

Economic Growth and Human Development: Analysis of Impact-Reversibility Behaviour of Macro-Variables

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Abstract

This paper aimed to examine the nature of impact- reversible reactions, the catalytic (activators) of forward and backward impact reactions of economic growth and human development variables and to set the empirical priorities strategies (EPSs) for achieving both economic growth and human development in developed and developing countries. The data set used in the analysis was constructed by merging countries' human development indices; gross national income (GNI) per capita of the 20 selected countries from 2011 to 2016. The polynomial regression is used to analyse data for examination of the nature of the impact- reversibility behaviour of the economic growth and human development variables. The paper evidenced that the ICT development, government expenditures, net export, life expectancy, personal income and education are activators of the forward and backward impacts-reactions. It concluded that both economic growth and human development are strongly related and activating each other, reversibly (interchangeably). Moreover, the economic growth is a primary input of human development in the forward reaction, i.e., economic growth to human development, and in the later stage (long – run term) the human development becomes an input of economic growth in the backward impact reaction, .i.e. human development to economic growth. The paper recommended that developing countries, in order to attain both economic growth and human development will set their priorities strategies on increases exportation in relating to importation (net export), ICT developments in a country, which reduces labour and operation costs, and government expenditures. On the other hand, the developed countries in order to attain economic growth as their only priority strategic goal will set their priority strategies to increase its income indices, life expectancy and employment rates.

Keywords: Human development; Economic growth; Impact-reversibility behaviour, Forward impact reaction and backward impact reaction.

1. Introduction

One of the active and debatable issues in the fields of economics and development is how to achieve both economic growth and human development. The most frequently asked questions are; how the economic growth affects human development, is it possible a country to concentrate on economic growth and human development comes automatically or it is a vice versa? If not, what should be given a priority? Scholars argue differently, some of them stand on the facts that, economic growth and human development are not related and doesn't influence each other. For example, Mukherjee and Chakraborty (2010) confirm that both growth and development are not related and not influencing each other. They supported by Mehrara and Musai (2013); Colombatto (2006) and Khan (2007). On the other hand, Haller (2012), and Mihaela and Georgiana (2015) argue that growth and development are related and influencing each other. Their finding supports Ranis *et al.* (2000), Boozer *et al.* (2003), and Ranis and Stewart (2005). The debate is still ongoing and creating a policy dilemma for policy makers.

The foundation of this paper is built up on the studies of Ramirez *et al.* (1997); Ranis and Stewart (1997); Ramirez *et al.* (1998); Ranis and Kosack (2004); Ranis and Stewart (2001); Ranis *et al.* (2000); Ranis and Kosack (2004); Boozer *et al.* (2003) and Ranis and Stewart (2005). The paper introduces and deeply explains the concept of the two ways chains - *reversible impact reactions* of the economic growth and human development variables. Broadly, the paper aims to test the reversibility behaviour of the impact-reactions of the economic growth and human development variables. The paper explores the nature of the impact- reactions and the catalytic variables that speed up the reactions either from economic growth to human development or the vice versa.

Specifically, the paper examines the nature of impact- reversible reactions, the catalysts (activators) of the forward and backward impact –reactions of economic growth and human development variables. Moreover, it examines the empirical characteristics of developed and developing countries on the economic growth and human development, and sets the empirical priorities strategies (EPSs) for achieving both economic growth and human development in developed and developing countries.

2. Research Hypotheses

This paper is guided by the following null hypotheses:-

$H_{0,1}$ = There is no significance influence of economic growth on human development.

$H_{0,2}$ = There is no significance influence of human development on economic growth.

3. Review of Empirical Studies

Sen and Mahbub ul Haq are the most well-known human development theorists. The work of Sen is focused on capabilities, what people can do and be. It is these capabilities, rather than the income or goods that they receive (as in the Basic Needs Approach), that determines their well being. This core idea also underlies the construction of the Human Development Index, a human-focused measure of development pioneered by the UNDP in its Human Development Reports. The economic side of Sen's work can best be categorized under welfare economics, which evaluates the effects of economic policies on the well-being of peoples. Sen wrote the influential book 'Development as freedom' which added an important ethical side to development economics (Sen, 1985).

Human Development Report (HDR) (1996), discusses the issue of economic growth and human development nexus. The report addresses three kinds of links that studies are revealed, the strong links-both human development and economic growth are high in this links; weak links –both human development and economic growth are weak/low and the last one is unbalanced links- that, one of the either human developments or economic growth are low or high than other. Human Development Report (HDR) (1996), explains main two effects of the either side, effect of economic growth on household income and spending on human development and effect of economic growth on government policies and expenditure, e.g. policy for correcting the human capital markets-provision of loans to students, insurances for health services, etc. The essence of the strong, weak and unbalanced links is due to difference of human development efficiency in both developed and developing countries Human Development Report (HDR) (1996); UNDP United Nations Development Programme (1990); and UNDP United Nations Development Programme (2009).

Streeten (1994) and Ranis *et al.* (2000) find that economic growth and human development have a two-ways relationship. Moreover, the first chain consists of economic growth benefiting human development with Gross National Income (GNI) Ranis *et al.* (2000). Specifically, GNI increases the human development by increases expenditure from families, government and organizations such as NGOs. With the rise in economic growth, families and individuals will likely increase expenditures with heightened incomes, which, in turn leads to growth in human development (Streeten, 1994). On the other hand, the second chain, the human development benefiting the economic growth. That is, an increase of consumptions on health and education contributes to economic growth (Human Development Report (HDR), 1996; Ranis and Stewart, 1997; Ranis *et al.*, 2000; Ranis and Stewart, 2002; Ranis and Kosack, 2004; Streeten, 1994).

Analysis of the economic growth and human development nexus comes to conclude that the fundamental objective of the economic growth is to achieve the sustainable human development, and the main objective of the human development is to achieve economic growth (Ranis and Stewart, 2001). Some countries fail to transform the higher human development to economic growth, because these two ways relation are not come automatically (Haque, 2004; Ramirez *et al.*, 1998; Ranis and Stewart, 2001; Ranis and Kosack, 2004). One of the possible solutions suggested to improve the links in the countries with weak and unbalanced links is to improve the human capabilities, technology and investment and saving, trading, income distribution and government policy on spending - human development priority expenses (Baishya, 2012; Human Development Report (HDR), 1996; Lee, 2011; Mayer-Foulkes, 2003; Ranis and Stewart, 2002; Ranis and Kosack, 2004; Zhang, 1995).

The study done on investigating the link mechanism between economic growth and human development such as, Ranis and Kosack (2004) explains that the extent that greater freedom and capabilities increase economic performance, human development will have an important effect on growth. Similarly, the extent that increased incomes will increase the range of choices and capabilities enjoyed by households and governments, economic growth will enhance human development (Ranis *et al.*, 2000; Streeten, 1994). Ranis and Stewart (2005), empirically confirm that the significance of various links in each of the two ways chain overtime, from economic growth to human development including human development along with the investment ratio. The economic growth which is an important input into human development improvement is either prior or simultaneous. Therefore, traditional policy advice, which argues that human development improvements must wait until economic expansion makes it affordable, is likely to be in error (Ranis and Stewart, 2005).

Ramirez *et al.* (1998), explore the link between economic growth and human development; identify two chains, one from economic growth to human development, and the other conversely, from human development to economic growth. They find that there is an existing strong positive relationship in both directions. The public expenditures on social services and female education are especially important links in determining the strength of the relationship between economic growth and human development. The investment rate and income distribution are significant links in determining the strength of the relationship between human development and economic growth (Ramirez *et al.*, 1998).

Boozer *et al.* (2003), develop new empirical strategies to estimate the strength of the two ways chain connecting human development and economic growth. They conclude that human development must be given a priority for the achievement of higher economic growth as well as human development. Mukherjee and Chakraborty (2010), confirm that there is a need for further investigation to determine the underlying factors (other than per capita income) which influence human development achievements of a state. On the other hand, some of the scholars confirm that investing more in education, health and nutrition will improve the human capabilities, that, it will leads to improvement in technology, investments and savings (Egibiremolen and Anaduaka, 2014; Ghuman and Bhullar, 2009). They believe that education and training enhance the skills and capabilities of the people and bring them to the centre stage of economic growth (Anand and Sen, 2000; Ranis and Kosack, 2004; Zhang, 1995). According to Ranis and Kosack (2004); Fatah *et al.* (2012); Ramirez *et al.* (1997); Human Development Report (HDR) (1996); Ranis and Stewart (2005); Khan (2007) and Boozer *et al.* (2003) the economic growth and human development

have two chains of relations, chain A-that moves from economic growth to human development and chain B-that moves from human development to economic growth. They confirm the positive relationship between economic growth and human development.

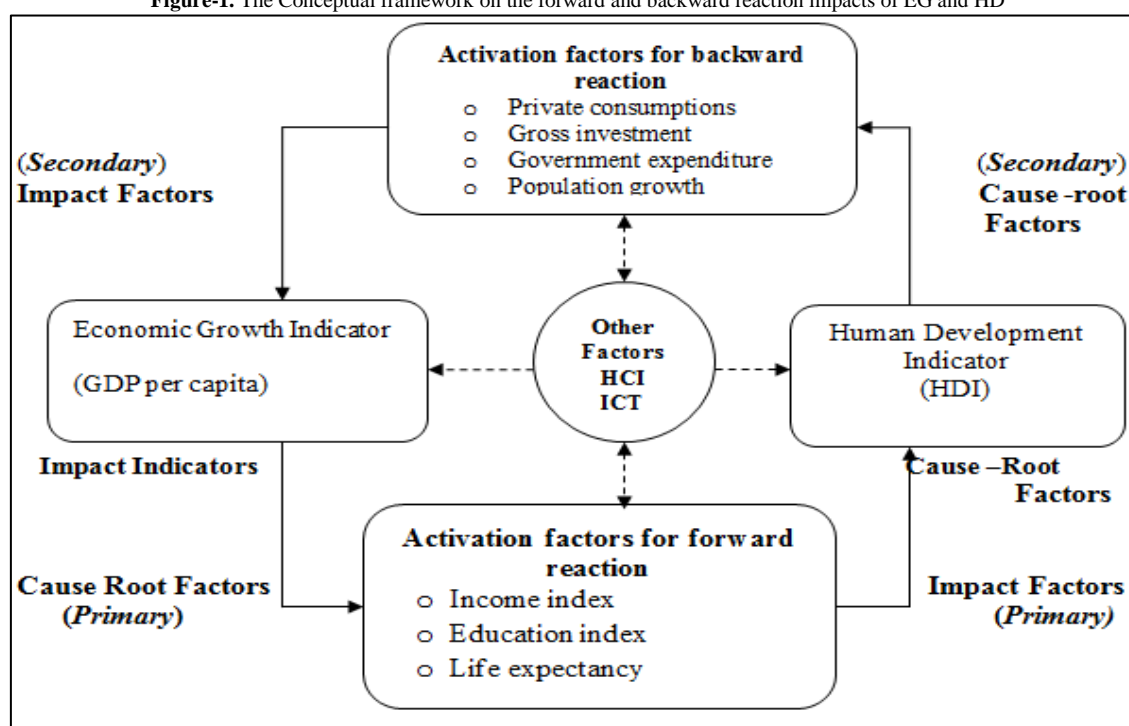
4. Conceptual Framework

The conceptual framework is built on two directional impact- reactions, i.e., forward (primary) and backward (secondary) impact- reactions.

Forward reaction impact (FRI) this is a *primary strategic impact* of the economic growth (EG) on the human development (HD) in the society. It is achieved if a country effectively and optimally prioritised in education, income distribution and health in enhancement of human development. This reaction shows the primary objective of the economic growth to the society. The improvement of education, income distribution and health services in the society highly impacts the life status of the people in the society, hence the human development improved. The education, personal income and health are primary inputs of the human development.

Backward reaction impact (BRI) this is a *secondary strategic impact* of the human development on economic growth in the society. This is achieved if a country characterised with a low population rate, high gross investment, optimal net export, maximum government expenditures and high private expenditures in a country. The employment rate, human capital index and ICT development index are moderator variables that actually rebalance the reactions in both directions in terms of education, skills and health accessibility.

Figure-1. The Conceptual framework on the forward and backward reaction impacts of EG and HD



Source: Author (2017)

The Figure 1 above shows the conceptual framework of the study. The figure shows two ways chains of relations – the forward reaction impact (FRI) and backward reaction impact (BRI).

5. Research Designs and Methods

The study based on a descriptive approach (quantitative) that leads to a description of the determinants as found from practice in the existing situation. A description of practices allowed an analysis to be performed based on the practical reality so as to arrive at conclusions that address the reality (Kothari, 2009). A description of practices is also critical for gaining insight into practices, provides a sound basis for judging their relationships – a central issue in this study, and forms a reliable basis for providing recommendations for further improvements. The study covers 20 countries in the world, 5 countries from each of four strata, i.e., very high human development countries, high human development, medium development and low development countries. The stratified-sampling procedure is used to obtain the sample size. Reasons to use stratified –sampling technique is not only the nature of data and their availability but also for accuracy and generalization of the findings of the study.

5.1. Data Analysis and Model of Specification

The data set used in the analysis was constructed by merging countries’ human development indices; gross national income per capita of the 20 selected countries from 2011 to 2016. Due to acceleration nature of the data of HDI and GNI per capita, the polynomial regression is used to analysis the nature of the impact- reversibility behaviours of economic growth and human development variables. The data of HDI accelerate but have a limit of

unity value. Therefore, it lacks the power of polynomial regression. From this ground the HDI data are analysed in linear regression model.

Polynomial regression models used to test the impact - reversibility behaviour of economic growth and human development variables.

$$HDI = \alpha + \beta_1.GNIpc \dots \dots \dots (i)$$

$$GNIpc = \alpha + \beta_1.HDI + \beta_2.(HDI)^2 \dots \dots \dots (ii)$$

Where

- HDI= Human Development Index
- GNIpc = Gross National Income per capita
- α = Constant term of the model
- $\beta_{i=1}$ = Coefficients of the model

6. Findings and Discussion

The study aims to test the impact-reversibility behaviour of economic growth and human development variables. It uses data from 20 countries sampled from developed and developing countries. Both linear and polynomial regression models are used to test the impact-reversibility behaviour of economic growth and human development variables.

6.1. The Nature of the Impact Reversible Reactions

6.1.1. Direction of the Reaction

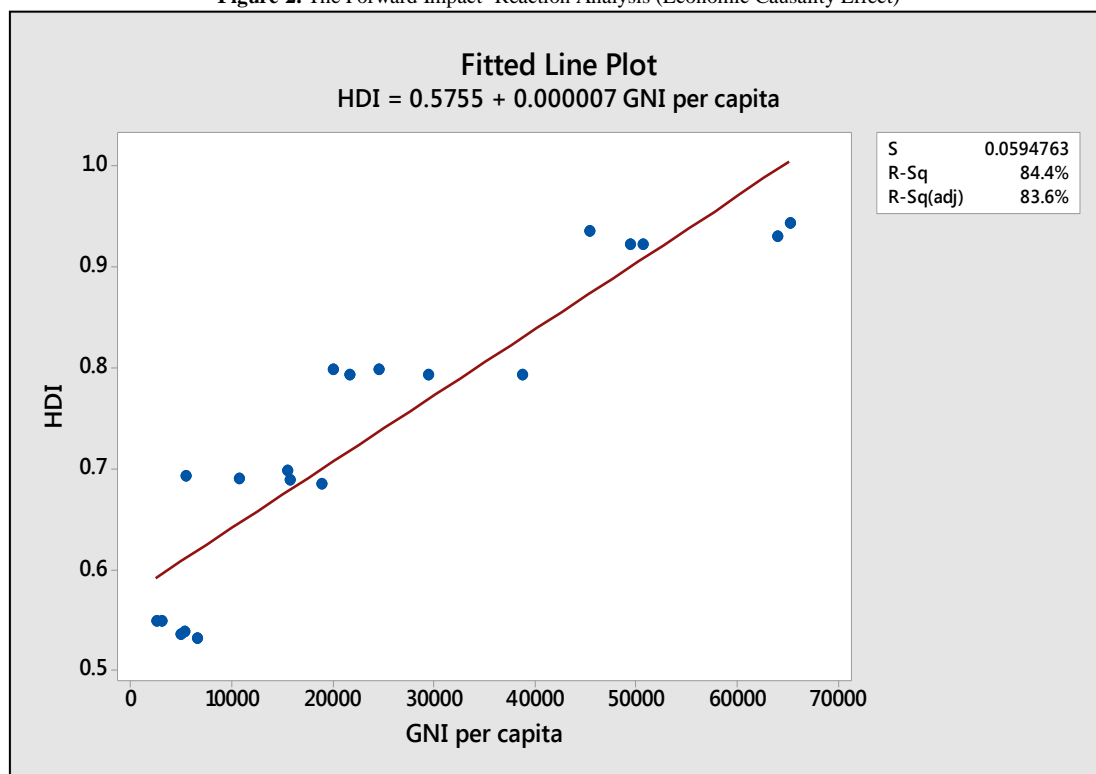
Direction of a reaction is preliminarily determined by the intensity of the activating factors. In examining the nature of the forward and backward impact reaction, empirically we found that human development is influenced by economic growth and on the other side the economic growth is influenced by human development in developed and developing countries. The regression analysis was done on the two relations. The regression model for forward and backward reactions portrays the positive influence for both directions (Figure 1).

6.1.2. Forward Impact -Reaction

HDI = 0.5755 + 0.000007 GNI per capita
S = 0.0594763, R-Sq = 84.4%, R-Sq (adj) = 83.6%, P-Value =0.000

The equation shows the *natural value* of HDI is 0.5755, the value at which the GNI per capita is not involved (equalised to zero). The ability of GNI per capita to affect the HDI is 0.000007 unit of HDI per unit of US Dollar distributed as GNI per capita. The coefficient analysis shows the little impact or weak causality effect of economic growth on human development. This is a weak reaction mostly experienced by the developing countries.

Figure-2. The Forward Impact- Reaction Analysis (Economic Causality Effect)



Source: Field data (2017)

The figure 2 shows a relationship between human developments measured in HDI and economic growth measured in GNI per capita. The figure shows the positive relationship between human development and economic

growth. The line of best fit is determined at 84.4%. This figure confirms that, human development influenced by changes of economic growth in positive ways.

6.1.3. Backward Impact-Reaction

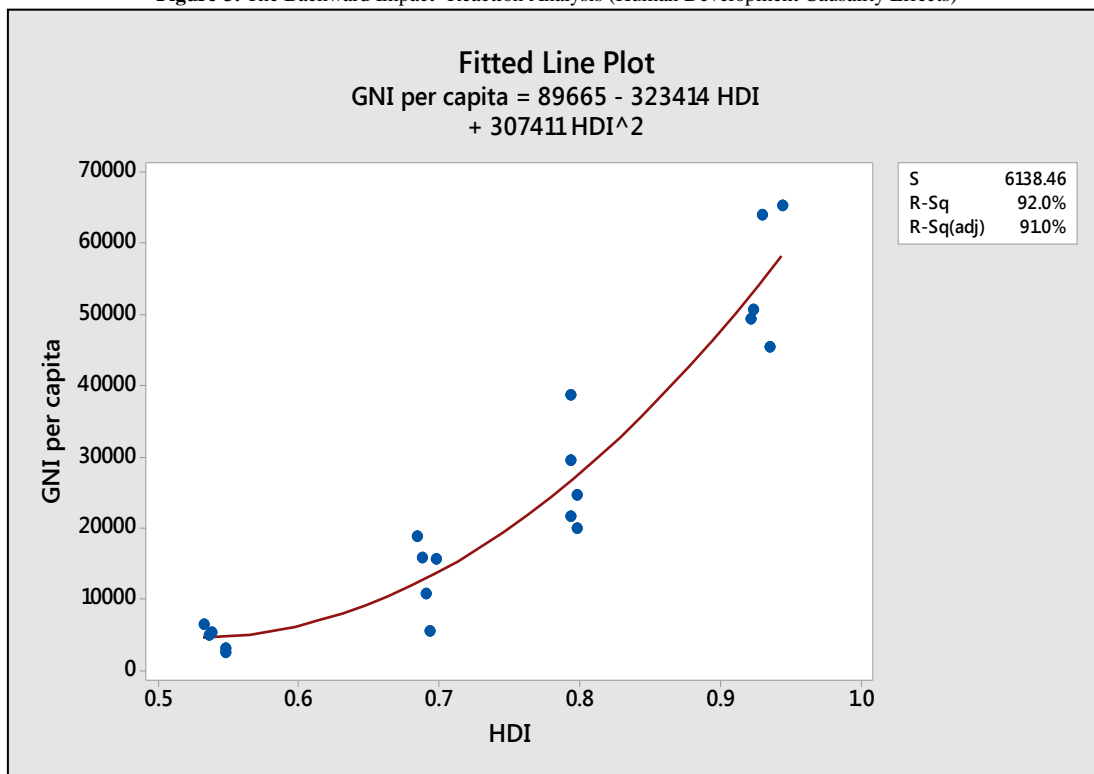
$$GNI\ per\ capita = 89665 - 323414\ HDI + 307411\ HDI^2$$

(0.000) (0.000) (0.001)

For domain $0.5755 < HDI \leq 1$

$S = 6138.46$, $R-Sq = 92.0\%$, $R-Sq\ (adj) = 91.0\%$

Figure-3. The Backward Impact- Reaction Analysis (Human Development Causality Effects)



Source: Author (2017)

The figure 3 shows the polynomial regression model on GNI per capita and human development in developed and developing countries. The figure shows the quadratic relations of the variables. The line of the best fit is determined at 92.0% at 5% significance level. This figure confirms that the economic growth is influenced by human development in a country.

The polynomial regression model shows the two strategic impacts of the human development on economic growth. The first (primary) impact of the human development on economic growth is to reduce the GNI per capita; this is due to prioritization effect on the human development *built-in-factors* strengthening. At the advancement stage of human development the squared HDI increases the economic growth; this is experienced by the developed countries. It is the second (secondary) impact of human development on economic growth. At the maximum level of human development, the GNI per is 73,662 US dollars. These are the characteristics of the backward reaction, from human development to economic growth. The graphical presentation of the GNI per capita and human development is shown in the figure 3.

6.2. Reaction Timing

The study finds that there are two types of the impact-reactions. The forward (primary) and backward (secondary) impact-reactions occur on a sequential timing. The primary reaction that moves from economic growth to human development is occurred first. The study reveals this kind of reaction is experienced by developing countries. In the later, at the advancement of human development, the backward reaction impact happens. This is the impact of human development on economic growth. At this stage countries experienced with high level of technology, employment rate, innovation, ICT development as the results of prioritising in human development. The backward reaction is a long- term impact that requires high investment in human capital in terms of education and health. The study found that only developed countries are now experiencing backward reaction impacts. They use their powers and ability in human development to generate more national income. The developing countries are now experiencing the forward reaction, characterised with education problems, health problems, low ICT and innovations.

6.3. The Catalysts (Activators) of Impact Reversible Reactions

The study examines the factors that direct influences the “built-in-factors” of economic growth and human development in developed and developing countries. The tested factors for the forward impact- reaction are ICT development index, employment rate, private consumption per capita, gross investment, and government expenditure, human capital index (HCI), population rate, and net export. The multivariate regression analysis was run. For backward reaction the regression analysis was done on examining employment rate, human capital index, ICT development index, income index, life expectancy and education index.

6.3.1. Analysis of Reaction Activating Factors

6.3.1.1. Primary Impact of GNI Per Capita on Human Life (Forward Reaction)

Regression Equation

$$\begin{aligned} HDI = & 0.4371 + 0.05525 ICT\ Index + 0.00176 HCI - 0.001192 Employment\ Rate \\ & (0.001) \quad (0.000) \quad (0.317) \quad (0.216) \\ & + 0.000001 Private\ consumption\ pc + 0.00119 Gross\ Investment\ (\%GDP) \\ & (0.639) \quad (0.347) \\ & - 0.002427 Government\ Expenditure\ (\% GDP) + 0.001378 Net\ Export\ (\% GDP) \\ & (0.017) \quad (0.010) \\ & + 0.0042 Population\ Growth\ (\%) \\ & (0.714) \end{aligned}$$

6.3.2. Model Summary

$$S = 0.0275297, R-sq = 97.96\%, R-sq (adj) = 96.48\%, R-sq (pred) = 86.87\%$$

The model explained at 97.96% level of determination, with a standard error of 0.0275297. This is significance and the best level of determination of the model. The ICT development index and net export show the positive activating power of 0.05525 HDI, and 0.001378 HDI for each unit of a variable respectively. There is a negative influence of government expenditure on human development that reduces -0.002427 HDI for each unit of currency used or spends by the government. Therefore, ICT development index, government expenditure and net export are the factors that influence the primary reaction, i.e., that are factors that activating the *built-in* -factors of HDI (income, education and health).

6.3.2.1. Secondary Impacts of Human Development (HDI) on GNI per Capita (Backward Reaction)

Regression Equation

$$\begin{aligned} GNI\ per\ capita = & -114891 + 552 ICT\ Index - 82 HCI + 515 Employment\ Rate \\ & (0.000) \quad (0.749) \quad (0.607) \quad (0.001) \\ & + 3373 Education\ Index + 78337 Income\ Index + 689 Life\ Expectancy\ (Years) \\ & (0.905) \quad (0.001) \quad (0.045) \end{aligned}$$

6.4. Model Summary

$$S = 5186.54, R-sq = 95.61\%, R-sq (adj) = 93.59\%, R-sq (pred) = 87.84\%$$

The model is determined at 95.61%, with an error of 5186.54. The model depicts the employment rate, income index, and life expectancy is statistically evidenced to have positive influences on GNI per capita. Therefore, the employment rate, income index and life expectancy in a country positively influence the built-in-factor of GNI per capita. Thus, the activation factors for secondary reaction-backward reaction are employment rate, income index, and life expectancy. This means the employment increases the income of an individual, then increases the personal expenditures (private expenditures), that results on increasing of the GDP of a nation. Life expectancy improves and stabilizes the national workforce that increases the productivity of the nation as well as they contribute positively to the national income.

6.5. Variable Elasticity Coefficient Analysis

For sensitivity analysis of the variables in the economic growth and human development functions, the coefficients analysis was done. This is to measure the effectiveness of each variable. The study finds that the forward (primary reaction), i.e., economic growth to human development, the ICT development has “single effect” (individual effects) of about 9.8 per cent at the maximum level of human development. The level of government expenditures has a single effect of 0.43 per cent and the level of efficiency on human capital investment has single effect of 0.31 percent. And the rest variables in this forward equation have the less single effects of 0.31 percent. Here, figures in numbers should not be taken into consideration but the magnitude effect; the word *more or high, less or low* will be preferred in interpreting these figures. For example, we can say that the ICT development has more positive impact on human development than other variables tested or involved in this study. And the others should be interpreted in the same ways.

The backward (secondary) reaction, i.e., human development to economic growth, the single effects of the variables are not presented in percent because there no limited-upper values of GNI per capita as the measure of economic growth. The magnitude of the number is used to interpret the single effects, but this will not convey a sound meaning to the policy makers. As a general rule, the higher coefficient of the variable indicates the higher

individual effects. Therefore, the study confirms that the variables that have high individual effects on this reaction are education index and income index. These will be the most policy priority of the countries favoured to this impact-reaction; mostly are developed countries. The life expectancy and employment rate have also marginal single effects in comparison with others.

6.6. The Empirical Characteristics of Macroeconomic Variables

The descriptive statistics of the variables are displayed in the [table 1](#) for the purpose of understanding the general characteristics of the countries sampled from developing countries and developed country. The characteristics of the variables values of developing and developed countries represented by minimum and maximum statistical values respectively.

Table-1. Descriptive Statistics for empirical variables of the sampled countries in developing and developed countries

Variable	Mean	SE Mean	StDev	CoefVar	Minimum	Maximum
HDI	0.7392	0.0328	0.1468	19.85	0.5320	0.9440
ICT Index	5.251	0.552	2.470	47.03	1.820	8.850
Employment Rate	61.52	2.43	10.88	17.69	44.70	79.80
HCI	66.62	3.50	15.67	23.52	22.00	87.16
Education Index	0.6694	0.0398	0.1778	26.56	0.3710	0.9270
Income Index	0.7485	0.0355	0.1586	21.18	0.4640	0.9760
Life Expectancy (Years)	72.14	1.77	7.92	10.98	52.40	83.40
Private consumption pc	10660	1834	8200	76.92	832	27147
Gross Investment (%GDP)	20.77	1.51	6.75	32.51	10.60	32.80
Government Expenditure(%)	33.59	2.43	10.87	32.36	12.30	52.50
Net Export (% GDP)	3.26	4.11	18.38	564.71	-41.30	39.10
Population Growth (%)	1.589	0.432	1.933	121.66	-0.790	8.450
GNI per capita	24862	4579	20480	82.38	2500	65210
HD Velocity Rate	0.002600	0.000358	0.001603	61.64	0.000000	0.006000
GDP-Growth Rate	2.775	0.725	3.240	116.77	-3.900	8.500

Source: Author (2017)

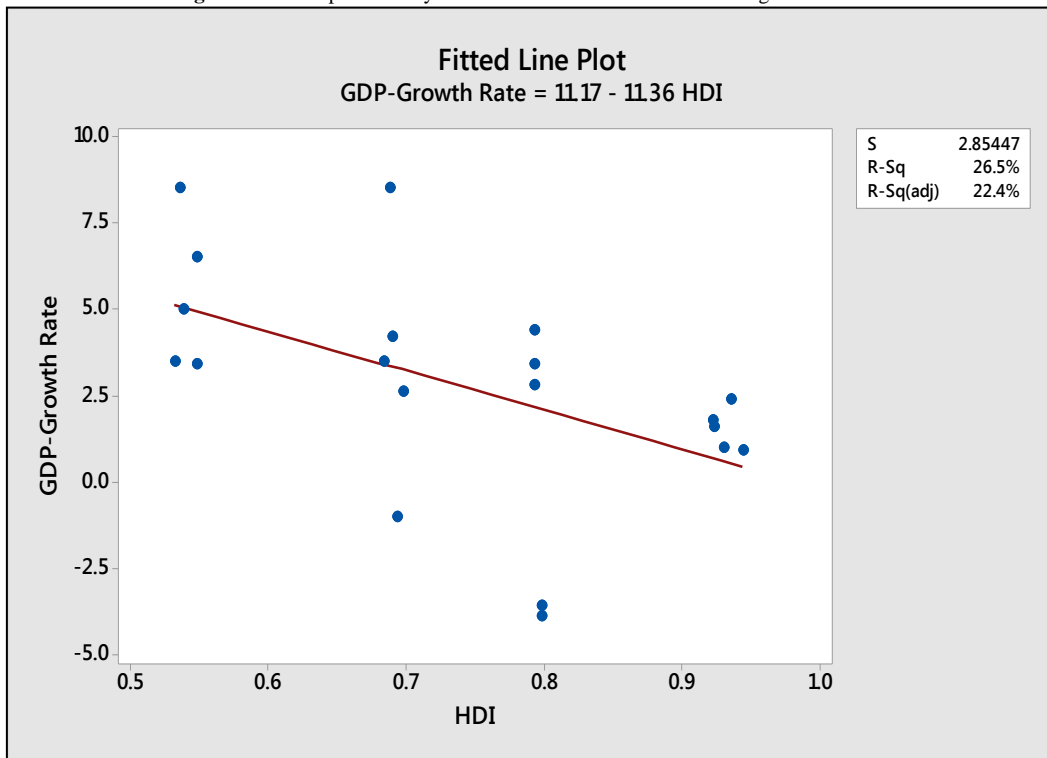
The [table 1](#) shows the descriptive statistics of the determinants of economic growth and human development in developing and developed countries. The relative variability of the human development is about 19.89, with the mean of 0.7392 in the range of 0.5320 to 0.9440. These numerical figures indicate *the shorter intervals* in human development between the developing and developed countries. Most of the developing countries are performing well in human development. The data show a shorter interval among very high, high, moderate and low human development countries.

The GNI per capita in developing and developed countries varies from 2,500 US dollars to 65,210 US dollars, with a mean of 24,862 US dollars and standard error of 4,579 US dollars. These numerical figures show the extreme variation /interval of GNI per capita between developing and developed countries. This means, there is an extreme disparity in economic growth between developing and developed countries.

6.7. Policy Priority and Objective Commitment

The *speed of the economic growth* (informally velocity) was tested by using Real GDP Growth Rate in the some of the countries with very high, high, medium and low human development indices. The study finds that the velocity of the economic growth speeds up from the low human development countries to the very high human development countries-negative related ([Figure 4](#)). This means that countries which characterised with low or medium human development, their economies are growing faster than those of countries characterised with very high or high human development indices. This is because of *human development priority effects* - the developed countries differ in policies prioritization with the developing countries. Most of the developed countries' policies aim at economic *stabilisation* but in most developing countries their policies aims to *economic growth*, this is two difference visions and approaches, and it is the reason of developing countries to experience higher GDP growth rate than developed countries. Because of the fact that most of the developed countries have very high and high development indices and their economic velocity is low- Real GDP Growth rate, this provides the negative nature of the relationship between economic growth speed and the human development.

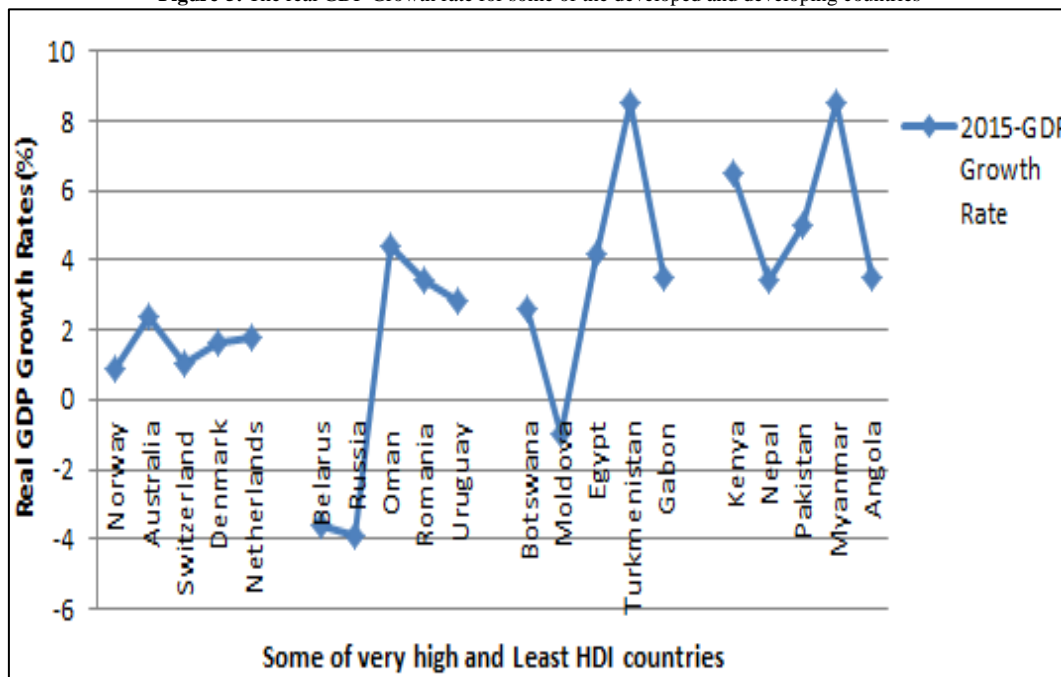
Figure-4. The empirical analysis of GDP Growth rate and HDI in regression model



Source: Author (2017)

The figure 4 shows the relations between GDP growth rate and human development index in developing and developed countries. The figure profiles the negative relations between GDP growth and human development, with 26.5% level of determination. This implied that the high change of GDP is experienced by the countries with low HDI; this doesn't imply that the high GDP Growth rate reduces the human development in country; this is the *timing data effects*. The study shows the developing countries are faster accelerating to growth than developed countries (Figure 5).

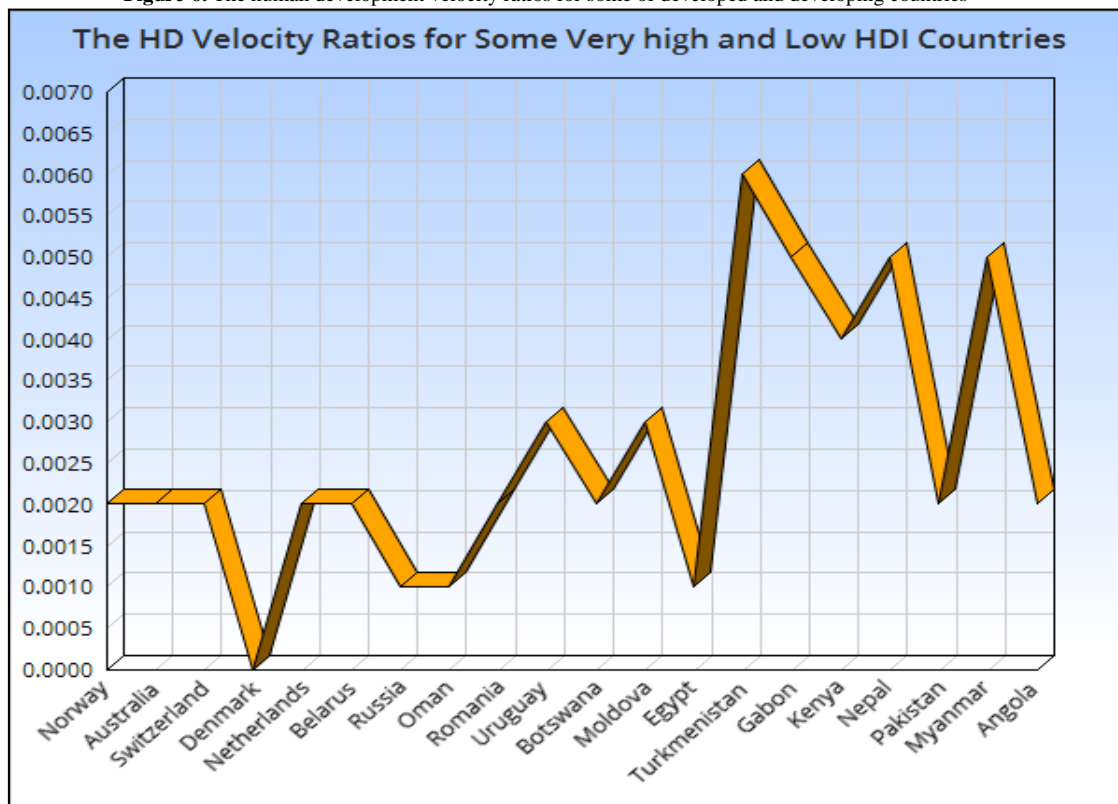
Figure-5. The real GDP Growth rate for some of the developed and developing countries



Source: Author (2017).

Figure 5 shows the real GDP Growth rate of the sampled countries in developing and developed countries. The figure shows that the developed countries experience the lower GDP Growth rate to compare to developing countries; this is due to the priority and commitment effects. The development commitment is higher in developing countries than in developed countries. In other words, the developing countries are improving human development faster than developed countries. The speed of HDI in developed countries is lower to compare to those of developing countries (Figure 6).

Figure-6. The human development velocity ratios for some of developed and developing countries



Source: author (2017)

Figure 6 shows the developed country experiences the slower change in human development to compare to those of the developing country. This means the developing countries have strictly policy and objective commitment on human development to compare to the less developed countries that prioritised on the human development. Denmark shows no change of the human development intensity (index) in two years from 2014 to 2015. Norway, Australia, Switzerland, Netherlands characterised with very high human development intensity in the countries and tend to have little changes in human development per year. This is quite different with Angola, Myanmar, Pakistan, Nepal, Kenya, Gabon and the likes which characterised with the least human development intensity, and experiences higher changes of human development intensity.

6.8. Empirical Priorities Strategies (EPSs) for Developed and Developing Countries

The variables sensitivity analysis and factors analysis help to understand the single effects of each variable in primary and secondary reactions impact. The study statistically finds that the primary impact reaction that experienced by most of the developing countries is activated by net export, ICT development and government expenditures. The human capital investment has a negative impact on human development in developing countries. From this statistical evidence, the developing countries, in order to attain both economic growth and human development will set their priorities strategies on increases exportation in relating to importation (net export), ICT developments in a country, that will reduces labour costs and operation costs, and reduce the government expenditure. These are main set of priorities in developing countries. The gross investment, investment in human capital, private consumptions per capita, population rate have a positive influence on human development in a country, but not statically proved.

The backward (secondary) reaction, mostly experienced by developed countries statistically evidenced to be positively related to GNI per capita distributed in the population (income index), employment rate and life expectancy. The ICT development, employment rates, and education index have a positive influence on economic growth, but investment in human capital has a negative influence in developed countries. From this statistical evidence, the developed countries in order to attain economic growth as their only priority strategic goal will set their priority strategies to increase its income indices, life expectancy and employment rates.

7. Tests of Hypotheses

The study aimed to test the impact-reversibility behaviour of economic growth and human development variables in developed and developing countries.

Two sets of hypotheses were tested at 5 percent of significant level. The GNI per capita has a coefficient of 0.000007, $R-sq$ 84.4 percent, $p-value$ of 0.000. In testing the first set of the hypothesis at 5 percent level of significant, the values of *calculated probability* are less than *alpha levels*, that is $0.000 < 0.05$. From this fact we lack the empirical evidence to accept the null hypothesis, therefore, we conclude that human development in the society in both developed and developing countries results from the advancement of economic growth in their countries.

The second set of hypotheses was tested at 5 percent level of significant. From the polynomial regression, the coefficient of human development index in the linear relations is -323414 and 307411 in the quadratic relations, with R

This study confirmed that economic growth and human development are strongly related. It confirms to (Boozer *et al.*, 2003; Ramirez *et al.*, 1998; Ranis *et al.*, 2000), and others that there is a strong relationship between economic growth and human development. On the other hand, the study contradicts to Mehrara and Musai (2013), Colombatto (2006) and Khan (2007). The economic growth depends on the human development, and human development depends on the economic growth. As suggested by Boozer *et al.* (2003) the priority should pay to human development to raise economic growth and human development at the same time. The increase of income of the individuals in a country (high GNI per capita) increases the range and capabilities of choice enjoyed by the household, government and other organisation, including NGOs (Gupta and Gangal, 2015; Ranis and Stewart, 2002; Srinivasan, 1994). The increase of this enjoyment or consumption increases the human development in a particular country. The increase of consumption on health and education forces the economics to grow. This relationship is termed as the two ways chain relations, which depends on the *activating factors on each side*.

Empirically, the activating factors for forward reaction are found to be ICT development, net export and government expenditure. The advancement of ICT and increase the exportation in a country and reduces the government expenditure improves the human development in a country. This confirms to Ghuman and Bhullar (2009) and Eigbiremolan and Anaduaka (2014). The backward reaction, human development to economic growth is activated by employment rate, high personal income and high/better life expectancy in a country. These activators are the outputs of the human development in a country. Therefore, the improved or better employment rate, personal income and life expectancy in a country foster the economic growth. This confirms to Ranis and Kosack (2004) Ahmad *et al.* (2013); Anand and Sen (2000); Bundala (2012); ; Zhang (1995).

8. Conclusion and Policy Implications

8.1. Conclusions

The study sought to find out the relationship mechanisms of economic growth and human development with its activating factors in developed and developing countries. The considerable factors to improve either economic growth or, and human development were identified in this paper. In general both the economic growth and human development strongly related. The economic growth is the primary input of human development in the forward reaction, i.e., economic growth to human development. This kind of relation experienced by developing countries, like Tanzania, Kenya, Pakistan, Myanmar, Angola, and others. The activating factors for this reaction are employment rate, income index and life expectancy.

The economic growth is the output of the human development in the later stage. This is the backward reaction. The activating factors are ICT development, net export, and government expenditure. The advancement of human development in a country leads to improve the economic growth. This is a long– run term impact. This mostly, now is experiencing by the developed countries likes Norway, Australia, Denmark, the Netherlands, Switzerland, and others. The political policies and technology invested in a country have a positive impact on both human development and economic growth. The country may have high GNI per capita but fails to improve her human development status, due to imperfection of political policies and technology invested in a country.

The study found that improving social services (increasing consumptions) on health services, education service, reducing the government expenditures, increase the employment rate, ICT advancement and improving life expectancy will improve both economic growth and human development in developed and developing country.

8.2. Policy Implications

The two major policy implications are posed by this study. The most of the developing country experience with the forward reaction and advance their economic growth through multiple development programmes for the aim of improving the human development. The reaction statistically evidenced to be subject of ICT development, net export and government expenditure, therefore the improving of ICT development, raising net export and reducing the government expenditure will be a policy priority in developing countries. The application of these strategies will reduce the labour costs, increases the productivity and reduce the operational costs. These strategies will boost both economic growth and human development.

On the other side, the developed countries like Norway, Denmark, Australia, Switzerland, and others are now experiencing the backward reaction impacts. That is, their improved economic growth advances the human development. The advanced human development stabilises the economic growth by improving income distribution, employment opportunity, employment rate and life expectancy. Therefore, concentration on the aforementioned backward activators will be policy priority in developed countries.

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