Trade and Growth Relationship: Continent Matters

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Abstract

In this paper, we discuss the impact of openness to international trade on economic performance. The most important problem facing economists and researchers on this subject is that trade share may be endogenous. As a consequence, examining the positive correlation between trade and income cannot identify the direction of causation between the two: countries that adopt freer trade policy will experience accelerating growth, or rich countries are traditionally more open to trade ?. Both the two directions seem to be possible. Following previous work, we treat trade share as endogenous and therefore use geography characteristics as an instrument for trade. To improve the quality of the instrument, we use a richer data set and capture countries' s continental identification. By studying a panel of 130 countries for the year 1975, 1980, 1985, 1990, 1995, 2000, 2005 and 2010, we find that trade promotes growth differently in different parts of the world. Not surprisingly, the long-run effects of trade on income and income growth are statistically positive for countries in Europe, America, Asia and Oceania. The only exception is Africa, our estimates indicate that the effect of trade on economic performance is insignificant for this continent.

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1 Introduction

The controversy over the impact of globalization on country's prosperity, in fact, has been never ended. Certainly, globalization is a complicated process of the expansion of world trade, capital flows, immigration, communication and multinational business activity. In the context of this paper, we focus on the long-run effects of openness to international trade on income and income growth. Finding the answer to the question: "Does international trade open the gate of prosperity for all parts of the world ?", that is the aim of this work.

Empirical works usually conclude that trade and growth are positively correlated but the direction of causation is always unclear. Traditionally, countries whose reach a higher income and open to international markets, have adopted other policies that raise income, too. In their paper, Frankel and Romer (1999) construct an innovative instrument for trade, that based on countries' geographic characteristics to resolve the problem of endogeneity. Using this instrument, they showed with data for the year 1985 that bilateral trade across countries and GDP per capita were positively correlated. Irwin and Tervio (2002) confirm those results for the period 1913-1990 and include zero-trade data. Even if Rodriguez and Rodrik (2001) questioned the methodology of Frankel and Romer, the debate has not been settled and most of papers enhance the model of Frankel and Romer (1999). Alcala and Ciccione (2002), Dollar and Kraay (2002) and Brucker and Lederman (2012), among others, found a positive relationship between trade and growth. Noguer and Siscart (2005) show that geographical controls must enter into the income equation to avoid bias. Likewise, including geographical control lowers the impact of international trade on growth but the effect is still significantly positive.

This paper re-examines the relationship between trade and income, also trade and income growth. We suppose that each continent has some specific characteristics that affect on trade and income relationship. Continental specific characteristics can enter in the global trade body in two ways. First, we suppose that numerous Regional Trade Agreements (RTAs) have different effects on the current situation of internal trade flows in different continent of the world. More precisely, we suggest that if two nations are located in the same continent, the degree of intra-regional trade among countries in this continent may increase or decrease the total amount of bilateral trade between them. Second, geography can play a determinant rule in the trade and income relationship. That is, in different continents, trade has different impacts on

income and income growth.

In summary, in this paper we estimate the impact of openness to trade on income and income growth. Facing the problem of endogeneity in the model, we therefore construct an instrument for trade share that based on countries' geography characteristics. Our approach is novel for two points : first, when construct an instrument for trade, we add dummies to identify the location of two countries in the gravity equation, which is related to our first proposition; second, trade share is conditioned by continent in the income and income growth equations, which is related to our second proposition.

Section 2 presents how we construct our instrument for trade using Frankel and Romer' method, also our strategy to estimate the effects of trade on income and income growth. With the hope of providing a global view of impact of international trade on prosperity in all parts of the world for the last 4 decades, our data set covers among 130 countries [1], in the year 1975, 1980, 1985, 1990, 1995, 2000, 2005 and 2010. We report the quality of the instrument and the estimates of trade's impact on income and growth in section 3. We have two principal results. First, by adding continental location dummies, we obtain an instrument with greater precision. Second, we prove that trade has a significant and positive effect on economic performance in Asia, America, Europe and Oceania. By contrast, we suggest that international trade has no effect on income and economic growth for African countries. Finally, the section finishes with 3 robustness checks. Section 4 concludes this paper with some suggestions for future researches.

2 Trade versus Growth: Methodology

As discussed in the introduction, the two mains content of this paper are firstly constructing an instrument for trade share, and secondly re-estimating the impact of international trade on income and income growth. The key assumption in our study is that we outline the effects of country's continental location both in the construction of the instrument, and in the income and growth equations.

[1] 43 from Africa, 25 from Europe, 29 from America, 28 from Asia and only 5 from Oceania

2.1 Constructing the Instrument: How Continent Matters ?

We begin by constructing our data set of instrument for country's trade share. More precisely, we construct 2 instruments for trade share. The data set covers 130 countries, from 5 continents [2], at t=1975, 1980, 1985, 1990, 1995, 2000, 2005, 2010. The measures of both the two are based on countries' geographic characteristics. The construction of our instruments is based on the original work of Frankel and Romer. They use gravity equation to link bilateral trade between two countries and their geographies. Frankel and Romer' version of bilateral equation can be written as:

$$ln(\tau_{ij}/GDP_i) = \alpha_0 + \alpha_1 lnD_{ij} + \alpha_2 lnN_i + \alpha_3 lnA_i + \alpha_4 lnN_j + \alpha_5 lnA_j + \alpha_6(L_i + L_j) + \alpha_7 B_{ij} + \alpha_8 B_{ij} lnD_{ij} + \alpha_9 B_{ij} lnN_i + \alpha_{10} B_{ij} lnA_i + \alpha_{11} B_{ij} lnN_j + \alpha_{12} B_{ij} lnA_j + \alpha_{13} B_{ij}(L_i + L_j)\epsilon_{ij}, \quad (1)$$

Where N is population, A is area, L is a dummy for landlocked countries, B is a dummy for a common border between two countries. Variables from α_8 to α_{13} represent geographical interactions between two countries whether they share a common border. This version of gravity equation can provide more information about bilateral trade and ensure that only countries' geographic characteristics are used to construct an instrument for country's trade.

After regressing bilateral trade share between 63 countries in 1985 on its geographic characteristics, they use this set of estimated coefficients and obtain the fitted bilateral trade values $\widehat{\tau_{ij}}$. The aggregation of all fitted bilateral trade between country i and other countries finally give the predicted value of trade share $\widehat{T_i}$. These authors compute $\widehat{T_i}$ for 150 countries in 1985.

To begin with, we construct the first instrument for trade using the same method as Frankel and Romer. Bilateral trade data comes from IFS Trade Statistics, covering bilateral trade flows for 130 countries with the rest of the world, with a total of 9226 observations in 1985 and 15126 in 2010.

Next, we construct the second instrument for trade by adding two types of dummies in the gravity equation. In our empirical works, we suggest that continental specifics have been a key rule of the trade and growth relationship. As presented in the introduction, continental specific can be reflected in its level of internal trade flows. Given the objective of capturing of trade' s specific characteristics in 5 continents, especially

[2] Asia, America, Africa, Europe, Oceania

its level of intra-region trade, we then therefore introduce 2 types of dummies on bilateral trade equation (1): (i) To capture the geography location of country i, we add dummies to identify whether i locates in Asia, Africa, America, Europe or Oceania (that we denote $Asia_i$, $Europe_i$, $Africa_i$, $Oceania_i$ in the equation, America is the reference continent),(ii) To capture the internal flows of good within continent, we add dummies to identify if country i and j locate in the same continent. (that we denote $DAsia_{ij}$, $DEurope_{ij}$, $DAfrica_{ij}$, $DOceania_{ij}$, $DAmerica_{ij}$)
Where $Asia_i$ is equal to 1 if country i is located in Asia, 0 if not. Variables $Europe_i$, $Africa_i$, $Oceania_i$ are based on the same logic. $DAsia_{ij}$ is equal to 1 if both country i and country j are Asian countries. We apply the same logic to $DEurope_{ij}$, $DAfrica_{ij}$, $DOceania_{ij}$ and $DAmerica_{ij}$.
We then use the constructed instrument $\widehat{T_{i1}}$ and $\widehat{T_{i2}}$ to investigate the relationship between trade and income, also between trade and income growth.

2.2 Trade in the Income and Growth Equations: How Continent Matters ?

First, we begin this perspective with the basic specification of Frankel and Romer in their paper (1999). Considering a cross-sectional regression of income per person on the ratio of exports or imports to GDP

$$ln(Y_i/N_i) = \beta_0 + \beta_1 \times Trade_i + \beta_2 \times ln(N_i) + \beta_3 \times ln(A_i) + u_i, \qquad (2)$$

Where Y_i is income per person in country i, T_i is the trade share, and N_i and A_i are its population and area. Cross-sectional regression with data from 1985 shows a statistically significant relationship between trade share and income. The key identifying assumption in their analysis is that country' size much be controlled for on the measurement of international trade' effect on income. According to previous work, we capture the idea that country's size much be controlled for while estimating the impact of international trade on country's standard of living. However, according to Alesina and al. (2004), we choose only log of population to controlling for country's size in the income equation.
Second, to estimate trade's impact on income, we consider a panel regression of income per person on the ratio of trade share to GDP conditioned by continent. We suggest that the effect of openness to trade may be a result of which part of world

that country i is located. Or, in another term, trade has a different impact on both living's standard. We use panel data of 130 countries, for the years 1975, 1980, 1985, 1990, 1995, 2000, 2005 and 2010. Our developed version of equation (2) can be written as:

$$\begin{aligned} ln(Y_{it}/N_{it}) =& \beta_0 + \beta_1 Trade_{it} \times America_i + \beta_2 Trade_{it} \times Asia_i + \beta_3 Trade_{it} \times Africa_i \\ &+ \beta_4 Trade_{it} \times Europe_i + \beta_5 Trade_{it} \times Oceania_i + \beta_6 lnPopulation_{it} + \sigma_{it}, \end{aligned} \tag{3}$$

Finally, we discuss the effects of the level of openness to international trade on growth rate and then examine how international trade evolves in response to economic factors. As we propose there, the key identifying assumption is the same as income equation. We distinguish the trade' s effects on growth rate by continent. We then focus on growth equation of the form:

$$\begin{aligned} ln\frac{y_{i,t}}{y_{i,t-5}} =& \gamma_0 + \gamma_1 Trade_{i,t-5} \times America_i + \gamma_2 Trade_{i,t-5} \times Asia_i + \gamma_3 Trade_{i,t-5} \times Africa_i \\ &+ \gamma_4 Trade_{i,t-5} \times Europe_i + \gamma_5 Trade_{i,t-5} \times Oceania_i + \gamma_6 lnPopulation_{i,t-5} \\ &+ \gamma_7 lny_{i,t-5} + \gamma_8 Government_{i,t-5} + \gamma_9 Investment_{i,t-5} + \omega_{i,t-5}, \end{aligned} \tag{4}$$

Where $y_{i,t}$ is per capita income of country i at time t (t = 1980, 1985, 1990, 1995, 2000, 2005, 2010), $Government_{i,t-5}$ and $Investment_{i,t-5}$ are respectively government consumption and investment rate of country i at time *t-5* (both in percentage share of GDP).

3 Results

As discussed in section 2, we construct two types of instrument $\widehat{T_{i1}}$ and $\widehat{T_{i2}}$ for trade share T_i. After obtaining the instruments, we examine the long-term effects of openness to international trade on income and income growth. Our panel data consists of 8 years : 1975, 1980, 1985, 1990, 1995, 2000, 2005, 2010 and up to 130 countries in 5 continents as Asia, Europe, America (Both Nord and Sud), Africa and Oceania[3].

[3]Sources and detailed descriptions of all the variables can be found in Appendix A

3.1 Quality of the Instrument

Column (1) and (2) of table 1 show the results by performing Frankel and Romer' version of bilateral trade equation in 1985 and 2010. Our results are similar with the general findings in gravity literature [4] and empirical works in other papers [5]. We also observe the change of sign of the estimated elasticity of trade with respect to i 's population. In fact, our estimates indicate that bilateral trade between country i and country j is decreasing in i's population in 1985, but increasing in i's population in 2010

Column (3) and (4) report the estimates of gravity equation by adding continental dummies of country i and j. As presented in section 2.1, the difference between Frankel and Romer' version of gravity model and our version is a simple identification where "host" country i comes from and whether i and j situate in the same continent. These simple modifications reflect the impact of numerous Referential Free Trade Agreements (RPTAs) in different regions on the overall trade patterns.

Not surprisingly, the identification of whether two countries i and j come from the same continent are statistically significant, especially in the later years (through all remain significant at the 0.1% and 1% level). The estimated coefficients of DAsia, DEurope, DAmerica and DOceania are positive. By contrast, negative coefficient recorded for African countries shows again the unfavorable situation of intra-regional trade among African countries . More precisely, bilateral trade raises for 1.3 point in 1985, and 2.3 point in 2010 if two countries i and j are European countries. If two countries come from the Americas, the ratio of bilateral trade to GDP decreases by a factor of 0.3 in 1985 and increases by a factor of 1.1 in 2010. Bilateral trade to GDP ratio between 2 Asian countries falls by a factor of 0.2 point in 1985 and increases by a factor of 0.3 point 15 years later. However, the estimates also imply that if two countries come from Africa, bilateral trade decreases by a factor of 2.0 in 1985 and 1.5 in 2010.

The most important result is, our continental dummies in gravity equation can raise the performance of the instrument for trade by providing more information about geography's component of country's trade.

[4] Gravity model of bilateral trade shows that trade between two countries i and j is negatively related to the distance between them and positive related to i's size and j's size

[5] for example, Frankel and Romer (1999), Noguer and Siscart (2005)

Table 1: Gravity Model Estimates

Model	No continental dummies added		Continental dummies added	
Year	1985	2010	1985	2010
Intercept	-6.38***	-12.966***	-9.669***	-15.531***
	(0.42)	(0.356)	(0.531)	(0.426)
Ln Distance	-0.85***	-1.387***	-0.979***	-1.175***
	(0.04)	(0.029)	(0.045)	(0.038)
Ln Population i	-0.24***	0.064***	-0.127***	0.109***
	(0.03)	(0.017)	(0.024)	(0.019)
Ln Area i	-0.12***	-0.067***	-0.080***	-0.090***
	(0.02)	(0.013)	(0.018)	(0.014)
Ln Population j	0.61***	1.152***	0.870***	1.126***
	(0.03)	(0.017)	(0.020)	(0.017)
Ln Area j	-0.19***	-0.208***	-0.139***	-0.177***
	(0.02)	(0.013)	(0.016)	(0.013)
Landlocked	-0.36***	-1.327***	-0.597***	-1.240***
	(0.08)	(0.044)	(0.060)	(0.044)
Borders	5.10***	8.313***	5.519***	11.007***
	(1.78)	(1.986)	(2.039)	(1.934)
Borders*Ln Distance	0.15	0.937***	0.372	0.588*
	(0.30)	(0.234)	(0.247)	(0.229)
Borders*Ln Population i	-0.29	-0.226 .	-0.307*	-0.413**
	(0.18)	(0.133)	(0.138)	(0.130)
Borders*Ln Area i	-0.06	-0.238 .	0.082	-0.026
	(0.15)	(0.128)	(0.138)	(0.124)
Borders*Ln Population j	-0.14	-0.333*	-0.401**	-0.488***
	(0.18)	(0.135)	(0.139)	(0.131)
Borders*Ln Area j	-0.07	-0.183	0.259 .	0.041
	(0.15)	(0.141)	(0.156)	(0.137)
Borders*Landlocked	0.33	1.012***	0.283	1.292***
	(0.33)	(0.224)	(0.240)	(0.218)
Asia			-0.001	0.265***
			(0.100)	(0.074)
Europe			-0.241*	0.127.
			(0.094)	(0.073)
Africa			0.857***	0.886***
			(0.094)	(0.070)
Oceania			0.345*	0.969***
			(0.151)	(0.122)
DAsia			-0.204	0.319**
			(0.132)	(0.100)
DEurope			1.301***	2.212***
			(0.142)	(0.125)
DAfrica			-2.073***	-1.567***
			(0.129)	(0.090)
DAmerica			-0.288 .	1.135***
			(0.135)	(0.112)
DOceania			2.697***	3.659***
			(0.428)	(0.422)
Obs.	3220	15176	9226	15176
R^2	0.36	0.394	0.353	0.431
SE	1.64	2.551	2.453	2.474

Table 2 reports the correlation between T and $\widehat{T_1}$, also between T and $\widehat{T_2}$ in 8 years of interest. The correlation between T and $\widehat{T_1}$ pre-1990s are higher than the correlation between T and $\widehat{T_1}$. However, in the later period, this value has lowered and not overtake 40 %. Likewise, among 254 preferential trade agreements since 1948, nearly half occurring after 1995 [6], this statistic reinforces the idea that our instrument must be better in the post-1990s period.

Table 2: Correlation Between Real and Estimated Trade Share

Year	1975	1980	1985	1990	1995	2000	2005	2010
$\widehat{T_1}$	**0.533**	**0.589**	**0.622**	**0.473**	**0.340**	**0.348**	**0.370**	**0.395**
$\widehat{T_2}$	**0.531**	**0.471**	**0.451**	**0.501**	**0.408**	**0.459**	**0.394**	**0.411**

3.2 Income Equation

Our panel IV estimator relies on a two stage least squares (2SLS) procedure. Table 3 presents parameter estimates of our basic specification outlined in section 2.2. Column (1) shows an OLS regression of log income per person on a constant, the log of population (country's size) and the trade share conditioned by continent on which country is located. Column (2) and (3) report respectively the 2SLS estimates of the same equation using $\widehat{T_{i1}}$ and $\widehat{T_{i2}}$ as the instruments for trade share T_i. As showed by OLS estimates, an increase in the trade share of one percentage point is associated with an increase of 0.8 percent in income per capita in America, 0.6 percent in Asia and 1.6 percent in Europe, statistically significant at 0.1 % level. In Africa, this coefficient is surprisingly negative.

As indicated in column (2), OLS estimates underestimate rather than overestimate the effects of trade on income. As we supposed in the paper, we treat trade share as endogenous, we then focus on 2SLS estimates. 2SLS(1) estimates show that a 1 % increase in the trade share of GDP leads to about a 2.8% increase in income per capita for European countries, 2.3 % for American countries and 1.6 % for Asian countries.

Our regression in column (3) shows a statistically and economically significant rela-

[6]Statistics of The General Agreements on Tariffs and Trade (GATT) and the World Trade Organization (WTO)

tionship between trade share and standard of living in 4 continents. Europe, America and Asia consecutively rank first, second and third continent that benefit from the freeing of trade. Our result indicates that impacts of trade on income are different by continent. More precisely, we suggest that Europe benefit most from international trade. A 1 % increase in the trade share of GDP leads to about a 2.2% increase in income per capita for European countries, 1.7 % for American countries and 1.1 % for Asian countries. The point estimates also imply that increasing population by one percent raises income per person by 0.15 percent in 2SLS(1) estimates, and by 0.1 percent in 2SLS(2) estimates. The most important results of 2SLS estimates is that, international trade has no effect on income for African countries.

Table 3: Trade versus Country's Standard of Living

Estimation	OLS	2SLS(1)	2SLS(2)
(Intercept)	8.123^{***}	4.926^{***}	6.245^{***}
	(0.347)	(0.886)	(0.627)
Trade share*America	0.828^{***}	2.388^{***}	1.733^{***}
	(0.131)	(0.407)	(0.287)
Trade share*Asia	0.562^{***}	1.606^{***}	1.191^{***}
	(0.077)	(0.278)	(0.176)
Trade share*Europe	1.635^{***}	2.801^{***}	2.294^{***}
	(0.104)	(0.280)	(0.193)
Trade share*Africa	-1.187^{***}	0.112	-0.454
	(0.126)	(0.421)	(0.296)
Trade share*Oceania	0.108	1.592^{***}	1.082^{**}
	(0.217)	(0.438)	(0.336)
Ln Population	0.002	0.156^{***}	0.093^{**}
	(0.021)	(0.045)	(0.033)
R^2	0.413	0.269	0.363
Adj. R^2	0.410	0.265	0.359
Num. obs.	1040	1040	1040

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

3.3 Growth Equation

Table 4 presents the OLS and IV estimates of regressions of growth on a constant, openness conditioned by continent, log of population and additional controls. As showed in column (1), OLS estimates indicate again a positive relationship between trade and growth only in 3 continents: America, Asia and Europe. More precisely, an increase in the trade share of one percentage point is associated with an increase of 0.06 percent in income per capita in America, 0.05 percent in Asia and 0.08 percent in Europe, statistically significant at 5 % level. 2SLS estimates increase the impact of trade share on growth. Both the 2SLS(1) and 2SLS(2) estimates indicate that after controlling for other variables, the Americas is the continent that benefit most from trade in terms of income growth. A increase of one percentage of trade share can accelerates growth rate in America at 0.22 percent. This value obtained for European countries is 0.19 percent. Asian countries are behind with 0.17 percent.

As compared to 2SLS(1) estimates, 2SLS(2) estimates lower the effects of openness to trade on economic growth. The important result of 2SLS(2) is, the coefficient that reflects trade's impact of growth in Africa becomes insignificant.

In these empirical works, Alesina et al. (2003) examined the trade versus economic growth relationship using different instruments for trade, different samples and different estimated methods (SUR and 3SLS). Using Frankel and Romer' instrument in a panel of 78 countries over the period 1960-2010 (average of 10 years), these 3SLS estimates show that an increase of 1 percent in real trade share on GDP ratio raise growth rate for 1.63 percent, that is similar with our results. Moreover, our results are also consistent with the situation of trading goods in this continent. In fact, Africa's share in world exports fell from about 6 per cent in 1980 to 2 per cent in 2002; its share of world imports from about 4.6 per cent in 1980 to 2.1 per cent in 2002. In recent years, the continent of Africa account for only less than 3 % of world trade, a very small number given Africa's area and population.

Table 4: Opennes versus Growth

	OLS	2SLS(1)	2SLS(2)
(Intercept)	−0.013	−0.215	−0.087
	(0.073)	(0.128)	(0.105)
Trade share*America	0.063**	0.229***	0.148**
	(0.023)	(0.066)	(0.050)
Trade share*Asia	0.049***	0.173***	0.115***
	(0.014)	(0.048)	(0.032)
Trade share*Europe	0.086***	0.194***	0.120***
	(0.019)	(0.048)	(0.034)
Trade share*Africa	0.019	0.154*	0.065
	(0.024)	(0.071)	(0.053)
Trade share*Oceania	0.064	0.213**	0.145**
	(0.038)	(0.067)	(0.055)
Ln Initial GDP per capita	−0.018**	−0.019**	−0.020**
	(0.006)	(0.007)	(0.007)
Ln Population	0.013**	0.029***	0.020**
	(0.004)	(0.008)	(0.006)
Government	−0.176*	−0.143	−0.182*
	(0.080)	(0.086)	(0.082)
Investment	0.471***	0.331***	0.391***
	(0.059)	(0.081)	(0.068)
R^2	0.128	0.036	0.101
Adj. R^2	0.119	0.027	0.092
Num. obs.	910	910	910

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

3.3.1 Robustness Checks

To verify the robustness of our results, we estimate our equations with some modifications. Robustness tests are showed in Appendix B

First, we examine equation (3) and replace log GDP per capita by log GDP per worker as dependent variable. If the estimated elasticity of income per worker with respect to trade becomes significant for African countries, that is our framework is affected by the labor force participation rate in this continent. The results are showed in Table (7) in Annex B. The impacts of trade on income per worker are significantly positive in America, Asia, Europe and Oceania (at the 0.1 percent and 1 percent).

However, trade share has no effect on African economic growth.
Second, we examine equation (4) in two sub-panel data : the first contains data in 1975, 1980, 1985, 1990 and the second one consists data in 1995, 2000, 2005 and 2010. Table (8) in Annex shows that the effects of trade on income in 5 continents haven't changed much before and after the year of 1990
Finally, we check the possibility that systematic differences of income among 5 continents are providing our results. That is, difference measures of trade's effects on income and income growth among parts of the world are simply a results of its difference level of standard of living. Because Africa is the poorest continent, than African countries benefit less from trade.
To check this hypothesis, countries are divided into quin-tiles according to their gross income. Each quin-tile represents 20 %, or one fifth, of 130 countries in our panel. The equation is similar to equation (4, trade share are conditioned by the quin-tile of income distribution that country comes from. Trade has a statistically significant and positive effects on income growth for all 5groups of countries. This result allows us to think that geography location really enters in the trade-growth relationship, and if trade has no effect on growth, it's not the problem of income's level. As argued by Arvind (2003): "In low-income countries, openness to international trade is indispensable for rapid economic growth".

4 Conclusion

This paper has argued that geography location can plays a key rule in the trade versus income relationship. In our empirical works, we propose : (i) first, the continental location of two countries in a bilateral trade equation can provide more information about countries' geography and then give better estimated instrument for trade share (ii) second, regions in the world have numerous difference between them as technology used, costs of off-shoring, proximity for another so a region should benefit more or less from openness to trade than others. We based on these two propositions and estimates the trade's impact on income and economics growth rate of 130 countries. First, the fact to accounting for country' s location gives better estimates of gravity equation. This result allows us to construct an instrument for trade share, that based on countries' geography characteristics, with more precision. Economically, this result also shows that PFTAs have different effects on different regions. Especially, within-regional trade among African countries compares unfavorably with other regions.
Second, we find that trade has different impact on both income and income growth in different parts of the world. We based on the assumption that trade share should be conditioned by continent on the measurement of trade' effects on income and growth rate. As mentioned in the title of our paper : "Continent matters". 2SLS estimates confirm a positive impact of trade on income and income growth for 4 continents as America, Asia, Europe and Oceania. The most important message in this paper is that freer trade has not been an engine of growth in Africa.
Some recent statistics reports propose that African countries should increase the level of internal trade flows within this continent to secure future growth. We suggest that future researches can focus on the relationship between trade and economic growth in Africa. The final question is: African countries should be more open to developing and developed markets, or focus on trading goods within Africa ?.

Appendix A. Data sources and descriptions

First, we have data on bilateral trade equation. Bilateral trade data are from the IFS Direction of Trade statistics (current price), data of Gross Domestic Product are from release 7.1 of the Penn World Table (Alan Heston, Robert Summers and Bettina Aten, current price) . Distance is measured as the great-circle distance between

countries' principal cities. Population is also from Penn World Table 7.1, constructed from real GDP per capita (RGDPCH), real GDP per worker (RGDPW) and total Population (POP). Finally, we observe and add other geography dummies as Landlocked, Common Border.

Table 5: Descriptive Statistics of Gravity Equation, 130 countries

Variables	Number of observations	Mean	SD	Min	Max
Bilateral Trade (% GDP)	81679	0.004	0.044	E-6	6.979
Population (Millions)	81679	2,25E+01	82.249	0.029	7,95E+02
Distance (Miles)	81679	4598.00	2776.643	13.13	12340.00
Area (Thousand of square miles)	81706	392.600	7406.586	0.11	3,60E+03
Common Border (Dimensionless)	81679	0.028	0.167	0	1
Landlocked (Dimensionless)	81679	0.233	0.452	0	2

Second, we have data on income equation. Openness to trade is the ratio of imports plus exports in exchange rate $U.S to GDP in PPP $U.S. constant 2005 and comes from the Penn World Table 7.1. Data on GDP per capita and GDP per worker are also from Penn World Table 7.1

Table 6: Descriptive Statistics for Trade and Income equation

Variables	Number of observations	Mean	SD	Min	Max
Openness (% GDP)	1170	0.695	0.492	0.028	4.217
GDP per capita ($ 10 K)	1170	9.457	11.761	0.160	87.090
GDP per worker ($ 10 K)	1170	21.680	24.744	0.482	243.400
Population (thousand person)	1170	16340.0	63807.42	32.5	794900.0

Finally, in the growth equation, data on Investment share and Government consumption share are also from Penn World Table release 7.1 (PPP at 2005 constant price).

Appendix B. Robustness checks and other tests

Table 7: Trade versus Country's Standard of Living, 1975-2010

	OLS	2SLS(1)	2SLS(2)
Intercept	9.445^{***}	6.395^{***}	7.552^{***}
	(0.369)	(0.936)	(0.663)
T*America	0.770^{***}	2.174^{***}	1.626^{***}
	(0.130)	(0.405)	(0.286)
T*Asia	0.545^{***}	1.461^{***}	1.127^{***}
	(0.076)	(0.276)	(0.175)
T*Europe	1.456^{***}	2.519^{***}	2.082^{***}
	(0.104)	(0.284)	(0.195)
T*Africa	-1.152^{***}	-0.039	-0.455
	(0.125)	(0.415)	(0.291)
T*Oceania	0.034	1.361^{**}	0.942^{**}
	(0.215)	(0.434)	(0.333)
Ln Population	-0.022	0.120^{**}	0.066^{*}
	(0.021)	(0.045)	(0.033)
R^2	0.387	0.267	0.341
Adj. R^2	0.384	0.263	0.337
Num. obs.	1040	1040	1040

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

Table 8: Trade versus Living' s Standards in two sub-periods

Years	1975, 1980, 1985, 1990			1995, 2000, 2005, 2010		
	OLS	2SLS(1)	2SLS(2)	OLS	2SLS(1)	2SLS(2)
(Intercept)	8.58^{***}	3.53	5.08^{**}	8.27^{***}	3.92^{*}	5.87^{***}
	(0.52)	(2.70)	(1.81)	(0.52)	(1.67)	(1.05)
T*America	0.63^{**}	3.04^{*}	2.32^{**}	0.84^{***}	2.79^{***}	1.89^{***}
	(0.21)	(1.23)	(0.83)	(0.18)	(0.73)	(0.45)
T*Asia	0.37^{**}	1.83^{*}	1.37^{*}	0.60^{***}	1.93^{***}	1.37^{***}
	(0.14)	(0.80)	(0.54)	(0.10)	(0.47)	(0.27)
T*Europe	1.49^{***}	3.47^{***}	2.89^{***}	1.63^{***}	3.02^{***}	2.36^{***}
	(0.18)	(0.92)	(0.59)	(0.14)	(0.49)	(0.29)
T*Africa	-1.43^{***}	0.53	-0.12	-1.13^{***}	0.71	-0.12
	(0.19)	(1.23)	(0.81)	(0.18)	(0.77)	(0.47)
T*Oceania	-0.23	1.96	1.33	0.25	2.16^{**}	1.42^{**}
	(0.32)	(1.19)	(0.83)	(0.30)	(0.75)	(0.51)
Ln Population	-0.02	0.24	0.16	0.00	0.19^{*}	0.11^{*}
	(0.03)	(0.14)	(0.10)	(0.03)	(0.08)	(0.05)
R^2	0.35	0.10	0.23	0.46	0.22	0.38
Adj. R^2	0.34	0.09	0.22	0.45	0.21	0.38
Num. obs.	520	520	520	520	520	520

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

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