the estimates. Test-statistics and robust standard errors (in parentheses) are asymptotically robust to heteroscedasticity. The test for the second-order serial correlation in the first-differenced residuals, is asymptotically distributed as $N(0,1)$ under the null of no serial correlation. The Sargan statistic is a test of the over-identifying restrictions, distributed as chi-square under the null hypothesis of instrument validity.

⁶ Other explanatory variables were included in the analysis to gauge the impact of macroeconomic conditions, including various measures of exchange rates and volatility, investment, FDI, capital account openness, measured by the Chinn-Ito de Jure controls, but the results are also mixed and statistically inconclusive.

Table 6. GMM results including regional dummy for SSA

The dependent variable is exports diversification (Theil Index): 1970-2010				
	(1)	(2)	(3)	(4)
	With trade	With tariff	With trade	With tariff
L.Theil (IMF)	0.479*** (13.04)	0.504*** (15.15)	0.490*** (13.52)	0.531*** (16.27)
GDP per capita	0.00001*** (4.83)	0.00001*** (4.83)	0.00002 (0.08)	0.00002 (0.77)
Human Capital	-0.00524*** (-8.36)	-0.00463*** (-8.34)	-0.00478*** (-7.48)	-0.00423*** (-7.45)
Remoteness	-0.00008*** (-7.06)	-0.00009*** (-7.65)	-0.00008*** (-7.04)	-0.00009*** (-7.29)
Access to electricity	-0.00104*** (-2.60)	-0.00034 (-0.94)	-0.00095** (-2.39)	-0.00026 (-0.72)
Institutions	-0.01570*** (-6.41)	-0.01840*** (-7.94)	-0.01490*** (-6.16)	-0.01710*** (-7.44)
Trade/ Tariff	-0.00135*** (-4.05)	0.00513*** (4.53)	-0.00121*** (-3.64)	0.00479*** (4.20)
SSA*Trade/ SSA*Tariff	0.00020 (0.52)	-0.00104 (-0.37)	0.00005 (0.12)	-0.00195 (-0.68)
GDP per capita (Square)			1.07e-10* (1.81)	6.13e-11 (1.19)
Constant	3.122*** (13.18)	2.850*** (13.36)	3.065*** (13.01)	2.714*** (12.74)
Observations	435	332	435	332
Arellano-Bond AR(1)	0.029	0.006	0.00	0.005
Arellano-Bond AR(2)	0.536	0.443	0.536	0.464
Sargan	0.000	0.000	0.000	0.000

Notes: t statistics in parentheses: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Regressions reported exclude outliers defined in terms of trade concentration and other structural variables relative to economic size. Countries excluded from the regressions are: Hong Kong, Singapore, Equatorial Guinea, Guyana, Maldives and Lesotho.

In all the reported results, the endogenous regressor, i.e. lagged export diversification index, determine the change in export diversification across time in all specifications. The findings also corroborate those from the OLS estimates and show that, as far as the structural and policy determinants of export specialization are concerned, human capital and institutions lead to exports diversification, and the results are statistically robust. This is in line with the findings in the literature (e.g. Hausmann et al 2007, and Agosin et al 2012), that countries with abundant human capital specialize in differentiated manufactured products. GDP per capita is associated with exports diversification, and the non-linear impact of GDP per capita on exports diversification is also confirmed, when controlling for the impact of trade on SSA (column 3, Table 6). The estimated coefficients for remoteness confirm those for the cross-country estimates in Tables 4 and 5. Access to electricity is also found to lead to exports diversification when controlling for the impact of trade intensity. Also, the impact of trade and trade policy are in line with those for the long run estimates, that is, on average, there is a link between trade intensity and trade policy, and exports diversification across developing countries.

6. Conclusion

Over the past few decades, developing countries have increased their dependence on trade and adopted more liberal trade policies. Yet vulnerable countries such as LDCs and SSA continue to account for an insignificant percentage of global trade and have highly concentrated export structures. Against this backdrop, this paper examines the role of trade and trade policy in exports diversification in developing countries using both parametric and non-parametric techniques.

The non-parametric analyses indicate that countries that are more open to trade tend to have more diversified exports structures than those less open to trade. Furthermore, the results from the panel data estimations suggest that trade intensity and trade liberalization are drivers of exports diversification. On average, trade and trade liberalization seem to be associated with exports diversification, both in the short and in the long run. The empirical analyses also provide evidence that institutions, human capital, GDP per capita, and geography, accompanied by infrastructure, also influence the diversification prospects.

An important message from the empirical findings is that although trade is an engine of growth and development, the realization of its potential benefits is not automatic. In particular, it also depends on the nature of other government policies such as human capital, institutions, infrastructure, and the geographical constraints facing a country.

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Appendix

Table A1. Variables definition and data sources

Variable	Indicator	Source
Trade and trade policy	Trade (% in GDP)	World Development Indicators
	Tariff (weighted)	World Integrated Trade Solutions
Export diversification measures	Manufacturing value added (% of GDP)	World Development Indicators
	Manufacturing exports (% in total exports)	Authors' own calculation
	IMF Theil diversification index	IMF
	UNCTAD export diversification index. The index is computed by measuring the absolute deviation of the trade structure of a country from world structure	UNCTAD
Human Capital	Secondary school enrolment (net, %)	World Development Indicators
Remoteness	Distance to frontier score (0=lowest performance to 100=frontier)	World Development Indicators
Infrastructure	Access to electricity (% of population)	World Bank World Development Indicators
Institutions	Polity2 index. The index takes values between -10 and +10. Higher values indicate higher levels of democracy.	Polity IV database
Exchange rates	Real effective exchange rates (2010=100)	IMF IFS, World Bank World Development Indicators
	Change in exchange rate (%)	Authors' own calculation
	Exchange rate volatility (5-year period)	Authors' own calculation

Table A2. Summary statistics: complete sample

Variables	Obs.	Mean	Median	Standard Deviation	Min	Max
Structural determinants of diversification						
Manufacturing exports (% of Total exports)	3530	14.46	6.87	18.00	0	110.49
Manufacturing (% of GDP)	4625	13.21	12.15	7.41	0.16	45.67
Theil index*	5130	3.967	3.18	1.066	1.53	6.44
School enrolment, secondary (% net)	1531	52.25	55.33	26.56	0.09	99.42
GDP per capita	5484	5291.67	2200.58	9734.53	115.44	115003
Remoteness	6578	8607.22	7606.35	1601.57	6530.65	13202.21
Institutions	4,880	-0.71	-2.00	6.77	-10.00	10
Access to electricity	3863	1535.58	675.62	2584.62	9.72	22762.08
SSA	6624	.3263889	0	.4689268	0	1
Macroeconomic Factors						
Change in exchange rate (%)	2007	0.44	0.16	24.64	-99.99	792.21
Exchange rate volatility (5-year period)	2025	4995.81	6.45	100044.90	0.19	2015376
Standard deviation of REER index (5- periods rolling window)	2007	5296.37	6.27	106642	0.19	2613257
Gross capital formation (% of GDP)	4652	23.63	22.15	12.22	-5.74	219.06
Economic reforms						
Tariff rate	2450	9.89	8.90	7.58	0.00	88.43
Total trade (% of GDP)	5503	81.27	71.36	53.59	0.02	531.74
Exports (% of GDP)	5503	36.35	29.81	27.25	0.01	230.27
Imports (% of GDP)	5503	44.92	38.06	31.17	0	424.82

Table A3. Summary statistics for SSA and other developing countries (excluding SSA)

		SSA			Other developing countries (excl SSA)			
	<i>Observations</i>	Mean (Std. dev.)	Min	Max	<i>N</i>	Mean (Std. dev.)	Min	Max
Structural determinants of diversification								
Manufacturing exports (% of Total exports)	972	6.97 (8.93)	0	48.95	2558	17.31 (19.68)	0	110.49
Manufacturing (% of GDP)	1595	11.19 (6.63)	0.24	45.67	3030	14.28 (7.58)	0.16	40.45
Theil index*	951	0.77 (0.07)	0.50	0.92	2029	0.70 (0.11)	0.37	0.91
School enrolment, secondary (% net)	414	26.399 (20.33)	0.09	89.64	1117	61.83 (21.78)	3.58	99.43
GDP per capita	1923	1811.35 (2876.93)	115.44	25732.7	3561	7171.11 (11463.14)	161.9	115003
Remoteness	2116	7695.54 (510.23)	7023.12	8948.99	4462	9039.58 (1754.16)	6530.6	13202.21
Institutions	2002	-1.61 (6.05)	-10.00	10.00	2878	-0.09 (7.17)	-10.00	10.00
Access to electricity (% of population)	1088	82.84 (25.06)	0.01	100.00	2355	76.09 (31.99)	0.02	100
Macroeconomic factors								
Change in exchange rate (%)	586	-0.19 (25.18)	-87.91	472.17	1421	0.69 (24.42)	-99.99	792.21
Exchange rate volatility (5-year period)	590	39.15 (140.46)	0.62	1241.93	1435	7033.73 (118797.20)	0.19	2015376
Standard deviation of REER index (5-periods rolling window)	586	40.24 (148.65)	0.29	1484.04	1421	7463.91 (126686.90)	0.19	2613257
Economic reforms								
Tariff rate	760	10.81 (5.43)	0.50	39.16	1690	9.48 (8.34)	0	88.43
Total trade (% of GDP)	1882	74.57 (47.68)	6.32	531.74	3621	84.75 (56.11)	0.02	455.28
Exports (% of GDP)	1882	30.19 (20.15)	2.52	124.39	3621	39.54 (29.80)	0.01	230.27
Imports (% of GDP)	1882	44.38 (33.88)	2.98	424.82	3621	45.21 (29.67)	0	227.35

Table A4. Sample of countries (n=144)

Afghanistan*	Dominica	Lesotho*	St. Vincent and the Grenadines
Algeria	Dominican Republic	Liberia*	Saudi Arabia
Angola*	Ecuador	Libya	Samoa
Antigua and Barbuda	Egypt, Arab Rep.	Macao SAR, China	Senegal*
Argentina	El Salvador	Madagascar*	Seychelles
Armenia	Equatorial Guinea*	Macedonia	Sierra Leone*
Aruba	Eritrea*	Malawi*	Singapore
Azerbaijan	Ethiopia*	Malaysia	Solomon Islands*
Bahamas	Faroe Islands	Maldives	Somalia*
Bahrain	Fiji	Mali*	South Africa
Bangladesh*	French Polynesia	Mauritania*	South Sudan*
Barbados	Gabon	Mauritius	Sri Lanka
Belize	Gambia	Mexico	Sudan*
Benin*	Ghana	Mongolia	Suriname
Bhutan*	Grenada	Moldova	Swaziland
Bolivia	Guatemala	Morocco	Syria
Botswana	Guinea*	Mozambique*	Tajikistan
Brazil	Guinea-Bissau*	Myanmar*	Tanzania*
Brunei Darussalam	Guyana	Namibia	Thailand
Burkina Faso*	Haiti*	Nepal*	Timor-Leste*
Burundi*	Honduras	New Caledonia	Togo*
Cabo Verde	Hong Kong	Nicaragua	Tonga
Cambodia*	India	Niger*	Trinidad and Tobago
Cameroon	Indonesia	Nigeria	Tunisia
Central African Republic*	Iran	Oman	Turkey
Chad*	Iraq	Pakistan	Turkmenistan
Chile	Jamaica	Palau	Uganda*
China	Jordan	Panama	United Arab Emirates
Colombia	Kazakhstan	Papua New Guinea	Uruguay
Comoros*	Kenya	Paraguay	Uzbekistan
Congo, Rep.	Kiribati*	Peru	Vanuatu*
Congo, Dem. Rep.*	Korea, Rep.	Philippines	Venezuela
Costa Rica	Kuwait	Qatar	Vietnam
Cote d'Ivoire	Kyrgyzstan	Rwanda*	Yemen
Cuba	Lao PDR	St. Kitts and Nevis	Zambia*
Djibouti*	Lebanon	St. Lucia	Zimbabwe

Note: * denotes Least Developed Countries (LDC).