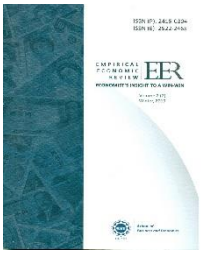

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Article: **An Empirical Analysis of the Relationship between International Trade and Quality of Life**

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An Empirical Analysis of the Relationship between International Trade and Quality of Life

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Abstract

Ever increasing trade restrictions have severe consequences for the quality of human life. Since improving the quality of life (QoL) is the core of economic development, therefore, it is important to investigate the factors affecting it. International trade is an important factor which affects QoL. Therefore, the current study is an attempt to analyze the nexus of international trade and QoL in the member countries of the United Nation Development Program (UNDP). Since QoL is a subjective measure, therefore, human development index (HDI) was used to empirically measure it. Data of 184 UNDP member countries for a period of 28 years (1990-2017) was analyzed in the current study. Both cross-sectional and panel data analysis techniques were used. The results indicated that international trade positively affects QoL. Hence, it was concluded that instead of remaining a closed economy, countries should promote international trade to improve the QoL of their people.

Keywords: human development index (HDI), international trade, quality of life (QoL), United Nation Development Program (UNDP)
JEL Classification: F10, O15

Introduction

Over the past few decades, the argument that the benefits of a growing GDP (per capita) drip down to every sector of the economy has proved to be ineffective. Therefore, countries can no longer forecast economic growth as their ultimate objective. Indeed, increasing economic growth is essentially not a good indicator of "improved human development" of any nation. This is due to the fact that every country has a different set of abilities needed to convert its income into adequate financial resources that can be

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helpful in encouraging its "human development" or in improving its QoL (Nourzad & Powell, 2003).

Up-to-date growth approaches and strategies focus on the upgradation of export and have an outward orientation. International development and economic agencies support the promotion of international trade, rather than import substitution and segregation, as the appropriate method for generating growth. Several studies support the argument for the positive consequences of trade openness for growth (Barro, 1991; Dollar, 1992; Harrison, 1996; Bahmani & Niroomand, 1999; Majeed, 2016; Malik & Majeed, 2020). Considerable theoretical literature is available on openness-growth nexus but limited empirical evidence is available regarding the association between trade openness and QoL. Therefore, the aim of the current study is to fill this gap by exploring the relationship between international trade and QoL. The primary objective of the study is to determine whether or not international trade affects QoL.

To the extent that practical analysis of the effects of international trade on QoL is concerned, Sirgy, Lee, Miller, and Littlefield (2004) provided a qualitative analysis, while Sapkota (2011), Tsai (2007) and Majeed (2019) provided an empirical analysis for Asian economies. They further argued that countries are globalizing rapidly in terms of international trade and its consequences are extensively debated by practitioners, researchers, policy makers and academicians. However, there is a lack of consensus about how international trade benefits human lives, particularly QoL.

Sirgy et al. (2004) argued that international trade affects the quality of human lives through many channels. Its positive effects include the provision of quality goods and services such as better medical equipment, technological advancements in the education sector and a qualified medical staff that improves the health of general public leading to a healthier QoL. Similarly, if countries have up-to-date agricultural equipment and advanced technical services, they can expand their farming methods which enhances a nation's ability to increase its food production. Another way to enhance QoL is to improve and advance the quality of education which is only possible through the exchange of scholars and students.

Besides these positive effects, there are also some negative consequences of international trade that include the elimination of jobs in the manufacturing sector (Sirgy et al., 2004). Majeed (2011) also validated the adverse effects of international trade on QoL by employing time series data from 1970 to 2006 for Pakistan. Another negative effect was recorded on the health of individuals due to the transmission of AIDS through migration. Free trade of tobacco also leads to an increase in smoking which further leads to adverse health of smokers and indirectly affects the general public (Dollar, 1992). In a recent study, Qadir and Majeed (2018) reported adverse effects of international trade on population's health in Pakistan.

Additionally, Sirgy et al. (2004) stated that QoL is a subjective concept. Therefore, for the investigation of its empirical relationship with other factors, human development index (HDI) is the best proxy for measuring it because HDI is "the process of enlarging people's choices." These choices include a better and healthier life, a better level of education and having access to the resources required for a modest lifestyle or a better standard of living. "Additional choices include political freedom, guaranteed human rights and self-respect" (UNDP, 1990). HDI is a more relevant approach for measuring QoL. "It is not about increasing the richness of the economy where human beings exist; rather it is about increasing the richness and productivity of human life. It mainly focusses on people and their choices and opportunities" (UNDP, 2017).

In UNDP (1990), a renowned Pakistani economist Dr. Mahbub-ul-Haq stated that HDI measures human well-being through the development and richness of human lives, instead of the richness of the respective country's economy. Furthermore, he emphasized the people, their choices and opportunities and asserted that the "real asset of the nation are the people who live there." Similarly, Sirgy et al. (2004) also emphasized that the best empirical measure of QoL is HDI.

The key objective of the current study is to empirically examine the relationship between international trade and QoL in 184 UNDP member countries for the years 1990-2018. The current study contributes to the existing literature in the following manner. *Firstly*,

to the best of our knowledge this is the first study that analytically explores and empirically investigates the nexus of international trade and QoL in 184 UNDP member countries. Previoulsy conducted studies were either qualitative or the data set (for HDI) they employed came with 5-year time intervals. *Secondly*, this is the first study that applied both cross-sectional and panel data analyses. *Thirdly*, the current study employed novel econometric methodologies including ordinary least squares and Two-SLS for cross-sectional data analysis, while pooled OLS, random effects, fixed effects, two-stage least sqaures (Two-SLS) and the updated version of the generalized method of moments (GMM) were used for panel data analysis. *Fourthly*, previous studies used the data of HDI with 5-year lags, while the current study used the annual data for 28 years which provided more reliable and robust results. *Fifthly*, the current study also controlled for several major econometric problems including endogenity, heteroscedasticity and autocorrelation, thus providing robust and consistent results for better policy recommendations.

The remaining study is systematized as follows. The second section incorporates the literature review. The third section includes methodology and description of variables. The fourth section discusses the results and the fifth section concludes the study.

Literature Review

QoL is a composite and subtle view that emphasizes the extent of choices one has. If one has a greater degree of choice, it will lead to higher QoL. Primarily, choice is explained in economic terms. Therefore, the definition of QoL emphasizes the level of GDP (per capita). Even though GDP is a substantial aspect of the development approach, yet it cannot capture all aspects of development. It is an ambiguous concept because of its different interpretations by different people (Nussbaum & Sen, 1993). According to Theofilou (2013), QoL largely discusses how one can measure the ‘goodness’ of the multiple characteristics of their life. These valuations consist of emotional reactions, temperaments, sense of satisfaction from life and fulfillment along with work and personal relations. Some refer to QoL as a measure of “human well-being”.

Sirgy et al. (2004) stated that QoL is a qualitative measure which holds various dimensions of well-being in perspective using both subjective and objective means. It is subjective in the sense that one feels good and satisfied from the things available in general, while objectively QoL refers to the satisfaction gained from physical and mental health, social status, as well as cultural demand. One should not confuse it with the notion of the living standard of one's life based solely on income. It includes not only the wealth of an individual but also the environment, physical and mental health, educational level, and other aspects that play a vital role in improving the comfort of an individual. Different measures covered by the above mentioned concept are human well-being, physical well-being, economic well-being and consumer well-being. The definition of QoL given by UNDP (1998) involves the fulfillment of basic needs, an elegant standard of living, as well as the sense of gratification emanating from the fulfillment of basic needs.

In short, QoL is a multifaceted and subtle concept. We cannot measure it quantitatively. Therefore, we opted for a proxy instead, that is, "human development index (HDI)". The idea of HDI was first introduced by Dr Mahbub ul Haq and it is purely a human-centered approach. The focus of this approach is to enhance the capabilities of people by administering their choices and opportunities. In other words, we can say that the aim of human development is to develop and expand the capabilities of people regarding what they want to be and what they want to do. This approach was introduced for the first time in the very first report of human development issued by UNDP. The aim was to replace the longstanding reliance on GDP per capita used as a measure of social and economic progress of a nation. It was considered an intrepid attempt to include in a single, simple, and appealing statistic the information people could use (UNDP, 2017).

HDI measures development by computing three sub-components which include longevity, knowledge, and a higher standard of living (UNDP, 2017). Gender Development Index **(**GDI) also includes the same measures but it provides data by gender, separately. A greater disparity in human development leads to a lower GDI level as compared to HDI and vice versa. Similarly, Human Poverty Index (HPI) considers poverty, which indicates the

percentage of people who died under 40 years of age as well as the proportion of adults that are uneducated. Moreover, it also focuses on economic deprivation (Sirgy et al., 2004). Therefore, to overcome these problems, human development reports (HDR) are published annually for regions, member states and for the world in detail by UNDP. The basic principle of HDR is that the essential and basic components of QoL are a healthy and longer lifespan, a decent standard of living and education. It means that HDI measures human development using three factors, that is, knowledge, a longer and healthier lifespan and per capita GDP.

International Trade and QoL

Unlike the relationship between international trade and economic growth, little attention has been paid to the nexus between international trade and QoL. One might claim at the instinctual level that international trade alters economic growth mostly because of exports, while imports influence economic development. If countries use the import of both human and physical capital along with technology and new ideas, it can expand the development capacity of any country and hence improve the QoL of its people.

For example, advanced medicinal equipment and well-trained medical staff contribute to a developed health sector that boosts human development. Another contributing factor in improving the health sector is to provide effectual water treatment sources along with a modern sewerage system. Similarly, the import of advanced agricultural equipment, improved technical services, and up-to-date farming methods may expand a nation's capability to produce abundant food. The quality of education can also be improved by the exchange of scholars, researchers as well as students.

Trade openness leads to higher human development and consequently, to an improved QoL. The studies of Eusufzai (1996) **(**for group of developing countries), Nourzad and Powell (2003) (for panel of developing countries), and Davies and Quinlivan (2006) **(**for panel analysis) supported the positive influence of international trade on human development. The study of Razmi and Yavari (2012) for oil rich developing countries and that of Asongu (2013) also supported the argument that international trade significantly altered human development in Africa. Majeed (2018) found

favorable effects of economic globalization on QoL for OIC countries.

There are also some countries in which human development led to a higher economic growth rate which, in turn, tended to improve human development. Osman and Tan (1998) found interesting results regarding the contribution of human resource to economic development in the case of Singapore. Investment in human capital led to the development of Singapore. Its GDP per capita increased from US$3,021 to US$37,293 between 1970 and 2009.

Globalization encourages human development by reducing poverty. Sapkota (2011) found that globalization encourages human development. Moreover, it also promotes gender development and significantly decreases poverty.

From the literature review, it is evident that very limited empirical evidence is available about the nexus between international trade and QoL, which is the core dimension of economic development. Also, most of the previous studies were based on limited data (Sapkota, 2011) and because of data limitation (even if some studies were able to overcome the problem of data limitation) the analysis was restricted to only few countries (Davies & Quinlivan, 2006; Sapkota, 2011). Indeed, to the best of our knowledge there is still no empirical evidence available regarding the relationship between international trade and QoL in the member countries of UNDP. Therefore, the objective of the current study is to fill this gap by empirically investigating the nexus of international trade and QoL.

Theoretical Framework and Estimation Methodology

This section presents the theoretical framework while the second section presents the methodology used to investigate empirically the relationship between international trade and QoL.

Theoretical Framework

Sirgy et al. (2004) highlighted the importance of international trade in improving QoL. International trade leads to an increase in the availability of goods and services which boosts QoL. Improving QoL is at the core of development. Being a qualitative measure QoL

does not support empirical analysis; therefore, to cater this problem HDI was used to measure QoL as highlighted by Sirgy et al. (2004). Moreover, the same idea but in a broader sense, that is, the nexus between globalization and QoL was empirically tested by Sapkota (2011) and Majeed (2019). HDI was taken to measure QoL but the data used for analysis came with 5-year intervals. The current study followed the standard model by incorporating international trade instead of globalization as the independent variable in this model. Therefore, the model of the current study is constructed as follows:

$$QoL = f(International\ trade) \quad \text{(a)}$$

Along with international trade, income is another important factor contributing to QoL (HDI). Income increases the purchasing power of the individual; therefore, its importance cannot be denied in improving human development. Although income is an important factor affecting human development, it is not the only factor contributing to human development as it does not capture all aspects of development. Anand and Sen (2000) mentioned that income is not the only factor that explains human development, rather there are other factors as well which affect human development. These factors include health, education, capabilities of individuals, and provision of opportunities to improve the standard of living. Anand and Sen (2000) focused on the concept of QoL.

Education is an important factor which increases productivity, access to jobs and freedom to choose among different alternatives (Nourzad & Powell, 2003). Health also affects QoL. Infant mortality rate depicts the lack of health facilities. Indeed, low infant mortality rate reflects the human development of a country (Nourzad & Powell, 2003; Asongu, 2013).

Urbanization affects human development through the availability of better facilities such as health, education and an improved infrastructure, thus contributes to the enhancement of QoL. The effect of urbanization on human development was discussed by Nourzad and Powell (2003) and Sapkota (2011). Another factor documented in the literature and contributing to QoL is the age dependency ratio suggested by Sapkota (2011). When more individuals are dependent on the bread earner of the family, it leads to the availability of limited resources for human development

and thus constrains the ability to improve the standard of living. Therefore, to incorporate all these factors the model is constructed as follows:

QoL = f (International trade, GDP, Education, Urbanization, Infant Mortality Rate and Age dependency Ratio) (b)

Empirical Methodology

Trade improves QoL by increasing the availability of goods and services. Their mutual relationship was explained theoretically by Sirgy et al. (2004). However, their explanation is not supported by empirical evidence. Therefore, the current study empirically investigates the relationship theoretically explained by Sirgy et al. (2004) and Sapkota (2011). Along with international trade, other factors affecting QoL or human development are income, education, urbanization, infant mortality rate and age dependency ratio (Anand & Sen, 2000; Nourzad & Powell, 2003; Sapkota, 2011; Asongu, 2013; Majeed, 2018). Therefore, the econometric model of the study is stated as follows:

$$QoL_{it} = \alpha_{it} + \alpha_{it} international\ trade_{it} + \alpha_{it} lgdp_{it} + \alpha_{it} education_{it} + \alpha_{it} lurbanization_{it} + \alpha_{it} Infant\ mortality\ rate_{it} + \alpha_{it} age\ dependency_{it} + \mu_{it} \quad (1)$$

i = Cross-sections (1,2,3, …, 184)
t = Time periods (1,2,3, …, 28)

In the above model, international trade is taken as an independent focused variable along with some control variables. The dependent variable of our model is QoL which cannot be measured qualitatively, hence HDI is taken as its proxy instead (Sirgy et al., 2004). The data of the above mentioned focused variables was taken from the World Development Indicators (World Bank, 2018), while the data of the dependent variable was taken from the databank of UNDP. A sample of 184 United Nation member countries was selected for data analysis.

The current study conducted both cross-sectional and panel data analyses. For cross-sectional analysis, OLS and two-stage least squares techniques were employed. For panel data analysis, the study employed the techniques of pooled OLS, random effects, fixed effects, two-stage least squares and generalized method of

moments (GMM). The reason behind the simultaneous application of several techniques is that OLS does not address the problem of endogeneity, therefore, to provide robust results two-stage least squares was employed. Moreover, as pooled estimations do not address the time specific and country specific effects, therefore, random effects and fixed effects were employed. Random effects require no correlation between the regressors and the error term, while fixed effects incorporate such correlation. Though, pooled, random, and fixed effects estimations assume that intercept varies across the countries while the slope is homogenous and also, it does not deal with the issue of endogeneity which is common in empirical literature regarding trade (Frankle & Rose, 2005). Hence, to tackle this problem, the study moved towards two-stage least squares technique and system GMM. System GMM controls for heterogeneity, autocorrelation of both first and second order as well as the problem of simultaneity and so provides reliable and stable results.

Data and Variables

The current section comprises the description of variables used for the analyses and also discusses the sources of these variables.

Description of Variables

The current analysis used two types of data, that is, cross-sectional and panel data. Averages of the variables were calculated to make the data cross-sectional. The variables used in the study were trade (% of GDP), secondary school enrollment (% net), GDP (constant 2010 US$), urban population (% of total population), age dependency ratio (% of working age population), and infant mortality rate (per 1000 live birth). Tables stating variable description and sources are provided in the appendix.

In the current analysis, both GDP and international trade were used at the same time in the model. This was due to the fact that GDP denotes basically the market value of all the final goods and services produced within the borders of a country. Whereas, trade includes both exports and imports of a country. However, GDP includes only the exports; therefore, it can be argued that a very small share of trade is included in GDP. It means that one can

include both the variables at the same time in a model. The analysis also checked for multicollinearity in our model. The mean VIF value of the model is 4.07, which means that the model has no issue of multicollinearity. The current study used variables such as labor force (% of total population aged 15+), tax (% of GDP), and inflation (annual %) to check the sensitivity and robustness of the results.

Results and Discussion

The current section interprets and discusses the results obtained from the cross-sectional and panel data regression techniques. The study used different cross-sectional and panel regression techniques to find out the relationship between trade and QoL. Table 1 reports the results obtained from the cross-sectional OLS regression and shows that regression coefficients of the variables, that is, trade, education, GDP, and infant mortality rate are significant and have the expected signs.

Table 1

OLS Result and Sensitivity Analysis

Variables	CS OLS	Sensitivity Analysis		
	Dependent variable is HDI (QoL)			
International Trade	0.0157***	0.0144***	0.0140***	0.0151***
	(0.0066)	(0.0067)	(0.0068)	(0.0067)
GDP	0.0380***	0.0392***	0.0366***	0.0388***
	(0.0043)	(0.0043)	(0.0044)	(0.0044)
Education	0.00210***	0.00202***	0.00211***	0.00207***
	(0.0011)	(0.0011)	(0.0012)	(0.0011)
Urban Population	-0.0338***	-0.0352***	-0.0326***	-0.0348***
	(0.0044)	(0.0045)	(0.0044)	(0.0045)
Age Dependency Ratio	-0.00126***	-0.00128***	-0.000984***	-0.00127***
	(0.0012)	(0.0012)	(0.0012)	(0.0013)
Infant Mortality Rate	-0.0343***	-0.0341***	-0.0388***	-0.0350***
	(0.0065)	(0.0165)	(0.0168)	(0.0065)

Variables	CS OLS	Sensitivity Analysis		
	Dependent variable is HDI (QoL)			
Labor Force		-0.000551* (0.0012)		
Tax			-0.000305 (0.0014)	
Inflation				0.000211 (0.0011)
Constant	0.209*** (0.0852)	0.248*** (0.0892)	0.234*** (0.0928)	0.212*** (0.0853)
Observations	170	165	146	170
R-Square	0.958	0.959	0.961	0.958

Standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The regression coefficient of international trade is significant at 5% depicting that HDI increases by 0.015% if trade increases by one percent. Increase in trade leads to improvement in QoL (Sirgy et al., 2004; Sapkota, 2011; Majeed, 2018). Similarly, one percent increase in education boosts HDI by 0.021%. The co-efficient of urbanization is negative, though insignificant. Likewise, the regression coefficient of infant mortality rate is negatively significant and indicates that one percent increase in infant mortality rate decreases HDI by 0.0343%. Similarly, the coefficient of age dependency ratio is negative though insignificant.

Columns 2-5 check for the sensitivity of the results by incorporating different control variables. The results obtained are robust and reliable even in sensitivity analysis.

Two-stage Least Squares (Two-SLS)

When the error term is correlated with the independent variables in the model, it creates the problem of endogeneity. To remove this problem, one should introduce some instruments for problem creating variables. These instruments should be exogenous and their exogeneity can be checked through the values of "Durbin" and "Wu-Hausman (Score)".

Equation 1 is afflicted with endogeneity because international trade is correlated with the error term, that is, Cov (trade, μ) ≠ 0. In the presence of endogeneity, estimated results obtained from OLS regressions are biased and inefficient. To address the problem of endogeneity, an instrumental variable technique known as two-stage least squares (Two-SLS) was used (Frankel & Rose, 2005). An instrument must be an exogenous variable that should be highly correlated with endogenous variables and uncorrelated with the error term (hence uncorrelated with QoL / HDI). Frankel and Rose (2005) found that the gravity model is a good solution for confronting the problem of simultaneity. Frankel and Rose (2005) stated that international trade can be determined by the following factors: population, common language among countries, distance, and common borders. Such geographical factors are probably exogenous. However, when they are aggregated across all trading partners it becomes highly correlated with a nation's general trade and thus it makes a virtuous instrumental variable. These variables have recently been used to isolate the effect of international trade in growth studies (Frankel & Rose, 2005).

$$Trade_{it} = \propto_0 + \propto_1 ivtrade_{it} + \propto_2 ll_{it} + \propto_3 col_{it} + \propto_4 distance_{it} + \propto_5 Z_{it} + \omega_{it} \quad (2)$$

Equation 2 is the first stage regression equation for two-stage least squares, where *ivtrade* represents the initial values of international trade, ll is for landlocked countries, *col* constitute the linguistic links (common official language), and *distance* represents the distance between countries (Frankle & Rose, 2005; Mbabazi, 2017). Z represents dummies for different regions, that is, East Asia and Pacific, South Asia, the Middle East and North Africa, Latin America, North America, and Europe. The instruments we used in our model showed the following relationship with endogenous variables, that is, international trade.

The instrumental variables used in the current study are landlocked countries, common official language, population of the country, distance between countries, and regional dummies. Frankel and Romer (1999) and Ariekot (2017) suggested that landlocked countries constitute the best instrumental variable for international trade. Such countries do not have access to trade routes and

inadequate access to the sea is so far the biggest challenge any country can face. This inaccessibility to the sea increases the distance by twofold for internal transference of goods, which in turn increases the time required to transfer goods from one place to another. Border delays along with transport coordination issue can incur a direct cost for the receiver country. The result suggests that in case of landlocked countries, trade decreases by 0.19% for one percent increase in time delays**.**

Moreover, distance between countries also plays a vital role in the pattern of trade between or within countries. The negative impact of distance on trade is quite robust in our findings. Trade is not only reduced by distance between countries but also by international borders. Adjacent countries do more trade than non-adjacent countries which leads to less international trade. Distance and borders not only act as geographical barriers; rather, they also increase the cost of transferring goods between trading partners (Magerman, Zuzanna & Hove, 2015). The other main factors affecting trade include culture and language. Speaking the same language not only facilitates communication; rather, it also makes transactions easier and more transparent. A main problem faced without a common language is that it increases the cost because the ability to speak the same language may lead to easy transactions which in turn lead to more economic benefits (Fidrmuc & Fidrmuc, 2014).

Finally, the second stage equation for two-stage least squares technique which uses the estimated value of international trade obtained from the first stage equation is given below.

$$QoL_{it} = \propto_0 + \propto_1 international\ trade_{it} + \propto_2 lGDP_{it} + \propto_3 Education_{it} + \propto_4 Urbanization_{it} + \propto_5 Infant\ Mortality\ Rate_{it} + \propto_6 Age\ Dependency\ Ratio_{it} + \omega_{it} \quad (3)$$

The first column of Table 2 reports the results obtained from the first stage regression for Two-SLS (Equation 2), where the endogenous variable (international trade) is regressed on exogenous variables, such as the initial value of international trade, landlocked dummies, common official language, distance between countries, and regional dummies. Column 1 of Table 2 shows that 71% of the

variations in international trade are explained by geographical factors. It indicates that the condition of being landlocked can also reduce the scope of international trade. Therefore, we can say that geographical characteristics play a major role in the respective country's pattern of trade and our result is also supported by Ariekot (2017).

Table 2

Two-stage Least Squares Results

First Stage Least Squares Results (1)		Second Stage Least Squares Results (2)	
Trade is an endogenous variable in the first column			
Initial Value of Trade	0.54431***	Trade	0.03677***
	(0.0532)		(0.0121)
Landlocked Countries	0.11528*	Education	0.00198***
	(0.0674)		(0.0012)
Common Official Language	0 .00192	GDP	0.00774***
	(0.0019)	Urban Population	(0.0025)
Distance	0.00116		0.05363***
	(-2.46e-06)		(0.0107)
East Asia and Pacific	-0.02757	Age Dependency Ratio	-0.001186
	(0.10209)		(0.0014)
South Asia	-0.06149	Infant Mortality Rate	-0.012437***
	(0.16836)		(0.0012)
MENA	-0.12668		
	(0.09191)		
Sub-Saharan Africa	-0.21014**		
	(0.11445)		
Latin America	-0.3453***		
	(0.0964)		
North America	0.03851		
	(0.3198)		

First Stage Least Squares Results (1)		Second Stage Least Squares Results (2)	
Trade is an endogenous variable in the first column			
Europe	Omitted		
	Omitted		
Constant	3.5713***	Constant	0.0190***
	(0.6735)		(0.1201)
Observations	134	Observation	134
F-stats	16.77	Wald Chi^2	1981.87
R-Square	0.72	R-Square	0.94
Adjusted R^2	0.68	Durbin Score	0.284
Root MSE	0.28	Wu-Hausman Score	0.299

Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

*Note. T*he instruments used in Two-SLS and GMM models are landlocked dummies, common official language, distance between countries, and regional dummies. Regional dummies were constructed by the authors and the rest were taken from GEO CEPII data source.

Similarly, the current level of international trade pattern is highly affected by the initial or early pattern of trade. This indicates that countries with a good initial pattern of international trade tend to have a better current trade pattern. Moreover, the results of the first stage regression (Table 2) indicate that countries which are far from the equator (absolute longitude near to zero) and have linguistic heterogeneity also have less trade and vice versa (La Porta, Lopez, Shleifer & Vishny, 1999). Though the coefficient of both the variables is insignificant, the next instrumental variable that the analysis used was 'common official language' which showed a positive relationship with international trade. The findings are consistent with Fidrmuc and Fidrmuc (2014). "Distance between countries" was the next instrumental variable used to tackle the problem of simultaneity. The results showed that there exists a negative relationship between international trade and distance

between countries. More distance leads to less trade and vice versa. Our results are consistent with Magerman et al. (2015). Moreover, the exogeneity of instrumental variables can be checked through the value of "Durbin" and "Wu-Hausman (Score)". The null hypothesis stated that "variables used as instruments are exogenous." The *p* values of both scores are greater than zero indicating that the instruments are exogenous. The values are displayed in the second column of Table 2.

Second Stage Least Squares Results

The results of second stage regression are reported in the second column of Table 2 which displays the results when HDI is regressed on the estimated variable of international trade. It can be observed that all regression coefficients (except age dependency ratio) are significant. The regression coefficient of international trade is positive and depicts that one percent increase in trade enhances human development by 0.036%. The result shows that increase in secondary school enrollment, growth of GDP per capita and urbanization are helpful in improving human development. The coefficient of infant mortality rate indicates that one percent increase in infant mortality reduces human development by 0.012%. Similarly, one percent increase in secondary school enrollment and GDP per capita growth improve HDI by 0.019% and 0.077%, respectively. Likewise, HDI expands by 0.053% if urbanization increases by one percent. In case of age dependency ratio, we can observe that the coefficient is negatively insignificant.

Panel Regression Analysis

This section presents the interpretation and discussion of results obtained from panel data estimation techniques. HDI was regressed on international trade with other control variables in Table 3 which shows that all regression coefficients are significant. In the first column, regression coefficient of international trade is positive and significant indicating that one percent increase in international trade boosts HDI by 0.0113%, as proved by Sirgy et al. (2004) albeit qualitatively. Similarly, one percent increase in education and GDP improves HDI by 0.00214% and 0.0497%, respectively. The regression coefficient of infant mortality rate is negative but significant indicating that a one percent increase in infant mortality

rate decreases HDI by 0.00235%. Likewise, the regression coefficient of age dependency ratio is also positive and significant indicating that one percent increase in age dependency ratio decreases HDI index by 0.0018%.

Table 3

Pooled OLS and Sensitivity Analysis

Variables	Pooled OLS	Sensitivity Analysis		
	Dependent Variable is HDI (QoL)			
Trade	0.0113***	0.00976***	0.0108***	0.00840***
	(0.0012)	(0.0015)	(0.0012)	(0.00133)
Education	0.00214***	0.00220***	0.00218***	0.00217***
	(0.0017)	(0.000186)	(0.00017)	(0.00017)
GDP	0.0497***	0.0491***	0.0492***	0.0503***
	(0.0019)	(0.0011)	(0.0011)	(0.0011)
Urbanization	-0.0420***	-0.0419***	-0.0413***	-0.0420***
	(0.0011)	(0.0012)	(0.0011)	(0.0011)
Age Dependency Ratio	-0.000201**	0.001287***	-0.000232**	-0.000190**
	(0.00018)	(0.00119)	(0.0009)	(0.0000)
Infant Mortality Rate	-0.00186***	-0.00212***	-0.00181***	-0.00180***
	(0.0011)	(0.0000)	(0.0000)	(0.0000)
Tax		0.000199		
		(0.0001)		
Inflation			-0.00114*	
			(0.0016)	
Foreign Direct Investment				0.00569***
				(0.0006)
Constant	-0.0205	-0.0277	-0.0139	-0.0298*
	(0.0160)	(0.0190)	(0.0171)	(0.0167)
Observations	2969	2050	2957	2882
R-Square	0.963	0.957	0.963	0.965
F-Stats	7451.74	5841.19	5841.19	6232.82

Standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Fixed Effects Results

Pooled OLS model assumes that all countries are homogenous, and it does not account for time specific and country specific characteristics. This assumption is too restrictive in its nature and it distorts the relationship between the dependent and independent variable across all countries. Consequently, this restriction leads to the inclusion of fixed and random effects methods of panel estimation.

Fixed effects estimates incorporate country specific characteristics and they assume that the intercept varies among cross-sections. Therefore, the current analysis was proceeded using fixed effects technique. Table 4 depicts that the parameter estimates of international trade have a positive and significant coefficient implying that one percent increase in international trade improves human development by 0.0112%, which is consistent with the results obtained from pooled OLS. Moreover, secondary school enrollment also has a positive and significant coefficient indicating that one percent increase in secondary school enrollment improves HDI by 0.00134%. Similarly, one percent increase in GDP positively and significantly affects HDI by 0.0934%.

Urbanization also has a positive but an insignificant impact on human development. However, the age dependency ratio is positively and highly significant at 1% level of significance. It implies that one percent increase in age dependency ratio increases HDI by 0.0038%. On the other hand, the mortality rate shows a negative and significant result depicting that an increase in infant death rate deteriorates the quality of human life.

Random Effects Result

One problem with the fixed effects model is that it estimates the parameter for each unit by including dummy variables for relevant factors which are ignored. This results in the loss of the degree of freedom which substantially reduces the power of the model and increases the standard error of the estimated coefficients. In this situation, it is appropriate to use the random effects model (REM) which does not involve dummies and expresses ignorance through error term.

Table 4

Fixed and Random Effects Results

Variables	Fixed Effects	Variables	Random Effects
Dependent variable is HDI (QoL)			
Trade	0.0112*** (0.0113)	Trade	0.0012*** (0.0012)
Education	0.00131*** (0.0017)	Education	0.0124*** (0.0112)
GDP	0.0934*** (0.0024)	GDP	0.0585*** (0.0133)
Urban Population	0.0129 (0.0184)	Urban Population	-0.0495*** (0.0135)
Infant Mortality Rate	-0.0005*** (0.0012)	Infant Mortality Rate	-0.0113*** (0.0011)
Age Dependency Ratio	-0.0011*** (0.0019)	Age Dependency Ratio	-0.0033*** (0.0018)
Constant	-1.447*** (0.220)	Constant	-0.152*** (0.0414)
Observations	2969	Observations	2969
R-Square	0.879	R-square	0.8599
F-Stats	1523.11	Wald chi2	7197.97
Hausman Test		0.0000	

Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The second column of Table 4 presents the results of the coefficients obtained using random effects regression technique. Column 2 of the same table shows that there exists a positive and significant relationship between international trade and HDI, implying that one percent increase in trade causes 0.0112% increase in HDI which is the proxy for QoL. Moreover, the coefficients of secondary school enrollment, gross domestic product, urbanization, infant mortality rate, and age dependency ratio also indicate a significant relationship. It is noticeable that mortality rate and age dependency ratio depict a negatively significant relationship with HDI which indicates that one percent increase in age dependency

ratio and infant mortality rate decreases HDI by 0.01186% and 0.0011%, respectively.

Contrarily, one percent increase in secondary school enrollment and GDP per capita improves HDI by 0.00238% and 0.0585% respectively, while one percent increase in the urbanization ratio increases HDI by 0.00188%.

Selection between Fixed Effects and Random Effects

In order to examine which technique is more suitable, that is, fixed effects and random effects, Hausman (1978) test was used. The following null hypothesis was tested. H_0: No correlation exists between regressors and error terms. Since the *p* value was less than the level of significance (1%, 5% or 10%), we rejected the null hypothesis and concluded that fixed effects is the more appropriate model. The Hausman value is given in Table 4.

Two-stage Least Squares Technique

Background

If the given variables face the problem of endogeneity, the ordinary least squares regression technique gives biased results. In the current analysis, the variable international trade faces the problem of simultaneity, which means that independent variable is correlated with the error term. Therefore, to tackle this problem, the analysis employed two techniques. The first is two-stage least squares instrumental variable technique, while the other is generalized method of moments (GMM). We used Two-SLS because it uses instrumental variables to treat the endogenous variable of the model. Instrumental variable should be highly correlated with the endogenous variable and it should not show any significant relationship with the error term. Moreover, this technique gives results in two stages. In the first stage, endogenous variable (international trade) is regressed on the exogenous variables or instruments to produce a newly adjusted variable which is exogenous. Therefore, in the second stage, it uses the obtained variable to provide robust and reliable results which are free of endogeneity.

In the current analysis, instrumental variables used are landlocked countries (also called dummies, 1 if the country is

landlocked 0 otherwise), common official language, distance between countries and regional dummies. All these instrumental variables do not show any significant relationship with the error term but they are highly correlated with the endogenous variable. Therefore, the results displayed in the first column of Table 5 are free from the problem of endogeneity. The validity of the instruments can be seen from the values of Sargan and Basman scores which are 0.64% and 0.65%, respectively.

In column 1 of Table 4, the coefficients of international trade and GDP are positively and highly significant indicating that one percent increase in international trade and GDP leads to 0.0013% and 0.051% improvement in HDI. Moreover, the coefficients of education, urbanization, infant mortality rate and age dependency ratio also depict a significant relationship with international trade. These results are consistent with the previous findings of the current study.

Generalized Method of Moments (GMM) Technique

Background

To provide more reliable, consistent, and robust results, the analysis dealt with two other genuine econometric problems, that is, heteroscedasticity and correlation among the error terms of the model. For this purpose, the current study employed the GMM technique. It is better than Two-SLS because Two-SLS only deals with endogeneity, while GMM also deals with heteroscedasticity and correlation among error terms along with endogeneity. Moreover, GMM is a dynamic model which incorporates the lag variables as well to provide more robust results. Besides the lag variables (internal instruments), the GMM model also used other external instrumental variables in the current analysis which are highly correlated with the endogenous variable (international trade) and uncorrelated with the error term, which explains a strong and consistent relationship among the variables. Therefore, the current study proceeded with the updated version of GMM known as system GMM developed by Arellano and Bond following Kpodar and Jeanneney (2008) which provides better results.

Table 5

Two-SLS and GMM Results

Two-SLS Analysis		GMM Analysis	
Dependent variable is HDI (QoL)			
Trade	0.0013***	Trade	0.0112***
	(0.00015)		(0.00115)
Education	0.0123***	Education	0.0012***
	(0.00175)		(0.0011)
GDP	0.0511***	GDP	0.0047***
	(0.0128)		(0.0121)
Urban	-0.043***	Urban	-0.0036
Population	(0.0130)	Population	(0.01211)
Infant Mortality	-0.0118***	Infant Mortality	-0.0014***
Rate	(0.0012)	Rate	(0.0011)
Age	0.0127***	Age Dependency	-0.0115
Dependency	(0.00178)	Ratio	(0.0112)
Ratio			
		Lag of HDI	0.877***
			(0.0249)
Constant	-0.0499***	Constant	0.01849***
	(0.136)		(0.0137)
Observation	1561	Observations	1571
R-Square	0.963	Groups	123
Sargan Score	0.6486	Instruments	24
Basmann Score	0.6583	AR1	0.301
Wald-Chi^2	41737.18	AR2	0.903
Root MSE	0.02989	Hansen Score	0.336

Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Note. The instruments used in the Two-SLS and GMM models are landlocked dummies, common official language, distance between countries, and regional dummies. Regional dummies were constructed by the authors and the rest were taken from GEO CEPII data source.

To test the soundness of internal and external variables as appropriate instruments, the analysis employed Hansen test. The null hypothesis proposed that instrumental variables are exogenous,

that is, they are uncorrelated with the error term. The null hypothesis of Hansen test suggested that the instruments are valid. The second column of Table 5 shows the system GMM results. Lagged value of HDI was introduced to check the convergence effect. The results displayed in Table 5 indicate a significant relationship among variables. The table depicts that one percent increase in international trade improves HDI by 0.012%. Moreover, GDP, educational level, urbanization, infant mortality rate and age dependency ratio also depict a significant relationship among variables. The findings support the discussion of Sirgy et al. (2006) and Sapkota (2011), who found a positive relationship between international trade and human QoL. Moreover, Hansen test also confirmed the validity of the instruments, while the value of autoregressive (AR (2)) which is insignificant depicted that there is no serial correlation among the error terms in the model.

Conclusion

There are many studies and conceptual frameworks available that stress the relationship between international trade and economic growth. However, there are very few studies available in the context of international trade and QoL without which the achievement of economic development is impossible. Therefore, this paper investigated the effect of international trade on QoL in United Nation member countries. To fulfill our purpose, the current study used the panel as well as cross-sectional data of 184 UNDP member countries for the years 1990-2017.

To examine the hypothesis, the study used both cross-sectional and panel data analysis techniques. For panel analysis, pooled OLS, fixed effects model, random effects model, two-stage least squares (Two-SLS) and generalized method of moments (GMM) were used. While for cross-sectional analysis, the study employed OLS and Two-SLS. As pooled OLS does not account for time and country specific characteristics; therefore, random and fixed effects models were employed. These models address the time specific and country specific characteristics but do not deal with econometric issues, such as endogeneity, heteroscedasticity, and correlation among error terms. So, the current analysis proceeded towards Two-SLS and GMM to tackle these econometric problems. It is important to

mention that the results obtained from Two-SLS and GMM are preferable. Both the techniques provide robust, reliable, and consistent results which are free from major econometric issues such as heteroscedasticity, endogeneity, and both first and second order autocorrelation. The suggested policy according to these models is that a country should remove trade barriers (tariff, tax, quotes etc.) in order to encourage international trade which will improve the QoL of its population. According to our findings, trade positively and significantly affects HDI used as proxy for measuring QoL in the current research.

The current study concludes that in UNDP member countries, trade positively affects QoL. It indicates that countries can improve QoL by reducing tariffs and non-tariff trade barriers and by implementing other policies that facilitate international trade. International trade improves QoL by providing technological advancements in health, educational, agricultural and industrial sectors along with other major sectors, as well as by providing quality goods and services and improved health facilities. Therefore, it is important for the governments of all countries to emphasize the promotion of international trade for achieving better QoL which is the cornerstone of sustainable development.

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Appendix A

Description and Sources of Variables

Variables	Definition of Variable	Measurement/Unit	Source
	Dependent Variable		
QoL (HDI)	*"A composite index measuring average achievement in three basic dimensions of human development, a long and healthy life, knowledge and a decent standard of living".*	Range from 0 to 1. 0 for lowest HDI rank while 1 for highest rant.	UNDP (2019)
	Independent (Focused) Variables		
International Trade	*"Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product".*	"% of GDP"	World Bank (2019)
	Independent (Controlled) Variables		
Gross Domestic Product	*"GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and*	"Constant 2010 US$"	World Bank (2019)

Variables	Definition of Variable	Measurement/Unit	Source
	minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources".		
Secondary School Enrollment	*"Secondary education completes the provision of basic education that began at the primary level and aims at laying the foundations for lifelong learning and human development, by offering more subject- or skill-oriented instruction using more specialized teacher".*	"% net"	World Bank (2019)
Urbanization	"*Urban population refers to people living in urban areas"*	"% of total population"	World Bank (2019)

Variables	Definition of Variable	Measurement/Unit	Source
Infant Mortality Rate	*"Infant mortality rate is the number of infants dying before reaching one year of age, per 1,000 live births in a given year".*	"Per 1,000 live births".	World Bank (2019)
Age Dependency Ratio	*"Age dependency ratio is the ratio of dependents--people younger than 15 or older than 64--to the working-age population--those ages 15-64. Data are shown as the proportion of dependents per 100 working-age population".*	"% of working-age population"	World Bank (2019)