THE IMPACT OF TRADE LIBERALIZATION ON PER CAPITA INCOME: EVIDENCE FROM SUB SAHARAN AFRICA

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Abstract
Trade liberalization in Sub-Saharan Africa has been implemented in the context of Structural Adjustment Program since late 1980. However, the empirical evidence on per-capita income and growth is mixed. This paper uses dynamic panel data and three indicators of trade liberalization to examine the relationship between trade liberalization and real per-capita income for Sub-Saharan African countries. The study finds that trade share has positive impact on per-capita income while tariff rates are negatively associated with per-capita income. Even if these openness indicators maintained the expected sign, they have insignificant effect on per-capita income. However, the liberalization dummy variable has positive and significant effect on per-capita income and the result is consistent and robust to changes in specifications and sample sizes.

1.INTRODUCTION
The history of trade goes back at least to Adam Smith in his wealth of nations. His great achievement was to initiate and take the lead in advocacy of free trade, free markets and laissez faire. Trade restriction and product regulations were all viewed as detrimental to a nation’s economic health. Similarly, traditional trade theory forwarded the idea that countries can specialize in their comparative advantage. On the other hand, the new trade theory recently emphasis on intra-industry trade. However, protectionist theories become dominant and for decades, import substitution industrialization strategies had their origin in the thinking of Raul Prebisch in 1950. Until late 1980s, the protectionist influence was continued. Since 1986, tariff on goods have fallen from a world average of 26% to just 8.8% in 2007 with the decline specially marked for developing countries from a much higher initial level. Trade as a share of world GDP has also increased from 25% in 1960 to 46% in 1999. In particular, the period since 1990, has been a decade of trade policy reform and the General Agreement on Tariff and Trade (GATT) was signed by 65 additional countries between 1990 and 2005 (Rodriguez, 2007). According to Wacziarg and Welch’s (2008), 49 countries liberalized their economy between 1990 and 2001. For several decades, Sub-Saharan countries pursued import substitution strategy and implemented series of trade restrictiveness policies that include high level of tariff, non –tariff barriers, and exchange rate controls along with established state owned enterprises. For instance, Ghana gained independency in 1957 and highly overvalued its currency in 1966. Yet, the country eventually implemented trade and capital market reform through the late 1980’s and 1990’s. Uganda also gained its independence in 1962 and resumed trade liberalization measures in 1988. Both countries showed positive post liberalization growth changes (Wacziarg and Welch, 2008). In general, Sub -Saharan African countries have implemented structural adjustment program during the 1980s and then took a series of economic reform including trade liberalization with the aim of enhancing economic growth. The channels through which openness enhances growth are well established in the theoretical literatures. For instance, trade can have simulative effect on knowledge spillovers and investment in innovation (Grossman and Helpman, 1991); productivity improvement due to intra industry trade (Melitz, 2003); improvements in the quality of macroeconomic policy (Wacziarg, 2008); efficiency gains from exploiting comparative advantage; increase product variety (Krugman, 1979); reduced costs from economic of scale and better resource reallocations through market competition (Dollar and Kraay, 2003). However the empirical relationship between trade and per capita income at the cross-national level has been a topic of research for several decades. Some studies showed
positive association between trade and per capita income while others do not. For example Sachs and Warner (1997) argued that trade openness increased the speed of convergence while the evidence from the study of Baliamoune (2002) suggested that increased openness to trade has led to income divergence rather than convergence in African countries. Using panel data framework, Greenaway (2002) found that liberalization appeared to impact up on growth in developing countries. However, Dollar and Kraay (2003) used instrumental variable regression and found that cross country variation in institution and trade were not significant on long run growth. Sachs and Warner (1997) undertook cross sectional studies from African countries and they found that natural factors such as limited access to the sea and tropical climate explained the slow growth of African. Africa’s lack of openness to international market also played important role in the slow growth. This paper contributes to this lively debate on the linkage between trade liberalization and per capita income in Sub-Saharan African countries using several measures of liberalization rather than confined to a single measure. The study uses innovative and appropriate econometric techniques to take care of the persistent problem of endogeneity of macro-variables. Unlike other research, the study also includes institutional and financial indicators to disentangle the effect of trade liberalization on per capita income. The rest of the paper is organized as follow. Section 2 offers model specification and estimation techniques. Section 3 provides data sources and examines the measures of trade liberalization. Section 4 offers estimation results and discuss the results. Section 5 concludes.

2. MODEL SPECIFICATION AND ESTIMATION
This study will examine the impacts of the three trade liberalization indicators (trade share, tariff rates and liberalization dates) on real GDP per capita for sub-Saharan African countries. Instead of growth rate in per-capita income, the study uses the log of per capita income as it is commonly used in empirical literatures (e.g. Frankel and Romer, 1999; Acemoglu et al., 2001; Rodrik et al., 2004; Dollar and Kraay, 2003). Following Wacziarg and Welch (2008), construction of openness indicator using date of liberalization, the model is specified as:

\[ Y_{it} = \alpha Y_{it-1} + \beta X_{it} + \gamma LIB_{it} + C_i + \phi t + U_{it} \ldots \ldots (1) \]

For \( i = 1, 2, ..., N \) and \( t = 1, 2, 3, ..., T \)

Where, \( Y_{it} \) is the natural logarithm of real GDP per capita in country \( i \) at time \( t \). \( X_{it} \) is vectors of predetermined, endogenous, and exogenous explanatory variables. It includes the log of investment as a share of GDP; the log of government consumption as a share of GDP; investment price; private credit as a share of GDP(proxy for financial development); life expectancy; ethnicity; total reserve; resource endowment dummies; colonization dummies (colonies of France, Belgium, and United Kingdom); land locked countries and dummy for southern African countries. \( LIB_{it} \) is the binary liberalization indicator, i.e. \( LIB_{it} = 1 \) if \( t \) is greater than the year of liberalization for country \( i \) and no reversal of trade policy reforms have occurred, 0 otherwise. \( C_i \) and \( U_{it} \) are country specific unobserved heterogeneity and the iid disturbance term respectively. \( \phi t \) is time dummy variable. \( \alpha, \beta \) and \( \gamma \) are parameters to be estimated

The rational for inclusion of these variables is that huge number of variables have been proposed as income determinants in cross country literature (Benito, 2009). For instance, macroeconomic instability is captured by government consumption relative to GDP. Benito argued that government consumption lowers savings and growth through distortion effect of taxes. Investment price level is taken as proxy for the level of distortions that exist in the economy. However, it is also possible to argue that higher investment return and higher price for some investment good can initiate further innovation in research and
development provided that there is well developed patent right. Thus, the sign of this variable is unpredicted prior to investigation.

Baliamoune–lutz et al. (2007) incorporated financial development in their growth regression equation by arguing that underdeveloped financial systems were unable to absorb sizable foreign exchange inflow. According to Acemoglu et al (2001), different types of early colonization policies created different sets of early institutions (e.g. Extractive states Vs Neo- Europes) which would affect current institution and thereby current income. Similarly, Jenson and Nordas (2006) argued that common colonial history can reduce international transaction cost because they might have similar institutions. Moreover, to disentangle the effect of trade on per capita income, geography variables are used in empirical work (Sachs and Warner, 1997). In place of liberalization dummy, this study also uses openness indicator (trade volume relative to GDP) in equation one. Trade share indicates country’s exposure to international markets and to some extent it carries indication of effects of trade liberalization. In separate regression, average tariff rate (trade policy variable) is directly controlled in the per capita income equation indicated above.

In the per capita income regression, both trade share and institutional quality indicators such as rule of law; political stability and controls of corruption are controlled. The first reason to include institution is that it is a direct determinant of real per capita GDP. Second, an increase in trade share may not reflect improvement in trade policy restrictiveness but it might be mainly the result of better institution. Rodriguez and Rodrik (2001) argued that most regression result linking trade openness and growth would be break down when variables representing institution were included in the analysis. They further criticized the findings of Dollar and Kraay(2003) on the ground that the strong correlation between trade ratio and per capita income may be spurious because of the omitted variable such as institution. Baliamoune and Ndikumana (2007) also argued that researchers, who exclude institution, cannot discover the missing link between trade liberalization and growth in African countries. Consequently, the current study uses the average of five institutional indicators (i.e. government effectiveness, rule of law; control of corruption; regulatory quality and political stability) in the openness-income regression. Each indicator is measured on scale that lies between -2.5 and 2.5 and higher value implies better institution.

To estimate equation one and its varieties, the dynamic panel data estimation frame work is adopted for sub Saharan African countries. The model is estimated using first difference GMM and system GMM. Arellano and Bond (1991) developed first difference GMM estimator that allows joint endogeneity of explanatory variables including the lagged dependent variable. This estimator is well behaved in capturing unobserved country specific effects. Since the estimator requires the model to be differenced, it may throw away some cross countries information. In the case where the auto regressive parameter is weakly identified from first difference equation, system GMM, that uses lagged first differences of the variables as an instrument for the equation in levels, can dramatically reduces finite sample biases and produces precise estimates(Bond et al., 2001; Blundel and Bond,2000).

Similarly, Roodman (2006) argued that the additional assumption that first difference of instrumenting variables are uncorrelated with fixed effect introduces more instruments and can improve efficiency in system GMM. Blundel and Bond(2000) have made a monte carlo simulation about the small sample properties of the GMM estimators and they found that even in small sample size and the lagged dependent variable coefficient as high as 0.9, system GMM produces much better estimates with no virtual bias. But, first difference GMM showed downward bias with less precision.
3. DATA SOURCES AND MEASURES OF TRADE LIBERALIZATION
The study provides the source of the data and the types of variables drawn from each source as follow. The main data sources include Penn World table 6.3 (for government consumption, investment, price of investment, population, trade share); Worldwide Governance Indicators Project (2009) for the five institutional indicators; The 2008 World Bank Development Indicators (for total reserve, private credit, life expectancy); Africa Research Program at Harvard University (for colonization dummy, ethnicity, land area); the 2009 Global Monitoring report (for the tariff rate constructed by Kee et al., 2009). In addition, I obtained the data for the date of liberalization for African countries from Wacziarg and Welch (2008). The study attempts to use the main trade liberalization indicators in the econometric estimation of income per capita as each of the indicator has different time span and sample coverage. For instance, the date of liberalization index has relatively longer time series dimension (1975 to 2001) and covers 33 sub-Saharan African countries. Trade share is the most commonly used and available data with remarkably high panel dimension (run from 1975 to 2007 and consists of 35 sub-Saharan countries). The tariff data that has less aggregation problem was scant for African countries. This data recently constructed for 18 sub-Saharan countries for the time span of 1996 to 2005. In addition, the data that represent the quality of institutions are very contemporary in the context of African countries (run from 1996 to 2007 for 41 countries). In each sample, all variables have times series observation. Extensive discussions on the main trade liberalization indicators are forwarded in the subsequent paragraphs for more clarifications.
Sachs and Warner (1995) constructed a dummy variable for openness based on five additional dummy variables for specific trade related policies. They (for the period 1970 to 1989) classified a country as closed if it meets at least one of the following criteria: average tariff rates of 40% or more; non-tariff barriers covering 40% or more; a black market exchange rate of at least 20% lower than the official exchange rate (BMP); a state monopoly on major exports (XMB), and Socialist Economy System (SOC).
Wacziarg and Welch (2008) revised the Sachs and Warner criteria in order to correct for the bias pointed out by Rodriguez and Rodrik (2001) and have extended their data to cover the 1990s. They argued that liberalization dates reflect broader shift in trade policy and do not simply capture changes in the BMP and XMP variables. Liberalization date is the date after which all the Sachs-Warner openness criteria are continuously met. Therefore, following Wacziarg and Welch (2008), the current study uses the date of liberalization as indicator of openness which enables to capture the within-country liberalization dynamics. Trade share is considered another trade restrictiveness indicator. Since trade share is an outcome measure, it is not only reflecting a wide range of trade policy choices but it also measures differences in tastes, macroeconomic shocks, and other factor which are not attributed to trade policies (Kee et al., 2008, 2009). Even though it has certain limitations, trade share has been used in this study as well.
The other approach to measure trade liberalization is to simply rely on tariff data assuming that all other trade policy instruments are positively correlated with tariff. However, Kee et al. (2009) showed that tariff and non-tariff barriers would rather negatively correlated. Aggregating large sets of tariff lines in to a common meaningful measure was another challenge. But, they overcome these problems and formulated sound procedures to produce impressive tariff data. The current study benefited in using this recent data.

4. ESTIMATION RESULTS AND DISCUSSION
First, the study provided statistical evidence for the presence of unobserved heterogeneity in the cross-countries per-capita income regression. The test revealed the presence of country specific effect as coefficients in fixed effect estimation are quite different from OLS
estimates. Second, the strict exogeneity assumptions of fixed effect (FE) estimation are not longer hold in our regression. In particular, the lead value of trade share(forwarding trade share one period a head) is statistically significant in fixed effect estimation of income per capita, suggesting that trade share is actually endogenous (results are available on request).

Table 1 (in column 1) presents estimation results only from System GMM because the liberalization dummy did not show sufficient variation in difference GMM. Among others pointed in the model specification and estimation section, a nice feature of system GMM is that one can include time invariant regressors which would disappear in difference GMM and at same time, the coefficient estimates for other regressors do not change asympotically (Blundel and Bond,2000; Rood Man ,2006). As shown in table 1, the model performs very well on the ground that it passes both Sargan test for over identification restriction with a null hypothesis of joint validity of instruments and the Arellano-Bond tests for second order autocorrelation in differences [AR (2)]. Thus, the Sargan test ensures that all instruments are valid. All variables had the expected sign. For sake of brevity, openness represents the liberalization dummy in column 2 and trade share in the rest columns of the table. The liberalization dummy was shown to have positive and statistically significant effect. The mean real per-capita income of the liberalizers are 2.16 percentage point higher than the per-capita income of the non – liberalizers, citrus paribus. Since the dummy captured the intercept term, about 2.16 percentage points mean shift in per capita income was recorded after trade liberalization. This coefficient indicates the within variation as well. This finding is consistent with reported growth effect of 2.44 percent in Sachs and Warner cross country regression. Similarly, Wacziarg and Welch (2008) found that over the period 1950-1998, countries that liberalized their trade regimes have experienced an average increase in annual growth rate on the order of 1.5 percentage points compared to pre-liberalization times.

Table 1: Estimation results for real GDP per capita as dependent variable

<table>
<thead>
<tr>
<th>Variables</th>
<th>system GMM dates of liberalazation</th>
<th>system GMM of trade share regression</th>
<th>system GMM income relation</th>
<th>five years average trade share income relation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lincome (lagged)</td>
<td>0.8737*** (0.0726)</td>
<td>0.9532*** (0.0578)</td>
<td>0.8910*** (0.0624)</td>
<td>0.3912** (0.1922)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.3935** (0.1981)</td>
</tr>
<tr>
<td>Investment</td>
<td>0.00388 (0.0181)</td>
<td>0.0307** (0.0142)</td>
<td>0.0149 (0.0167)</td>
<td>0.1102 (0.1423)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0626 (0.1293)</td>
</tr>
<tr>
<td>Private credit</td>
<td>0.0192*** (0.0049)</td>
<td>0.0041 (0.0142)</td>
<td>0.0094** (0.0044)</td>
<td>0.0891 (0.1336)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0501 (0.0561)</td>
</tr>
<tr>
<td>Investment price</td>
<td>-0.0001 (0.0079)</td>
<td>-0.0063 (0.0252)</td>
<td>0.0018 (0.0059)</td>
<td>-0.0720 (0.1412)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.1049 (0.0990)</td>
</tr>
<tr>
<td>Life expectancy</td>
<td>0.0030** (0.0014)</td>
<td></td>
<td></td>
<td>0.2441 (0.4311)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.3783 (0.5276)</td>
</tr>
<tr>
<td>Government consumption</td>
<td>-0.0163** (0.0072)</td>
<td>-0.0608** (0.0287)</td>
<td>-0.0058 (0.0055)</td>
<td>-0.1251 (0.1392)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.0342 (0.1534)</td>
</tr>
</tbody>
</table>
According to Greenaway (2002), substantial (2.7%) impacts on growth were observed after liberalization. All these findings suggest that our result is consistent and reliable. Four reasons can be mentioned as to why our estimated parameter for liberalization dummy reflects trade policy changes. First, the study relies on liberalization dates that indicate shift in trade policy but not simply capture change in black market premium (BMP) and state monopoly on major exports. Second, colonization dummy was used to capture early institutions just to overcome upward biases in the estimate of liberalization index. Third, the view that market structure rather than trade policy derives the result become less appealing when financial development is controlled in the regression. Fourth, the study benefited from Wacziarg and Welch (2008) construction of this variable that incorporates criticisms happening on the benchmark Sachs and Warner (1995) liberalization index.

In place of liberalization dummy, trade share is used and table 1 depicted the results for difference GMM (in column 3) and System GMM (in column 4). The models pass the
diagnostic tests for autocorrelation [AR (2)] and Sargan test for over identification of instruments though weak for difference GMM. Thus, instruments are valid and no second order serial correlation is detected. All variables in the model have exhibited the predicted sign. Trade share is statistically significant in difference GMM while it is not in system GMM. Series robustness checks have been made to see whether trade share is still significant in difference GMM for many specifications. First, investment price is dropped from the model and trade share was found to be significant. Second, the study directly moved from long run regression framework to short run framework by taking five years average of all variables and the equation is re-estimated using difference and system GMM and the estimation results are reported respectively through column 5 and 6. Trade share is not statistically significant in both estimation techniques. These results declared that estimates of system GMM (from column 4) are consistent and dependable.

Because of the superior features of system GMM including small sample properties among others, this estimator would be used to quantify the income effect of average tariff rates. In fact, tariff rate is important and direct trade policy variable. The estimation results are shown in Table 2. To downplay any claim on unexplained residual, institutions are controlled. As Table 2 shows, all the diagnostic tests are once again acceptable. Among other variables, column 2 includes tariff rate and political stability while column 3 and 4 consist of tariff rate with rule of law and control of corruption respectively. In each alternative scenario, all variables have maintained the predicted sign. Institutions have positive impact on per capita income while tariff rate is negatively correlated with per capita income. If average tariff rate decreases by one unit, the mean per-capita income would increase by about five percentage point in almost all scenarios, citrus paribus.

Table 2: System GMM estimation results for GDP per capita using trade policy and institutions variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>with political stability</th>
<th>with rule of law</th>
<th>with less corruption</th>
<th>with average institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income(lagged)</td>
<td>1.1712*** (0.1142)</td>
<td>1.1484*** (0.1206)</td>
<td>1.1348*** (0.1276)</td>
<td>1.1891*** (0.0352)</td>
</tr>
<tr>
<td>Investment</td>
<td>0.0767** (0.0374)</td>
<td>0.0835** (0.0395)</td>
<td>0.0937** (0.0421)</td>
<td>0.0057 (0.0098)</td>
</tr>
<tr>
<td>Private credit</td>
<td>0.0011 (0.0748)</td>
<td>0.0095 (0.0744)</td>
<td>0.0271 (0.0793)</td>
<td>0.0034 (0.0051)</td>
</tr>
<tr>
<td>Investment price</td>
<td>0.0874** (0.0368)</td>
<td>0.1077** (0.0411)</td>
<td>0.1326** (0.0463)</td>
<td>0.0058 (0.0083)</td>
</tr>
<tr>
<td>Political stability</td>
<td>0.0311 (0.0492)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rule of law</td>
<td>-</td>
<td>0.0675 (0.0951)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control of corruption</td>
<td>-</td>
<td>-</td>
<td>0.0732 (0.0809)</td>
<td></td>
</tr>
<tr>
<td>government consumption</td>
<td>-0.0908** (0.0419)</td>
<td>-0.0807* (0.0428)</td>
<td>-0.0717* (0.0461)</td>
<td>0.0064 (0.0070)</td>
</tr>
</tbody>
</table>
However, the estimated coefficient is statistically insignificant. We can reasonably suggest some factors that may explain the insignificant contribution of tariff to the per capita GDP. First, the time period considered in the study (1996-2005) may be short to enjoy the fruit of liberalization. Second, there may be a substitution from the less efficient quota to a more efficient tariff during the liberalization episode. It means that tariff liberalization may not be adequate enough to stimulate the economy at satisfactory level. Third, even though the average tariff declines, there may not be strong institutions and infrastructure to facilitate trade flows and effectively channeled to per capita GDP through absorption of foreign technology and within country efficient resource re-allocation. Fourth, tariff policy reform may be irregular which eventually leads to large standard deviations. Fifth, this tariff data is the first data set constructed for African countries which is still only available for 18 sub-Saharan countries. It means that countries that strongly liberalize and get its benefit may be missed from our data. Consistent with our finding, Jenson and Nordas (2006) reported that tariff rate was indeed insignificant though it has been nice indicator trade liberalization. Finally, it is very important to estimate the per-capita income equation by including interaction term between trade share and average institutional quality and table 2 (column 5) presents the result. Average institutional quality has positive impact on real per-capita income albeit insignificant.

In this case, the point estimate of the direct impact of trade share on per-capita income is given by its own effect plus the coefficient of the interaction term times the average level of institution. Given the negative estimate of trade share(as shown in column 5 in table 2), the net impact of trade share on per capita income will only be positive when the value of average institutional quality is above a certain threshold which is calculated by equating the total effect to zero. The current study computed this threshold to be two and certainly lies in the range between -2.5 and 2.5, where high values indicate better institutions. However, it would be certainly challenging for African countries to achieve this threshold level of institutional quality. Due to this reason, the interaction term is insignificant implying that only strong institutions can enhance effectiveness of trade flow. The weak complementarities
between trade share and institution give evidence for the countries to further improve their institutional level.

5. CONCLUSION
In this paper, three different trade liberalization indicators have been used to investigate the impact of trade liberalization on per-capita income for sub-Saharan African countries using dynamic panel data framework. Provided that there is no reversal of trade reform after the date of liberalization took place, trade liberalization dummy showed positive and significant impact on mean per-capita income of the liberalizers. However, both trade share as proxy for trade liberalization and tariff rate as direct measure of trade restrictiveness do not show significant impact on per-capita income of the countries under consideration. Nevertheless, all the three indicators confirmed that trade liberalization had positive impact on real per capita income albeit insignificant for trade share and tariff rates. In addition, the joint effect of institutional quality and trade share has shown to be positive but they have weak complementarities which can be explained by the low level of institutions. Since the existing institutions levels are below the required threshold, they cannot effectively facilitate trade flows to promote growth. Even if adequate non-tariff data is scant for African countries, examination of its effect is left for future research.

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