

## Economic Globalization: Boon or Bane for African Health?

**Vishalkumar Jani**  
**Ravindra H. Dholakia**

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**INDIAN INSTITUTE OF MANAGEMENT**  
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**INDIA**

## ECONOMIC GLOBALIZATION: BOON OR BANE FOR AFRICAN HEALTH?

Vishalkumar Jani<sup>1</sup>  
Ravindra H. Dholakia<sup>2</sup>

### Abstract

The effect of globalization, especially economic liberalization, on socioeconomic development has long been debated in development economics. There is a view that globalization is not beneficial to the underdeveloped and developing world. Africa is always put forward as an example. So it is important to see what is really the impact of international integration and increasing trade on countries of Africa. Evidence for this is very limited and inconclusive. The present study attempts to decipher how health status of African countries is impacted by the economic liberalization. It aims to bridge the gap between the two strands of literature: (i) impact of economic liberalization on growth, and (ii) effect of economic growth on health status.

The findings show a positive effect of globalization on the health status of African countries with those having lower income and underdeveloped status in initial period benefiting more.

Key words: Globalization, Health, International trade, Africa, Low income

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<sup>1</sup> Doctoral Student, Economics Area, Indian Institute of Management, Ahmedabad.  
Email: vishalj@iimahd.ernet.in

<sup>2</sup> Professor, Economics Area, Indian Institute of Management Ahmedabad.  
Email: rdholkia@iimahd.ernet.in

## **ECONOMIC GLOBALIZATION: BOON OR BANE FOR AFRICAN HEALTH?**

Several studies consider African countries, along with some of the South Asian countries, as examples of asymmetric development process being propagated through the process of globalization (Ouattara, 1997; Cornia, 2001). The argument is that these economies are not mature enough to stand shoulder to shoulder with developed world, and hence are not in a position to garner the positives of these global phenomenon. However, IMF (2001), has argued that the integration in international economy would be a major force behind economic growth of developing countries resulting in development and poverty reduction. This debate would be better informed if African countries are subjected to test whether their socioeconomic development process is impacted by globalization. Since our interest is to examine the nature of impact of globalization on the socioeconomic welfare indicators of the African countries, we follow the methodology of comparing current status with the previous levels of development in these countries. Health, being major indicator of the socioeconomic development of a country, is used to address the debate in hand.

The present study is organized in five sections. The second section explores the existing literature on how globalization and liberalization impact health and development process at large. The next section proposes a framework which talks about possible pathways through which health may be affected by liberalization. It also describes methodology used to analyse the data. The fourth and fifth sections talk about results of the current study and inferences and conclusions drawn from them respectively.

### **GLOBALIZATION AND HEALTH**

Diseases have always travelled along trade routes so it has been a long relationship between health and liberalization (Deaton, 2004). HIV/AIDS and Ebola are recent examples of how diseases spread across boundaries.

Health, being an important development indicator, has been used to decipher liberalization's impact on development process (Deaton, 2004; Levine & Rothman, 2005; Krishnakumar & Sarti, 2014; Umanã- Peña et al., 2014). Mostly theoretical arguments revolve around incremental improvements in health status vis-a-vis direct comparison with developed world.

Basic assumption underlying economic liberalization resulting in health improvements is the trickle down mechanism. Due to integration in international economic and trade system, a

country will have higher gross domestic product (GDP) and hence higher personal disposable incomes as more people will get employment and productivity too will rise (Dollar & Kraay, 2004). Increased GDP may also result in higher tax revenues and hence more resources for government. This increased disposable income may result in higher spending on nutrition and healthcare which will result in better personal health levels. At the same time, increased resources with government will result in stronger public health infrastructure and spending on healthcare which will result in better health across country ( Pritchett & Summers, 1993).

Globalization is not only about economic liberalization but many other factors like technology transfer, information spreading, migration of people, cultural adaptations and political discourse also impact health, and socioeconomic development at large. Over and above this, issues like intellectual property rights (IPR) and pollution too have complex influence on the health outcomes of the underdeveloped world.

Infectious diseases in developing world have been reduced due to technology transfer that has taken place as a part of the globalization process. But now new evidences suggest that non communicable diseases are spreading to the developing and the underdeveloped world from developed countries along with liberalization (Labonté, Mohindra & Lencucha, 2011). This is a result of more sedentary lifestyle and change in food habits and lifestyle.

General Agreement on Trade in Services (GATS), adopted by the World Trade Organization (WTO) in 1995, has taken connectedness of countries across globe to a newer height. Health services too started getting affected by this, both positively as well as negatively. Medical tourism and cross border movement of patients have become a large industry. But African countries are not at beneficial end in this evolution as they do not have medical infrastructure or facilities as some of the Southeast Asian countries and India do possess and provide world-class medical services. But along with this, movement of health professionals have started. Many developing countries benefitted from their citizens going abroad and studying medicine to come back and serve their native land. This resulted in faster knowledge transfer and technology adaptation. But it has a flipside that many never returned to serve their own countries. This hit badly the health system of the developing and underdeveloped countries (Bundred & Levitt, 2000).

Political integration through participation in multilateral agencies such as the United Nations and the World Bank has resulted in benefits for African countries as they have brought a lot

of grants and overseas aid to African countries. Though it is debatable whether such aids are detrimental to the future of these countries. But *prima facie*, it has resulted in better capabilities for these countries to avoid real disasters in terms of health (Gbesemete & Gerdtham, 1992; Murthy & Okunade, 2009).

There are a few empirical studies trying to find globalization's and specifically international trade's impact on health. As far as globalization's impact on health is concerned studies by Deaton (2004) and Krishnakumar and Sarti (2014) have made an effort to unfold this relationship. Deaton (2004) has argued that globalization may have positive effects on health status to an extent to which globalization promotes economic growth. According to him on one hand, knowledge and technology transfer about health has facilitated the improvement, and on the other hand, outburst of HIV/AIDS in the later part of the 20<sup>th</sup> century has resulted in slower improvements in health in underdeveloped countries compared to developed world. Though Krishnakumar and Sarti (2014) have human development as their main focus, they have discussed impact on health too. They found that higher the integration in international economy and participation in multilateral activities was beneficial for health across countries.

Apart from these empirical studies, Cornia (2001) argued in favour of globalization's positive impact on health. But he was unsure about trickling down of this positive impact without favourable domestic conditions and prudent macroeconomic policy. He asserted that these benefits were not realized to the full potential in Africa and Latin America because of weak domestic economy, policies and asymmetric global economic environment. He, therefore, favoured removal of asymmetric global economic policies and establishment of new global governance mechanism to ensure that globalization benefits reach to the lowest level. Dollar (2001) had the similar arguments about the positive impact of globalization and liberalization on health and also emphasised on the requirement of strong domestic economic policies and suitable international architecture for realization of all the possible benefits.

Levine and Rothman (2006) attempted to study how trade has impacted child health. They found openness of an economy results in slightly reduced infant and child mortality rates. They too argued that those, who overemphasized the negative consequences of trade on health, were not totally right. Davies and Quinlivan (2006) found positive impact of trade and openness on social welfare across countries of the world. Their main focus was human development. They found developing countries that have opened their economies had higher

per capita income and hence better welfare compared to countries with closed economies. Owen and Wu (2007) have analysed the effect of trade openness on health indicators like infant mortality rate and life expectancy. They found positive impact of international trade openness on health status. Their findings also suggested that benefits in terms of health improvement were higher for poor countries compared to developed countries. Umaña-Peña et al(2014) have recently found that trade in services had a positive impact on health when analysed using cross-sectional regression but the impact was not significant statistically when analysed using the difference regression equation.

Thus literature on the impact of globalization, especially international trade, on health status across countries is inconclusive in general and particularly for developing countries of Africa, Latin America and South Asia. The present study is an attempt to check the experience of African countries in this regard.

## **FRAMEWORK AND METHODOLOGY**

Apart from this unclear linkages in economic theory explaining positive impacts of globalization and liberalization on growth, poverty and hence health status, there are arguments from other perspectives like environment, human rights and socio-cultural studies too. In order to gain better understanding of the mechanism through which international trade may impact health, a framework (Figure 1) is proposed.

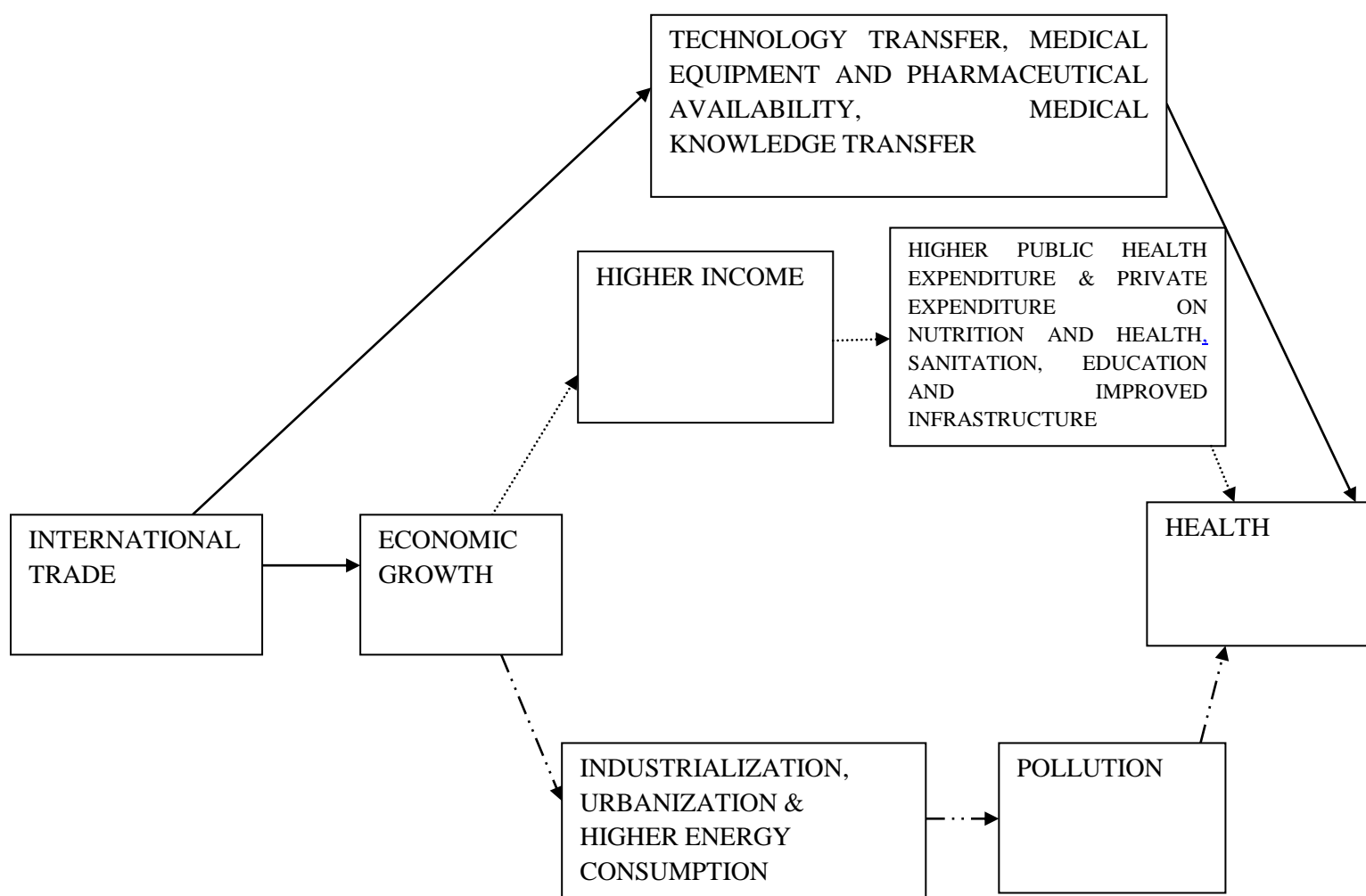
### **International Trade's Direct Impact on Health:**

International trade includes the trade in health consumables like medical equipment and pharmaceuticals, besides knowledge transfer occurring across borders due to service trade in health sector. The health service trade is on the rise in the form of medical tourism and migration of skilled professionals across the globe. Telemedicine, a result of technology revolution, uses information and communication technology to overcome the geographical barriers and allow medical world to reach the unreachable (WHO, 2010). This has been possible only due to technology transfer happening from developed world to developing and underdeveloped countries.

Since General Agreement on Trade in Services (GATS) has been adopted by the WTO, health sector too has participated in the process of service trade liberalization. As medical tourism evolved, private health services improved in terms of quality and facilities available

in the developing world. It has given access to treatments which were not previously available and usually out of reach of the poor people of the developing and the underdeveloped world (Hazarika,2010).

*Figure 1.* Proposed framework to understand impact of trade on health. (Bold arrows show direct effect of trade on health; Dotted arrows and dashed arrows show respectively positive and negative indirect effects of trade on health through economic growth.)



Trans-border movement of health professionals may have both positives as well as negatives for the developing world. Their health professionals get to learn highly sophisticated and quality skills and techniques from the developed world which may be helpful for these countries. But there is a risk that these professionals may not return to their native countries (Bundred & Levitt, 2000).

Trade related intellectual property rights (TRIPS) agreement was reached in 1994 which has direct impact on availability of medicines to the poor of the developing world. It has made newer medicines available to the underdeveloped world. But patent protection for medicines tends to increase the prices of the protected formulations resulting in less access to the poor and needy (Commission on IPR, UK Govt., 2002). Also it is observed that IPRs have played no role in encouraging research for medicaments of diseases which are predominantly spread in the developing or the underdeveloped world. ( Mathur,2007).

Thus direct impact of liberalization on health is hard to decipher due to complex issues attached to it.

### **Economic Liberalization's Indirect Impact on Health:**

Liberalization impacts health through various ways but the most debated pathway in the literature has been this indirect mechanism which works through economic growth. Though literature on the impact of trade on health is very limited, majority of the existing studies has concentrated on the indirect impact.

Trade may affect health through increasing the economic growth. (Levine & Rothman,2005). As mentioned earlier, there is ample evidence available for this linkage between trade and economic growth. (Sachs & Warner, 1995; Srinivasan & Bhagwati, 1999). More open the country, more economic growth it experiences. This has been a basic assumption behind the whole push for trade liberalization by multilateral organizations like IMF and WTO. This increasing economic growth results in higher disposable income for individuals. With higher per capita GDP, health status improves. (Pritchett & Summers, 1993). Though when they analyzed health status including life expectancy with infant and child mortality, they found that the impact of higher income was not as much as supposed by economists and there were many other social determinants for health beyond income.

Higher per capita income or GDP may result in higher levels of expenditure on health care. Based on data of 1970s, 90% of inter-country variation in per capita healthcare expenditure could be explained by differences in per capita GDP of countries (Newhouse, 1977). Hitiris and Posnett (1992) found income elasticity of healthcare expenditure to be near unity. They also established that crude mortality rates were negatively correlated with per capita healthcare expenditure. Thus improved GDP resulting in higher income may improve health



status through both higher public funding of the health system as well as the direct private expenditure on consumption of health services and nutrition. Haddad et al. (2002) found out negative relationship between sustained increase in per capita GDP and rate of under-nutrition. If income of nutrition deficient income group increases, human nutrition levels improve in that particular society. (Pinstrup-Andersen & Caicedo, 1978). So, as income of the poorer stratum increases, their propensity to consume more nutritious food improves and hence nutrition improves.

As each phenomenon has its pros and cons, economic growth yielded through trade liberalization may also have a negative impact on health. It is shown in the lower part of the proposed framework in Figure 1. This process though not clearly explored in the literature may end up negatively affecting the health status or at least reduce the positive impact of the trade on health.

One of the major factors that can drag the impact of trade on health towards negative balance or deterioration is environmental degradation. 'Pollution haven' hypothesis talks about pollution intensive industries of developed countries going to developing countries as the latter have lax pollution regulations reducing the costs for those industries to produce (Antweiler, Copeland & Taylor, 2001). Apart from this, Environmental Kuznets curve also strengthens the argument that, until a country does not reach a certain minimum level of per capita GDP, it faces environmental degradation with increasing GDP (Grossman & Krueger, 1994).

But the effect of trade on environment is not so simple. In empirical exploration of environmental effects of international trade, Antweiler et al. (2001) found that trade might have a very small but measurable effect on the environment with increase in per capita GDP. Similar findings were also obtained by Grossman and Krueger (1994). They emphasised that for the poor countries, with increasing trade and GDP, pollution might increase but above certain level of per capita GDP with more economic growth, environment would improve. Frankel & Rose (2005) showed that if international trade was instrumented using gravity model and then its effect on environment was checked, then it would have a positive effect on the environment keeping per capita income constant. They found that air pollution reduced by a significant amount due to international trade. They discarded the above mentioned 'Pollution haven' hypothesis. Countries having higher openness to international trade have

easier access to these technologies and they are more likely to adopt the environmental regulations at a lower per capita GDP compared to early adopters of these technologies in the developed world. (Lovely & Popp, 2008). And for this diffusion, openness to trade and technology transfer is very important.

## **Methodology**

The current study uses panel data method to evaluate the association between health and liberalization. All 41 African countries (Appendix 1) over time period of 1995 to 2011 are considered in order to answer the following:

- (i) Does globalization impact health status?
- (ii) Does international trade impact health status?
- (iii) Do trade-in-services and trade-in-goods have different health impact on?
- (iv) Does international trade impact health status of countries with different levels of development and income differently?

The indicators used as dependent variables, depicting health status, are infant mortality rate, under 5 mortality rate, life expectancy and crude death rate. These are the frequently used indicators for health status (Hitris & Posnett, 1992; Pritchett & Summers, 1993; Deaton, 2004; Davies & Quinlivan, 2006; Levine & Rothman, 2006; Owen & Wu, 2007 and Umaña-Peña et al., 2014).

For globalization, KOF globalization index (Dreher, 2006) is used. It has across countries indices on economic globalization, social globalization and political globalization. Based on these three, it also has a comprehensive Globalization index for each country. Details about KOF Globalization index is given in Appendix 2.

Apart from globalization indices, trade to GDP ratio is also used as an explanatory variable. Further to check if trade in services has different impact compared to trade in goods, trade in services to GDP and trade in goods to GDP ratios are also used.

Apart from these explanatory variables, per capita GDP, education index, per capita healthcare expenditure and percentage of population covered with sanitation facilities are used as control variables, all of which are likely to have positive impact on the health

indicators. GDP per capita and Health expenditure per capita have been transformed into constant price (2005) values. For controlling the impact of education, education index from Human Development Index is used. Per capita carbon dioxide emission has been included as a measure of pollution, which is expected to have negative impact on health indicators.

Basic model to be used for panel data analysis is:

Health status = f (Globalization/Liberalization, per capita GDP, per capita Health Expenditure, Educational status, Population covered with sanitation facilities, Pollution)

$$H_{it} = \beta_0 + \sum_{k=1}^{k=k} \beta_k X_{itk} + \sum_{m=1}^{m=m} \alpha_m Z_{itm} + a_i + u_{it}$$

$H_{it}$  -> Natural log of Health indicator (IMR/LE/U5M/CDR) of  $i^{\text{th}}$  country for the  $t^{\text{th}}$  time period

$X_{itk}$  -> Natural log of independent variable/s used for globalization or economic liberalization if they are not in percentage terms/ Without natural log if it/they is/are in percentage for as trade/GDP ratio

$Z_{itm}$  -> Natural log of relevant control variables like Real GDP per capita, Literacy level, Real Healthcare Expenditure per capita etc. Percentage of population having access to sanitation is used without natural log.

$a_i$  -> Unobserved time invariant individual effects

$u_{it}$  -> Error term

The panel data is tested for fixed effects vis-a-vis random effects using Hausman test (Hausman, 1978) which showed fixed effects model is appropriate. After this, data is tested for heteroskedasticity, autocorrelation and cross-sectional dependence using Modified Wald test for group wise heteroskedasticity (Baum, 2006) , Woolridge's test for auto correlation (Woolridge, 2002; Drukker, 2003) and Pesaran test (Pesaran, 2004) respectively. These tests showed that the group-wise heteroskedasticity, first-order correlation and cross-sectional dependence is present in the panel data. This complexities are required to be taken care of before using fixed effects model. For this, Driscoll and Kraay standard errors (Driscoll & Kraay, 1998; Hoechle, 2007) have been estimated to make hypothesis testing robust to complexities involved in the data. This method modifies error variance covariance matrix

taking into account heteroskedasticity, serial correlation and cross-sectional dependence between panels.

*Table 1* List of variables

lnimr	Natural log of IMR (Infant mortality rate)
lnle	Natural log of LE (Life expectancy)
lncdr	Natural log of CDR (Crude death rate)
lnu5m	Natural log of U5M (Under five mortality rate)
lngi	Natural log of Globalization index
lneg	Natural log of Economic Globalization index
lnsg	Natural log of Social Globalization index
lnpg	Natural log of Political Globalization index
trade	Trade/GDP ratio (%)
lngdp	Natural log of per capita GDP at 2005 constant prices
lnhe	Natural log of per capita Health expenditure at 2005 constant prices
lnei	Natural log of Education index from Human development index
lnco2	Natural log of per capita carbon dioxide emission
sanitation	% of population covered with sanitation facilities
service	Trade in services/ GDP ratio (%)
goods	Trade in goods/GDP ratio (%)
hdr	Interaction term: human development status in year 1995*trade/gdp ratio
	Low human development country = 0
	Medium human development country = 1
inctr	Interaction term: Income status in year 1995*trade/gdp ratio
	Low income country = 0
	Middle income country = 1
devtr	Interaction term: Development status based on World Bank criteria in year 1995*trade/gdp ratio
	Underdeveloped country = 0
	Developing country = 1

## RESULTS

Results of panel data analysis have been divided in five parts based on the explanatory variable of interest:

- Composite globalization index's impact
- Globalization index's components' impact
- International trade's impact
- Comparison of trade in services vis-a-vis trade in goods
- Comparing impact of trade across different groups of countries based on Development status; Human development status and Income status of initial time period

Table 2: Impact of Globalization Index on Health

	lnimr	lnle	lncdr	lnu5m
lngi	-0.481 (0.0710)	0.113*** (0.0212)	-0.263*** (0.0525)	-0.558*** (0.0872)
lngdp	-0.255*** (0.0427)	0.0993*** (0.0186)	-0.125** (0.0367)	-0.235*** (0.0365)
lnhe	-0.0258*** (0.00549)	0.00270 (0.00127)	-0.00636* (0.00261)	-0.0336*** (0.00686)
lneci	-0.302*** (0.0279)	0.102*** (0.0118)	-0.343*** (0.0249)	-0.416*** (0.0289)
lnco2	0.0461*** (0.00728)	-0.0312*** (0.00628)	0.0503*** (0.0124)	0.0516*** (0.00953)
sanitation	-0.0125*** (0.00168)	-0.000215 (0.000468)	0.000921 (0.000695)	-0.0150*** (0.00204)
_cons	8.006*** (0.496)	2.964*** (0.188)	4.061*** (0.406)	8.626*** (0.488)
N	697	697	697	697
R square	0.717	0.4421	0.4462	0.7176

Note: Driscoll Kraay standard errors in parentheses. \* =  $p < 0.05$ , \*\* =  $p < 0.01$ , \*\*\* =  $p < 0.001$

Impact of Globalization Index on health indicators is shown in table 2. The table shows that all regressions have high explanatory power and all variables have expected signs with most of them being statistically significant. Moreover the variable indicating globalization has highly significant positive impact on health status: reduction in mortality rates and

improvement in life expectancy. IMR, CDR and U5M in African countries would reduce respectively by 4.81%, 2.63% and 5.58% if Globalization index increases by 10%. For life expectancy and crude death rate sanitation shows a perverse sign but those coefficients are not statistically significant. Moreover when we drop sanitation from the regressions for life expectancy and crude death rate explanatory power of the model improves without affecting other coefficients much.

Table 3 shows results of impact of three components of Globalization- Economic, Social and Political index on health indicators in the African countries. All regressions show a good fit on the panel data with expected signs for all independent variables. These results too show a positive and statistically significant impact of economic globalization on the health indicators. Social globalization and political globalization also have similar impact on health indicators but for crude death rate both do not have statistically significant impact and for life expectancy political globalization does not have statistically significant impact.

Table 3: Impact of different dimensions of globalization on health

	Lnimr	lnle	lncdr	lnu5m
lneg	-0.242*** (0.0441)	0.0623*** (0.0143)	-0.148*** (0.0342)	-0.284*** (0.0514)
lnsg	-0.0751* (0.0326)	0.0356* (0.0168)	-0.0801 (0.0440)	-0.103* (0.0439)
lnpg	-0.0894* (0.0346)	0.00408 (0.0194)	-0.00461 (0.0461)	-0.101* (0.0416)
lngdp	-0.276*** (0.0472)	0.105*** (0.0179)	-0.139** (0.0359)	-0.257*** (0.0441)
lnhe	-0.0289*** (0.00491)	0.00477** (0.00145)	-0.0110** (0.00375)	-0.0383*** (0.00641)
lnel	-0.320*** (0.0338)	0.101*** (0.0101)	-0.341*** (0.0217)	-0.428*** (0.0417)
lnco2	0.0556*** (0.00964)	-0.0345*** (0.00744)	0.0583** (0.0150)	0.0631*** (0.0124)
sani	-0.0134*** (0.00143)	-0.00000184 (0.000544)	0.000366 (0.000896)	-0.0159*** (0.00178)
_cons	7.906*** (0.474)	2.962*** (0.168)	4.059*** (0.348)	8.554*** (0.475)
N	697	697	697	697
R square	0.7156	0.4464	0.4505	0.718

Note: Driscoll Kraay standard errors in parentheses. \* =  $p < 0.05$ , \*\* =  $p < 0.01$ , \*\*\* =  $p < 0.001$

Table 4: Impact of trade on health

	Lnimr	lnle	lncdr	lnu5m
trade	-0.00193*** (0.000435)	0.0000584 (0.000138)	-0.000383 (0.000272)	-0.00223*** (0.000476)
lngdp	-0.334*** (0.0478)	0.121*** (0.0212)	-0.173*** (0.0417)	-0.327*** (0.0404)
lnhe	-0.0185** (0.00577)	0.00138 (0.00114)	-0.00307 (0.00234)	-0.0252** (0.00699)
lnei	-0.456*** (0.0192)	0.144*** (0.0108)	-0.437*** (0.0245)	-0.595*** (0.0229)
lnco2	0.0606*** (0.00940)	-0.0330*** (0.00584)	0.0555*** (0.0114)	0.0684*** (0.0106)
sani	-0.0139*** (0.00157)	0.000100 (0.000487)	0.000183 (0.000740)	-0.0166*** (0.00191)
_cons	6.794*** (0.331)	3.262*** (0.140)	3.376*** (0.284)	7.217*** (0.284)
N	697	697	697	697
R square	0.6816	0.4123	0.4196	0.6831

Note: Driscoll Kraay standard errors in parentheses. \* =  $p < 0.05$ , \*\* =  $p < 0.01$ , \*\*\* =  $p < 0.001$

Table 5: Impact of trade-in-service and trade-in-goods on health

	lnimr	lnle	lncdr	lnu5m
lngdp	-0.333*** (0.0367)	0.187*** (0.0346)	-0.161*** (0.0301)	-0.339*** (0.0313)
lnhe	-0.0198** (0.0067)	0.000165 (0.0013)	-0.00318 (0.0021)	-0.0247** (0.0078)
lnei	-0.461*** (0.025)	-0.102*** (0.0081)	-0.403*** (0.025)	-0.579*** (0.0295)
lnco2	0.0618*** (0.0089)	-0.0162 (0.01)	0.0507*** (0.0099)	0.0707*** (0.0101)
sani	-0.0140*** (0.0016)	0.00224* (0.0008)	-0.00132* (0.0005)	-0.0166*** (0.0021)
service	-0.00208*** (0.0005)	-0.0000273 (0.0004)	-0.000195 (0.0005)	-0.00250*** (0.0006)
goods	-0.00173** (0.0005)	0.000124 (0.0001)	-0.000356 (0.0004)	-0.00200** (0.0006)
_cons	6.817*** (0.2797)	2.650*** (0.229)	3.365*** (0.2315)	7.320*** (0.2504)
N	748	748	748	748
R square	0.682	0.1097	0.3969	0.6765

Note: Driscoll Kraay standard errors in parentheses. \* =  $p < 0.05$ , \*\* =  $p < 0.01$ , \*\*\* =  $p < 0.001$

Table 6: Impact of trade on health: Low human development country vis-a-vis mid human development country

	lnimr	lnle	lncdr	lnu5m
trade	-0.00222*** (0.0005)	0.000317* (0.0001)	-0.00114** (0.0003)	-0.00282*** (0.0006)
hdtr	0.00113 (0.0006)	-0.00100* (0.0004)	0.00292** (0.0009)	0.00230* (0.0008)
lngdp	-0.336*** (0.049)	0.122*** (0.0218)	-0.177*** (0.0435)	-0.330*** (0.0426)
lnhe	-0.0184** (0.0058)	0.00128 (0.0011)	-0.00277 (0.0022)	-0.0249** (0.0069)
lnei	-0.446*** (0.0174)	0.136*** (0.0082)	-0.412*** (0.0191)	-0.575*** (0.0186)
lnco2	0.0595*** (0.0094)	-0.0320*** (0.0056)	0.0525*** (0.0107)	0.0661*** (0.0105)
sani	-0.0143*** (0.0015)	0.000484 (0.0006)	-0.000933 (0.0011)	-0.0175*** (0.0017)
_cons	6.816*** (0.3364)	3.242*** (0.1368)	3.434*** (0.2782)	7.262*** (0.2924)
N	697	697	697	697
R square	0.6825	0.4207	0.4317	0.686

Note: Driscoll Kraay standard errors in parentheses. \* =  $p < 0.05$ , \*\* =  $p < 0.01$ , \*\*\* =  $p < 0.001$ . Here the base case is low human development country.

Table 7: Impact of trade on health: Low income country vis-a-vis middle income country

	lnimr	lnle	lncdr	lnu5m
trade	-0.00184*** (0.00033)	0.000323* (0.0001)	-0.00109** (0.0003)	-0.00230*** (0.0004)
inctr	-0.000276 (0.0006)	-0.000769 (0.0004)	0.00206* (0.0008)	0.000213 (0.0007)
lngdp	-0.335*** (0.0495)	0.118*** (0.0225)	-0.166** (0.0441)	-0.326*** (0.0419)
lnhe	-0.0182** (0.0054)	0.00223 (0.0013)	-0.00534 (0.0029)	-0.0254** (0.0065)
lnei	-0.458*** (0.0184)	0.138*** (0.008)	-0.420*** (0.0186)	-0.593*** (0.0229)
lnco2	0.0604*** (0.0093)	-0.0334*** (0.0059)	0.0565*** (0.0114)	0.0685*** (0.0105)
sani	-0.0138*** (0.0016)	0.000280 (0.0006)	-0.000296 (0.0009)	-0.0166*** (0.0019)
_cons	6.797*** (0.3379)	3.272*** (0.1423)	3.350*** (0.2858)	7.214*** (0.2902)
N	697	697	697	697
R square	0.6816	0.4177	0.4263	0.6831

Note: Driscoll Kraay standard errors in parentheses. \* =  $p < 0.05$ , \*\* =  $p < 0.01$ , \*\*\* =  $p < 0.001$ . Here the base case is low income country.



Table 8: Impact of trade on health: Underdeveloped country vis-a-vis developing country

	lnimr	lnle	lncdr	lnu5m
trade	-0.00261*** (0.0005)	0.000312* (0.0001)	-0.00121** (0.0003)	-0.00320*** (0.0006)
devtr	0.00198** (0.0006)	-0.000744* (0.0003)	0.00244* (0.0009)	0.00286** (0.0009)
lngdp	-0.327*** (0.0452)	0.118*** (0.0209)	-0.164*** (0.0395)	-0.316*** (0.0369)
lnhe	-0.0180* (0.0062)	0.00117 (0.0010)	-0.00237 (0.0021)	-0.0243** (0.0076)
lnei	-0.438*** (0.0166)	0.138*** (0.0084)	-0.416*** (0.0187)	-0.570*** (0.0185)
lnco2	0.0592*** (0.0093)	-0.0325*** (0.0059)	0.0538*** (0.0116)	0.0664*** (0.0111)
sani	-0.0148*** (0.0014)	0.000422 (0.0005)	-0.000870 (0.0008)	-0.0178*** (0.0018)
_cons	6.766*** (0.3124)	3.273*** (0.1352)	3.341*** (0.2636)	7.176*** (0.2573)
N	697	697	697	697
R square	0.6851	0.4176	0.4294	0.6883

Note: Driscoll Kraay standard errors in parentheses. \* =  $p < 0.05$ , \*\* =  $p < 0.01$ , \*\*\* =  $p < 0.001$ . Here the base case is low income country.

How trade impacts health indicators is shown in the table 4. If trade to GDP ratio (in percentage) to increase by 10, IMR, CDR and U5M are to reduce by 1.93%, 0.03% and 0.223% respectively and life expectancy increases by 0.006%.

Table 5 shows impact of trade-in-services and trade-in-goods on health indicators. Both show similar results: reduction in mortality rates and increase in life expectancy.

The sum of trade-in-services to GDP ratio and trade-in-goods to GDP ratio is the ratio of trade to GDP. In this sense, regression results of table 5 and table 4 respectively can be seen as unrestricted model restricted model. Though trade-in-services seems to have higher impact on health indicators, based on joint F hypothesis testing coefficients of trade-in-services to GDP ratio and trade-in-goods to GDP ratio are not statistically different which means both have similar impact on health indicators. It is also notable that coefficients of life expectancy and crude death rate are not significant.

Table 6, 7 and 8 are showing results of how trade to GDP ratio impact differently to different groups of country based on their initial human development, income and development status

through the corresponding interaction term. Table 6 results shows that in countries that had low human development status in year 1995, trade impacts the health more positively compared to country with medium human development status in initial period since the coefficient of the interaction term (hdtr) has opposite sign to that of the coefficient of trade to GDP ratio (trade). Table 7 and table 8 reiterate the result of table 6 showing that low income countries and underdeveloped countries benefit more, in terms of health indicators, through trade.

## CONCLUDING REMARKS

African countries, as per our results in terms of health status, have benefited from globalization and international trade. These results support the argument that the trickling down effects of globalization and liberalization through higher income resulting in better welfare may outweigh the adverse impact. As we move from composite globalization index to more decomposed globalization indices, economic globalization emerges as the most influencing dimension of the globalization. This is further strengthened by the results about the impact of international trade on health indicators. It is also evident that coefficients of trade to GDP ratio are not as large as coefficients of economic globalization index. The most likely reason for this is the composition of the economic globalization index which includes not only international trade but also foreign direct and indirect investments, remittances, etc. In case of no statistical difference between impacts of trade in service and trade in goods on health status, service basket being traded by African countries has to be the reason. Majority of services traded is related to tourism and shipping which does not have requirement of high quality human capital that is essential to services like health, IT, consultancy, etc. which are at the root for development in countries like India.

The most striking result of our exercise is the inverse relationship between the development or income status of a country in the initial year and trade activities. This result contradicts the prevailing wider belief that underdeveloped or less developed countries are not benefitting as much as the more developed world (Ouattara, 1997; Cornia, 2001). Although it is not appropriate to extrapolate this result and comment about the developed world as no country in our study belonged to either high development, developed or high income category, it is still suggestive of the likely direction.

Our results also show a very important role of educational status and per capita GDP in improvement of health status. And at the same time, the study also acknowledges negative impact of per capita carbon dioxide emissions, a proxy used for pollution. The link from economic globalization to pollution needs to be explored further for the empirical evidence of the causality. It may indicate the kind of trade off developing and underdeveloped countries need to make when they consider their industrialization and health policy simultaneously.

Certain claims made in late 1990's about Africa not benefitting from globalization and liberalization (Ouattara, 1997) have to be revisited with new data and evidences. It also shows that with more internationalization, even underdeveloped economies of Africa have shown signs of improvement in domestic policies and institutions that have enabled the benefits to trickle down. And by and large, these results are in agreement with previous evidences and in line with the assumption based on which multilateral agencies are pushing liberalization and integration with outside world.

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## APPENDIX

## APPENDIX I

List of countries included in the study with Human development, Development and Income status in year 1995

Country	Human Development Status	Development Status	Income Status	Country	Human Development Status	Development Status	Income Status
Algeria	Medium	Developing	Middle	Malawi	Low	Under-developed	Low
Angola	Low	Under-developed	Middle	Mali	Low	Under-developed	Low
Benin	Low	Under-developed	Low	Mauritania	Low	Under-developed	Low
Botswana	Medium	Developing	Middle	Mauritius	HHD	Developing	Middle
Burkina Faso	Low	Under-developed	Low	Morocco	Medium	Developing	Middle
Burundi	Low	Under-developed	Low	Mozambique	Low	Under-developed	Low
Cabo Verde	Medium	Under-developed	Middle	Namibia	Medium	Developing	Middle
Cameroon	Medium	Developing	Middle	Niger	Low	Under-developed	Low
Central African Republic	Low	Under-developed	Low	Nigeria	Low	Developing	Low
Chad	Low	Under-developed	Low	Rwanda	Low	Under-developed	Low
Congo, Dem. Rep.	Low	Under-developed	Low	Senegal	Low	Developing	Middle
Congo, Rep.	Medium	Developing	Middle	Sierra Leone	Low	Under-developed	Low
Egypt, Arab Rep.	Medium	Developing	Low	South Africa	Medium	Developing	Middle
Ethiopia	Low	Under-developed	Low	Sudan	Low	Under-developed	Low
Gabon	Medium	Developing	Middle	Swaziland	Medium	Developing	Middle
Gambia, The	Low	Under-developed	Low	Tanzania	Low	Under-developed	Low
Ghana	Low	Developing	Low	Togo	Low	Under-developed	Low
Guinea	Low	Under-developed	Low	Tunisia	Medium	Developing	Middle
Guinea-Bissau	Low	Under-developed	Low	Uganda	Low	Under-developed	Low
Kenya	Low	Developing	Low	Zambia	Low	Under-developed	Low
Madagascar	Low	Under-developed	Low				

## APPENDIX II

### KOF Index of Globalization

KOF index of globalization is published annually by KOF Swiss Economic institute, a leading economic think tank from Germany, since year 2002. It was first described in Dreher, 2006 and then updated in Dreher, Gaston and Martens in 2008. As per the index, globalization is a process of creating networks of connections among actors at multi-continental distances, mediated through a variety of flows including people, information and ideas, capital and goods. It is seen as a process that erodes national boundaries, integrates national economies, cultures, technologies and governance and produces complex relations of mutual interdependence. (Dreher, Gaston & Martens, 2008).

Components:

It has three component indices: Economic, Social and Political globalization. Based on them a comprehensive globalization index is calculated for each country every year. Latest published indices available are for year 2014.

#### (a) Economic globalization

This index is kind of proxy for openness a economy has to internationalization. It has two dimensions: actual flows into the economy and restrictions to trade and capital. First dimension of actual flows include international trade, portfolio investments, FDI and FII flows etc. Later dimension is formed by hidden barriers, tariffs and restrictions employed on capital account.

#### (b) Social globalization

This component is aimed to capture how people across international boundaries get connected and exchange information with each other impacting social structure and institutions. It has three dimensions: personal contacts which measures direct interactions between people of different countries, information flow which indicates potential exchange of ideas and information and cultural proximity which measures how much a country has been influenced by western consumables and traditions.



**KOF INDEX OF GLOBALIZATION**

Indices & Variables		Weight
<b>A</b>	<b>Economic Globalization</b>	<b>36%</b>
I	Actual flows	50%
	Trade (% of GDP)	21%
	FDI (% of GDP)	27%
	Portfolio investments (% of GDP)	24%
	Income payments to foreign nationals (% of GDP)	27%
II	Restrictions	50%
	Hidden import barriers	24%
	Mean tariff rate	28%
	Taxes on international trade (% of current revenue)	26%
	Capital account restrictions	22%
<b>B</b>	<b>Social Globalization</b>	<b>38%</b>
I	Data on Personal contact	33%
	Telephone traffic	25%
	Transfers (% of GDP)	4%
	International tourism	26%
	Foreign population (% of total population)	21%
	International letters (per capita)	24%
II	Data on Information Flows	35%
	Internet users (per 1000 persons)	36%
	Television (per 1000 persons)	37%
	Trade in newspapers (% of GDP)	27%
III	Data on Cultural Proximity	32%
	Number of McDonald's restaurants (per capita)	45%
	Number of Ikea (per capita)	45%
	Trade in books (% of GDP)	10%
<b>C</b>	<b>Political Globalization</b>	<b>26%</b>
	Embassies in country	25%
	Membership in international organizations	28%
	Participation in UN Security Council missions	22%
	International treaties	25%

## (c) Political globalization

This dimension measures integration of a nation at a political level with other nations and multilateral agencies. It is measured through indicators like number of embassies in a country, number of multilateral groups or agencies where a country is a member etc.

**Calculation:**

Each of three components is converted into a index on a scale of one to hundred, where one indicates minimum score on that particular component and hundred depicts maximum over the 1970-2011. Higher values denote greater globalization. The weights for calculating three sub-indices are determined by principal component analysis for entire sample of countries and years. Data are calculated annually and where ever data for a variable is not present, it is linearly extrapolated and entered into analysis. The advantage of these indices is that they are calculated based on weighted averages of micro indicators and not the mere aggregation of sub-indices into overall index. So it is possible to have the information on the Globalization index even if one of the dimensional index is not reported due to missing values of some of the micro indicators.