International Journal of Business, Human and Social Sciences
ISSN: 2517-9411
Vol:3, No:6, 2009

The Impact of Trade on Social Development

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***Abstract*—**Studies revealing the positive relationship between trade and income are often criticized with the argument that "development should mean more than rising incomes". Taking this argument as a base and utilizing panel data, Davies and Quinlivan [1] have demonstrated that increases in trade are *positively* associated with future increases in social welfare as measured by the Human Development Index (HDI). The purpose of this study is twofold: Firstly, utilizing an income based country classification; it is aimed to investigate whether the positive association between foreign trade and HDI is valid within all country groups. Secondly, keeping the same categorization as a base; it is aimed to reveal whether the positive link between trade and HDI still exists when the income components of the index are excluded. Employing a panel data framework of 106 countries, this study reveals that the positive link between trade and human development is valid only for high and medium income countries. Moreover, the positive link between trade and human development diminishes in lower-medium income countries when only non-income components of the index are taken into consideration.

***Keywords*—**HDI, foreign trade, development, panel data.

I. Introduction

IS free trade a desirable objective of policy for a country? This issue has kept its importance and remained at the centre stage of major debates among economists ever since the times of Adam Smith, Stuart Mill, and David Ricardo [2]. Although there are controversies about the impact of trade on income, a great majority of research on the issue reports that there is a positive association between free trade and income [1], [3], [4] [5]. On the other hand, studies revealing the positive relationship between trade and income are often criticized with the argument that "development should mean more than rising incomes" [2]. Taking this argument as a base and utilizing panel data, Davies and Quinlivan [1] have demonstrated that increases in trade are *positively* associated with future increases in social welfare as measured by the Human Development Index (HDI)- a multi-component measure of income, education, and literacy conducted by United Nations Development Programme.

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The purpose of this study is twofold: Firstly, utilizing an income based country classification; it is aimed to investigate whether the positive association between foreign trade and HDI is valid within all country groups.

Since income is an essential component of HDI and it is widely accepted that there is a positive link between trade and income, one can come up with the question whether the positive link between trade and human development still exists when the income components of the index are excluded. The second purpose of this study is, keeping the same country categorization as a base, to investigate whether the positive association between foreign trade and HDI still exists when only life expectancy, literacy, and enrollment components of the index are taken into account.

The rest of the paper is organized as follows: In section two, debates over the relationship between trade, growth and income are summarized. Section three includes the introduction of HDI and HDI*. In section four, the modeling approach is briefly introduced. Data structure, variables and the country categorizations used in this study are introduced in section five. Finally, section six contains the findings of the study.

II. Trade and Income

Although Ricardo's notion of comparative advantage was both simple and profound, debates on the payoffs of international trade had been one of the touchstones of professionalism in economics for about two centuries [6]. According to advocates of free trade, by channeling resources into more efficient industries, free trade increases world output. As a result, although gains from trade are shared unequally among countries, world per-capita income increases, both domestic and world welfare improve [1].

According to another view, trade is a zero sum game where the rich countries get richer and the poor countries get poorer. Even if trade is positively associated with growth, this does not necessarily imply a causality as it is difficult to differentiate between the effects of trade and those other policies on economic growth [7].

It is believed that, after mid-1980's, advocates of free trade started experiencing harder times than any time since the publication of Ricardo's Principles of Political Economy [8], [9], [6]. This was mostly due to two theoretical challenges: First challenge was based on the demands for *fair trade* as a precondition of free trade. Second came from the concern that free trade makes the unskilled labor poorer in the developed countries [2], [9]. For example, in the United States, the

stagnation in real wages of the low skilled labor was often attributed to free trade. The unions were therefore strongly opposed to free trade with Mexico under North American Free Trade Agreement (NAFTA) for most probably the same reason [2].

Despite the intense oppositions, empirical studies reveal that trade inspired growth raises the per-capita income of developing countries. Moreover, as the level of income passes certain thresholds, developing countries employ this additional income to improve their environmental conditions [1].

Dollar and Craay [3], depending on evidence from individual cases and cross-country analysis, asserted that trade leads to faster growth and poverty reduction in poor countries. Frankel and Romer [4] found that trade has a large, though only moderately statistically significant, positive effect on income. Utilizing data from pre-war, inter-war, and post-World War II eras, Irwin and Terviö [5] have shown that the findings of Frankel and Romer [4] were confirmed throughout the whole century: countries which have higher shares of trade in their GDP's have higher income.

Since income is widely accepted to be positively correlated with foreign trade, it may, as a component of HDI, quite possibly be the main factor which determines the sign of the relationship between trade and HDI. Therefore, the relationship between trade and the non-income components of HDI (HDI*) should also be elaborated.

III. Human Development Index

HDI is published in annual Human Development Reports and consists of three basic components: longevity, educational attainment and standard of living. An index is calculated for each of these components to determine the value of HDI for all countries included. This index is a kind of relative average measure of the standardized scale that shows the general degree of the dimensional feature in the population. The HDI is calculated as arithmetic average of these three indexes. The minimum value of life expectation is taken 25 years and the maximum value is 85 years by assumption, and the value of life expectancy index varies between 0 and 1 respectively. Education index is calculated as a weighted average of adult literacy index (2/3) and gross enrollment index (1/3). To calculate the GDP index as proxy of standard of living, adjusted GDP per capita (PPP US$) is used and scaled so that minimum value is log 100 and maximum value is log 40,000 by assumption, and the value of this index changes between 0 and 1 respectively [10].

Alternative composite indexes are proposed to measure quality of life by adding new components and utilizing different weights. However, they are problematic in terms of being unable to include diverse domains of human development, calculating the indexes with arbitrary weights and representing biased estimations sourced from omission of interrelated multiplier effects of components [11]. Panigrahi and Sivramkrishna [12] claim that HDI rankings of countries are sensitive to upper and lower fixed limits of the component indexes. Thus, they offer an Adjusted Human Development Index that gives robust country rankings to the changes in the component limits.

HDI applies a simple weighting method which is equal weights for components. This method is clearly convenient but considered to be erroneous. The ideal version of the composite index of human development would use weights determined by the contribution of each component to the final qualitative purpose of the index. This means that each component of HDI should be weighted according to their impact on human development. Chakravarty [13] use the arithmetic average of components' individual contribution to the human development to calculate a Generalized Human Development Index. Similarly, Chowdhury and Squire [14] calculate the weights by a meta production function of human development and general development level of countries. They also evaluate their approach as correct in theory but impracticable in practice with available information level and add that: "In this context, intermediate means a solution that lies somewhere between equal weights and the ideal; and somewhere between the convenient and infeasible."

Although, many assumptions of HDI have been contested in the development economics literature, it is, probably, the best-known index of well being. It is also possible to use HDI by ignoring the income component. This index is calculated as simple average of life expectancy and education indexes, and named as HDI* by Human Development Report Office, UNDP.

IV. Modelling Approach

This study aims to assess the effect of trade on human development level of countries. Considering that the increases in the human development level of a country are a result of a continuous progress within that country, we include the past values of the HDI as well as volume of trade as explanatory variables in our model. Utilising the panel data estimation techniques, we estimate the following model:

$$HDI_{it} = \beta_0 + \beta_1 HDI_{i,t-1} + \beta_2 HDI_{i,t-2} + \beta_3 Trade_{it} + \alpha_i + u_{it} \quad (1)$$
$$i = 1,2,...,N \quad and \quad t = 1,2,...,T$$

HDI_{it} and $Trade_{it}$ in the above model, respectively, stand for the Human Development Index and volume of trade for country i at time t. Since the HDI figures are calculated for every 5 years, the data we use also consist of 5-year periods. $HDI_{i,t-1}$ and $HDI_{i,t-2}$, therefore, respectively, represent the HDI values of country i for the past 5 and 10 years. α_i is the fixed or random effect which captures the country specific characteristics that are not included in the model and u_{it} is the error term. N is the number of countries in the sample and T is the number of data points over time.

Regardless of the country specific component (α_i) treated as fixed or random, the within-groups estimator of the parameters in the above model is biased downwards and

inconsistent for small T [1] [17]. In a random effects modeling approach, the statistical properties, in particular the consistency property, of the Generalised Least Squares (GLS) or Maximum Likelihood (ML) estimators strongly depend on the assumptions made for the initial values of the dependent variable and also how the N and T approaches to infinity. The model, therefore, is estimated by Generalised Method of Moments (GMM) technique.

A standard approach in GMM estimation is to first difference the regression equation in order to remove the unobserved individual effects, which then takes the following form:

$$\Delta HDI_i = \beta_0 + \Delta HDI_{i,-1}\beta_1 + \Delta HDI_{i,-2}\beta_2 + \Delta Trade_i\beta_3 + \Delta u_i \quad (2)$$

where $\Delta HDI_i = (HDI_{it} - HDI_{i,t-1})$, $\Delta HDI_{i,-j} = (HDI_{i,t-j} - HDI_{i,t-j-1})$, $\Delta Trade_i = (Trade_{it} - Trade_{i,t-1})$, and $\Delta u_i = (u_{it} - u_{i,t-1})$. The Arellano-Bond estimator, which is used to obtain the results presented in this study, uses the lagged values of the dependent variable ($HDI_{i,t-2-j}$, $j = 0,1,...$) as an instrument for the ΔHDI_i while deriving the moment conditions [18] , [19].

V. Data & Variables

In 2008, HDI data are reported for 177 countries (UNDP, 2009). However, although HDI is an annually published index, comparable HDI series are produced in only 5-year increments (over the period 1975 through 2005). For only 106 of the 177 countries both trade and HDI data are available [15], [16]. Therefore, the panel framework utilized in this study contains 5-yearly series on 106 countries over the period 1975 through 2005. Table I gives the number of countries included in the study in each income group:

TABLE I
Number of Countries by Income Groups

	Number of Countries	% in Sample
High income: OECD	23	21.7
High income: Non-OECD	12	11.3
Upper Middle Income	16	15.1
Lower Middle Income	29	27.4
Low Income	26	24.5

During the estimations, the trade variable is calculated by dividing the volume of trade by population and then taking the natural logarithm. This variable is treated as 'predetermined' during the estimations.

[1] Same holds for the fixed effects Least Squares Dummy Variable (LSDV) estimator.

VI. Findings

This study investigates whether the positive correlation between foreign trade and human development still exist when the countries categorized by their income levels. This analysis simply shows the sensitivity of HDI and HDI* to trade volume in all income categories.

TABLE II
Descriptive Statistics for Country Groups

	Observation	Mean	Std.Dev.
High income: OECD			
HDI	161	0.895	0.045
HDI*	161	0.892	0.040
log(TradePC)	161	-4.723	0.789
High income: Non-OECD			
HDI	84	0.804	0.077
HDI*	84	0.778	0.104
log(TradePC)	84	-4.312	0.903
Upper Middle Income			
HDI	112	0.743	0.068
HDI*	112	0.761	0.085
log(TradePC)	112	-6.354	0.064
Lower Middle Income			
HDI	203	0.631	0.093
HDI*	203	0.648	0.12
log(TradePC)	203	-7.416	0.863
Low Income			
HDI	182	0.418	0.087
HDI*	182	0.402	0.113
log(TradePC)	182	-8.644	0.818

In order to assess the importance of trade on human development, the model explained in Section IV is estimated by GMM technique. Two sets of equations are estimated separately for each of the five country groups, choosing the dependent variable as HDI and HDI*. The Sargan test of over identifying restrictions and the second order autocorrelation test are also performed during the estimations.

TABLE III
Estimation Results for Model I

	H.I. OECD	H.I. Non - OECD	Upper M.I.	Lower M.I.	Low I.
$\Delta Trade_i$	0.017*** (0.004)	0.009* (0.005)	0.028*** (0.008)	0.014** (0.007)	-0.002 (0.007)
$\Delta HDI^*_{i,-1}$	0.846*** (0.133)	0.015 (0.179)	0.885*** (0.227)	1.254*** (0.174)	1.082*** (0.156)
$\Delta HDI^*_{i,-2}$	-0.260** (0.113)	0.505*** (0.154)	-0.453*** (0.146)	-0.455*** (0.109)	-0.422*** (0.142)
Constant	0.003* (0.002)	0.007*** (0.002)	0.004 (0.004)	0.002 (0.004)	0.006** (0.002)

Note: 1. Standard errors are reported in parenthesis
2. *p<0.10, **p<0.05, ***p<0.001

Table III reports the estimation results for HDI. Almost all parameter estimates are statistically significant. Increases in HDI levels that are observed over the past 10 years ($\Delta HDI_{i,-1}$) have an increasing effect on the changes in human development that is observed during the past 5 year period, confirming our expectation that the progress of human

development level in a country is an accumulating process. The value of parameter estimates for this variable is higher for the lower middle and low income countries than the high income countries. The effect of logarithmic difference of trade per capita on the changes in HDI is positive and significant for the categories: High income OECD, high income non-OECD, upper middle income and lower middle income. However, this significant effect disappears for the category five. This signals that although middle or high income countries can benefit from trade, it does not improve the human development in low income countries.

Turning to the results for HDI*, which consists of only the education and life expectancy components, the impact of changes in HDI* over the previous years are also significant for all country groups (Table IV). The parameter estimates for these two variables are consistent with what is obtained during the first set of estimations that are reported above. When the income component is excluded from the HDI, the trade variable becomes significant only for the high income and higher middle income countries. This variable is insignificant for the lower middle and low income countries.

TABLE IV
ESTIMATION RESULTS FOR MODEL II

	H.I. OECD	H.I. Non-OECD	Upper M.I.	Lower M.I.	Low I.
$\Delta Trade_i$	0.012**	0.014*	0.042**	0.009	0.014
	(0.006)	(0.008)	(0.018)	(0.01)	(0.014)
$\Delta HDI^*_{i,-1}$	0.641***	0.370**	0.756***	0.988***	1.149***
	(0.147)	(0.171)	(0.137)	(0.119)	(0.175)
$\Delta HDI^*_{i,-2}$	-0.356***	0.322**	-0.739**	-0.362***	-0.653***
	(0.105)	(0.148)	(0.31)	(0.136)	(0.173)
Constant	0.009***	0.002	0.01	0.009**	0.016***
	(0.003)	(0.003)	(0.006)	(0.004)	(0.003)

Note: 1. Standard errors are reported in parenthesis
2. *p<0.10, **p<0.05, ***p<0.001

The results support the basic motivation of the study and our expectations. In a decreasing income scale, trade loses its efficiency earlier in HDI* than in HDI. It could be interpreted as; below a stage of income level, trade affects human development in only income channels. Another supportive and important result is that, significance of trade effect (calculated with t values) on human development is decreasing at all significant income categories when income component is excluded. It is consistent with the literature which claims that trade is indirectly related with education and expected years of life.

These results imply that trade does not necessarily have the expected positive effects on the human development for all countries. Countries which have already achieved a certain level of development can benefit from trade. However trade does not seem to deliver its advantages for countries that actually needs more boosting.

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