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Growth Effects of Economic Globalization: A Cross-Country Analysis

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GROWTH EFFECTS OF ECONOMIC GLOBALIZATION: A CROSS-COUNTRY ANALYSIS

Sovna Mohanty*

Abstract

This paper analyses the effect of economic globalization indicators on economic growth through the channels of Total Factor Productivity (TFP) by using panel data approach and conducting policy simulations. The analysis is done on cross-country framework comprising developed, developing and least-developed countries in the post-liberalization period. The study also derives country-specific implications for India. The results show that most globalization indicators lead to higher total factor productivity with the exception of imports. Of the globalization indicators, FDI is beneficial for high--income economies and export is important for the low-income economies. The policy simulations prove that India has fared better than some advanced economies despite belonging to the lower-middle-income category which is synonymous with India's growth story.

1. Introduction

Growth disparity across economies has been a serious challenge to economists worldwide. Developing economies can enhance their economic growth through an increase in productivity. In the globalized era, economies become closely associated with external factors such as trade openness and FDI making them more productive than economies which produce for domestic markets. A study of how globalization impacts economic growth, indirectly through productivity could lead to drawing important policy conclusions for growth prospects and poverty reduction.

Based on the above literature review, the following are the focus of the study-

a) *Measurement of TFP:* Firstly, we have employed the growth accounting method which is a parametric approach and is based on strong theoretical assumptions as opposed to Frontier analysis.

b) *Determinants of TFP:* Secondly, We have tried to look for a rich set of explanatory variables from a purely empirical perspective which includes both globalization indicators and control variables. Earlier studies have studied the impact of either Trade openness or Investment in terms of FDI or Foreign investment inflows separately on TFP.

c) *Decomposition of TFP:* To gain an insight into how the factors differ in their contribution to TFP across the various income categories, we have decomposed to show the contribution of globalization variables and other factors based on the panel regression results.

d) *Policies conducive to improve TFP growth and hence economic growth.* Thirdly, we have tried to conduct a few policy simulations to explain TFP growth and GDP growth and those important for India.

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The rest of the paper is organized as follows: Section 2 presents the review of related literature; Section 3 presents the methodology to estimate the impact of economic globalization on economic growth, and explains the empirical framework, section 4 explains the estimated results, section 5 discusses policy implications for India and Section 6 concludes the study.

2. Review of Related Literature

Economic Globalization is a multidimensional concept and has been defined and measured variously over the years. The KOF Index of Globalization was introduced in 2002 (Dreher, 2006). Following Norris (2000) and Keohane & Nye (2000), it defines globalization to be the process of creating networks of connections among actors at multi-continental distances, mediated through a variety of flows including people, information, and ideas, capital and goods. More specifically, the three dimensions of the KOF index are economic globalization, political globalization, and social globalization. Broadly, economic globalization has two dimensions. The first index includes actual economic flows which are data on trade, FDI, and portfolio investment. The second index refers to restrictions on trade and capital using hidden import barriers, mean tariff rates, taxes on international trade (as a share of current revenue) and an index of capital controls.

Neo-classical growth models support the prediction that international trade affects economic growth. Grossman and Helpman (1991) identify the channels of openness – international transmission of ideas; an international flow of goods and services and international movements of capital. A larger amount of trade helps in improving the productivity by bringing in more efficient technology for production which increases the total factor productivity and improves economic growth. International trade through various transmission mechanisms (technological progress, R&D) leads to increase in knowledge transfer, the size of the market and thus an improvement in economic growth. FDI increases the stock of knowledge by labour training and skill acquisition.

The empirical literature on the impact of economic globalization on economic growth can be divided into two strands; one, which looks at the impact of economic globalization on economic growth directly and the other, which looks at the impact through TFP.

There are a number of studies which look at the impact of economic globalization on economic growth directly (Dreher 2006: Harrison 1996; Li and Liu 2005; Balasubramanyam *et al* 1996). Dreher (2006) analyzes empirically whether the overall index of globalization, as well as sub-indexes affects economic growth. The results show that on an average, countries that have globalized more than the others experienced higher growth rates, especially in the case of developed countries. Harrison (1996) has tested various measures of trade openness on economic growth and points to bidirectional causality between openness and economic growth. Balasubramanyam *et al* (1996) have tested the hypothesis whether the growth enhancing effects of FDI are stronger in countries which pursue an export promotion policy than in those following an import substitution one. Their results suggest that in export promotion countries, it is FDI which acts as a driving force in the growth performance followed by additions to the labour force and increased exports. Li & Liu (2005) examine the relationship between FDI and economic growth, and find a strongly paired relationship between FDI and economic growth in

both developing and developed countries, not only through FDI, but also through its interaction with other important factors.

The other strand looks at the impact of economic globalization on economic growth through TFP.

There have been a number of studies which explain the effect of TFP on economic growth (Chen, 1997; Tamura, 2002). One of such studies is by Chen (1997) who collects evidence on the impact of technological change on economic growth. He finds that relative importance of factor inputs as a source of economic growth would change over time depending on the stage of economic development. The effect of the technological change was mostly in the fast growing industrializing countries and very small in the slow growing developing countries. Similarly, Tamura (2002) concludes variation in input growth per worker could account for 35% and TFP growth for about 87% of the variance in the growth of output per worker across all countries.

There are several studies which have investigated the determinants of Total Factor Productivity at the global level (Miller & Upadhyay, 2000; Edwards, 1998; Borzenstein *et al* 1998;). Miller & Upadhyay (2000), Edwards (1998), and Wu (2004) have highlighted the role of trade openness and human capital in improving the economic growth through total factor productivity in cross country studies using panel data techniques.

Edwards (1998) has tested various measures of trade openness on TFP growth in a cross – country framework and finds that TFP growth is faster in more open economies; human capital and initial GDP have proved crucial in explaining the variation in TFP growth amongst economies. Wu (2004) has isolated the influences of openness on technological progress and efficiency. Openness has a positive and significant effect on both technological progress and efficiency.

Miller & Upadhyay (2000) and Rath & Parida (2014) study the impact of human capital and openness on TFP in a cross-country framework. Miller & Upadhyay (2000) find that for high levels of per capita income, trade has a positive significant impact, although its effects are negative for low per capita incomes. This means that for low-income countries a certain level of human capital is necessary to enjoy the benefits of trade. Rath and Parida (2014) find that long-run causality running from trade openness and human capital to TFP whereas in the short-run, there exists a bi-directional causality between trade openness and total factor productivity and between total factor productivity and human capital.

Several studies have offered evidence on how FDI affects TFP and hence economic growth. Mello (1999) examined the effect of FDI on growth and capital accumulation and the results are in line with the importance of the role of TFP over factors in explaining cross-country income differences. Mello (1999) suggests that FDI boosts long- run growth via technological up gradation and knowledge spill over. Knowledge transfers are expected to augment growth through labor training and skill acquisition. Kose *et al* (2009) find that financial openness (measured by capital account openness) is associated with higher medium-term TFP growth whereas financial integration (measured by the stock of external liabilities to GDP), is not correlated with TFP growth.

Several studies have highlighted the role of variables such as health, education, knowledge, structural change etc in TFP. Alvi and Ahmed (2014) study the impact of health and education on TFP

and find significant and positive impact on TFP for both indicators. There are several studies which have highlighted the role of knowledge in improving the productivity of the economy. Mastromarco and Ghosh (2009) have studied channels of technology diffusion, import of research and development, import of machinery, etc to see the effect on TFP of developing countries. The results show that positive effects of FDI, imported research and development depend crucially on the level of education. Borzenstein *et al* (1998) emphasize on FDI being an important channel for transfer of technology. Imports of high technology products, adoption of foreign technology are various means facilitated by multinational corporations. They find that a threshold level of human capital is necessary to ensure a higher productivity of FDI.

Of the two strands of literature review elaborated above, there are clear advantages of using the approach where productivity is used as a channel for economic globalization to affect economic growth. The determinants of economic growth in the literature are divided into factor accumulation and total factor productivity (Miller & Upadhyay, 2000). Basic inputs of production directly contribute to economic growth and other factors change the efficiency of basic inputs and indirectly contribute to economic growth. These factors determine the TFP. There is a wide consensus that cross-country differences in income primarily arise due to the differences in TFP (Klenow and Rodriguez-Clare, 1997; Hall and Jones, 1992). Klenow and Rodriguez-Clare (1997) and Hall and Jones (1999) found that productivity differences are the dominant source of the large world dispersion of output per worker accounting for 60% of the variance (Cordoga and Ripoll, 2008). Thus, it is crucial to understand what causes some countries to have higher levels of productivity than others which have been used in our analysis.

The literature review identifies four research gaps. In the existing literature, firstly, the roles of international trade and FDI and various other factors have been studied intensively but largely separately. Secondly, the relation between globalization and growth across the various levels of development has not been estimated for the period taken in the analysis. Thirdly, the current study is different from previous studies also as it deals with the problem of endogeneity. Fourthly, the studies have limited to looking at the impact of globalization on TFP and do not further look into the effects of economic globalization.

3. Methodology

To estimate the effect of economic globalization on economic growth through TFP, a four-step approach is used. In the first step, we have adopted a Cobb-Douglas Production Function to estimate TFP. In the second step, determinants of TFP have been estimated by giving special attention to indicators of economic globalization. In the third step, we have decomposed the contribution of the various globalization indicators and other factors to TFP. In the fourth step, the impact of TFP on economic growth has been seen by conducting policy simulations.

3.1. Concept and Decomposition of Total Factor Productivity (TFP)

For the estimation of TFP, we follow Miller and Upadhyay (2000).TFP is estimated using the Cobb-Douglas production function without human capital.

The functional form is expressed as follows:

$Y = AK^{\alpha}L^{\beta}$; where $0<\alpha<1$, $0<\beta<1$ (1)

Where Y equals real GDP and K equals the physical capital and L equals the number of workers (labour force in the working age group 15-64), α is the capital cost share and β is the share of production costs paid to labour. The production functions displays increasing, constant, or decreasing returns to scale as (α + β) are greater than, equal to, or less than one, respectively.

We follow the perpetual inventory method to calculate the capital stock.

Dividing equations (1) by the labour force (L) and then taking the natural logarithmic form, we get the following equation

$$lny_{it} = lnA_{it} + \alpha lnk_{it} + (\alpha + \beta - 1)lnL_{it} \quad (2)$$

Where *y* equals real GDP per worker, *k* equals the per worker stock of physical capital, i indicates the country and t indicates the time.

Equation (2) identifies the three sources of growth: capital, labour, and total factor productivity.

Following Mankiw *et al* (1992) we assume,

$$lnA(0) = a + \varepsilon \quad (3)$$

Where 'a' is a constant and ε is a country-specific shock which reflects not just the technology but resource endowments, climate, institutions, etc which differs across countries.

Thus, we can calculate TFP by rewriting equation (4) as follows:

$$lnA_{it} = lny_{it} - \alpha lnk_{it} - (\alpha + \beta - 1)lnL_{it} + \varepsilon_{it} \quad (4)$$

TFP is the change in output that cannot be explained by changes in inputs. Thus total factor productivity is computed as a residual or the amount of output growth that remains after we have accounted for the determinants of economic growth that we can measure. TFP captures the relation between measured input and measured output.

Differentiating equation (4) with respect to time,

$$G_Y = G_A + \alpha G_K + \beta G_L \quad (5)$$

Where, G_Y, G_K, G_L, G_A are the growth rates of output, capital, labour and TFP respectively.

The econometric model for capturing the globalization effect on productivity takes the following form:

$$TFP_{it} = \alpha_0 + \alpha G_{it} + \beta X_{it} + \epsilon_{it} \quad (6)$$

Where G_{it} represents globalization variables, X_{it} represents control variables and ε_{it} represents the random disturbance which is assumed to be normal and identically distributed with

$E(\varepsilon_{it}) = 0$ and $Var(\epsilon_{it}) > \sigma^2$.

To gain an insight into how the factors differ in their contribution to TFP across the various income categories, we have decomposed to show the contribution of globalization variables and other factors based on the panel regression results. The contribution to the overall annual percentage change of the TFP of each variable was computed as the average annual change in the variable times the regression coefficient of the variable from the GMM.

$$AAGR_{TFP} = AAGR_{e\ globalization} * (coefficients\ of\ globalization\ variables) +, AAGR_{e\ control\ variables} *(coefficient\ of\ control\ variables) \quad (7)$$

Where, AAGR=Average annual growth rate.

3.2. Empirical Model

We have estimated equation (6) using panel regression models .We start with static panel approach (fixed effects and random effects). Since our results may suffer from endogeneity bias and we also want to capture any dynamic effects, we repeat the estimation procedure by the country group with the use of Generalized Method of Moments (GMM) by Arellano and Bond (1991).

The static panel data model for estimation of the determinants of TFP is specified as follows,

$$lnTFP_{it} = a_0 + a_2 exports\ to\ gdp_{it} + a_3 import\ to\ gdp_{it} + a_4 FDI_{it} + a_5 Internet_{it} + a_6 Knowledge_{it} + a_7 Education_{it} + a_8 Health_{it} + a_9 AgriculturalEmployment_{it} + a_{10} IndustrialEmployment_{it} + a_{11} DCP_{it} + \varepsilon_{it} \quad (8)$$

Where *FDI* is the foreign direct investment as a percentage of *GDP* , the *internet* is the number of internet users, *knowledge* is measured by the patent applications, *and education* by the expenditure on education, *health* is measured by health expenditure , i=number of countries, t=time period .
In a dynamic setting, equation (6) can be written as

$$lnTFP_{it} = a_1 + a_2 exports\ to\ gdp_{it} + a_3 import\ to\ gdp_{it} + a_4 FDI_{it} + a_5 Internet_{it} + a_6 Knowledge_{it} + a_7 Education_{it} + a_8 Health_{it} + a_9 AgriculturalEmployment_{it} + a_{10} IndustrialEmployment_{it} + a_{11} DCP_{it} + \theta\ lnTFP_{i(t-1)} + \varepsilon_{it} \quad (9)$$

Following the KOF globalization index, export-to-GDP, import-to-GDP, FDI, and internet are used as explanatory variables to assess the relationship between economic globalization and TFP. Grossman and Helpman (1991) and Barro, Sala-i-Martin (1995), and Edwards (1998) among others, have argued that countries that are more open have a greater ability to benefit from technology diffusion and boost productivity growth. Accordingly, we formulate our main hypothesis and expect economic globalization to promote productivity growth. However, following Wang (2004) and Miller & Upadhyay(2000) the positive effect of FDI can be held only when a certain level of economic development is reached in the host country, whereas it is not necessary for international trade. Thus, we expect that FDI promotes productivity growth in high-income and middle-income economies and has a negative relationship in low-income economies. Accordingly, the predicted signs of the coefficients are as following : a_2>0, a_3>0, a_5 >0 across all levels of development and a_4>0 for advanced economies and a_4<0 for low-income economies.

The control variables that have been chosen for the analysis are knowledge, education, health, structural change, and financial development based on previous empirical studies. Mastromarco *et al* (2009) and Borzenstein *et al* (1998) emphasize the role of knowledge in absorbing more efficient techniques of production. Human capital in the form of level of education also has an important effect on TFP because of its role as a determinant of an economy's capacity to carry out technological capacity (Romer, 1990). Alvi *et al* (2014) find that the indicator of health has a positive and significant impact on TFP. Health directly affects the income and wealth through increasing labour productivity and savings. Hence, we expect a positive relationship between health, education, knowledge and TFP. A number of empirical studies have also found that a transition of economic activity from agriculture to non-agricultural sectors would lead to stronger productivity growth, as it implies a shift from lower- to higher-productivity sectors (Jaumotte (2007) and Mc Millan (2011).The idea of financial development affecting TFP is based on Schumpeter (1912).Hartmann *et al* (2007) conclude that deeper credit markets enhance capital reallocation and enhance productivity growth. Accordingly, the predicted signs of the coefficients are as following : a_6>0, a_7>0, a_8>0, a_9 <0, a_{10}>0 a_{11}>0.

The main hypothesis of our study is,

i. Trade openness promotes productivity growth (a_2>0, a_3>0) across all levels of development.
ii. FDI promotes productivity growth in high-income and middle-income economies and has a negative relationship in low-income economies (a_4>0 for advanced economies and a_4<0 for low-income economies).
iii. ICT promotes productivity growth (a_5 >0) across all levels of development.

3.3. Technique of Estimation

We have chosen a sample of 119 countries which comprise of high-income (46), upper-middle -income (40) and low-income countries (33) over the time period 1993-2012. The list of sample countries along with their income group is given in the appendix in Table A.1

We have estimated TFP as has been given in equation (4) using static panel data model. Equation (8) has been estimated using static panel data approach .The fixed effect model assumes that the unobservable country-specific effects are fixed parameters to be estimated along with the coefficients of the model while the random effects model assumes the unobservable country-specific effects to be a random disturbance. Diagnostic tests such as Lagrangian Multiplier (LM) and Hausman tests are used to choose between the panel data models. A high value of LM favors FE model or RE model over pooled OLS. Further, the statistical significance of Hausman specification test suggests that estimation by using FE is preferable to RE model.

One of the limitations of the static panel data model is that it assumes exogeneity of all the explanatory variables. However, the disturbances contain unobservable, time-invariant country effects that may be correlated with explanatory variables. Dynamic panel data model allows for such endogeneity by employing the instrumental variable technique (Baltagi, 2008).

Arellano & Bond (1991) have suggested a generalized method of moment (GMM) procedure in which the orthogonality conditions, which exist between the lagged dependent variable and the disturbancesε_{it}, is utilized to obtain additional instruments. The GMM estimator uses the lagged values

of the endogenous explanatory variables as instruments to address the endogeneity problem. We have estimated equation (9) using Arellano & Bond(1991)and Blundell & Bond(1998) GMM framework, we have applied a two-step system GMM[1]with robust standard error proposed by Windmeijer(2005) to estimate equation. As compared to one-step system-GMM, two-step system GMM is asymptotically more efficient.

3.4. Policy Simulations for Economic Growth

We have looked at the effects of TFP on economic growth by conducting policy simulations. We have compared the actual growth rate and predicted growth rates of India. The predicted TFP has been calculated by multiplying the coefficient of the variable with the average of the variables over the income group. Then we take a summation of the product estimated in the first step.The predicted GDP growth rates have been estimated using the same methodology as has been explained for predicted TFP growth rates.

3.5. Source and description of data

The variables have been sourced from World Development Indicators, World Bank. The measurement of variables has been given in the table below.

Table 1: Measurement of the Variables

Variable Description	Measurement
Calculating TFP	
Output	Output per worker is the dependent variable. We have used GDP (constant 2005 US$) as a measure of output.
Capital Stock	Capital Stock is calculated using the Perpetual Inventory Method .We take Gross Fixed Capital Formation (constant 2005 US$) and have used capital per worker.
Depreciation Rates	Depreciation rates used in the sample were 4% for high-income countries, 3.5% for middle- income countries and 2.5% in low-income countries following a study by Arslanalp *et al* (2011).
Labour	Number of workers in the working age population, where working age is defined as of 15-64.
Globalization Variables	
Trade	Ratio of exports of goods and services (constant 2005 US$) to GDP
	Ratio of imports of goods and services (constant 2005 US$) to GDP
FDI	Ratio of Foreign direct investment, net inflows to GDP
ICT	Internet Users (per 100 people)
Control Variables	
Health	Health expenditure, total (% of GDP)
Knowledge	Logarithm of Patent applications, residents
Human Capital	Gross enrolment ratio, secondary, both sexes (%)
Structural Change	Employment in agriculture (% of total employment) Employment in industry (% of total employment)
Financial Development	Domestic credit to private sector (% of GDP)

Source: Own Compilation

[1] For estimating system GMM, we use the xtabond2 package in STATA developed by (Roodman, 2006).

4. Results and Discussion

The production function estimates are given in tables 2 and 3. The results show that the output elasticity of GDP with respect to capital stock is highest in the high-income and upper-middle-income economies and is lowest in the low-income economies. The coefficient of labor is 0.072 for the overall category of countries and indicates that the production function exhibits increasing returns to scale. The coefficient of capital has a value of 0.724 which explains the elasticity of output with respect physical capital stock. These two coefficients generate the elasticity of output with respect to labour of 0.348. The output elasticity with respect to labour and physical capital sums up to a value of 1.072.Low-income economies, on the other hand, have the highest output elasticity with respect to labour. The results suggest that the economic growth is mainly driven by labour supply growth in low-income economies but in the advanced economies growth of physical capital plays the central role.

To look at a greater depth into the drivers of economic growth Tables 4 and 5 and Figure 1 decompose GDP growth rates into factor accumulation and TFP growth for different income groups using the standard growth accounting decomposition method as given below.

$$AAGR_Y = AAGR_K * \alpha + AAGR_L * \beta + AAGR_{TFP,} \quad (10)$$

Where, AAGR=Average annual growth rate

The growth decomposition in table 4 shows that GDP has grown at an average of 4.66% per year from 1993-2012.Of this 2.79% is attributable to capital stock followed by 1.79% of TFP. Table 4 shows that low-income economies have a higher rate of growth than high-income economies and upper-middle economies which are interesting because it is in line with the convergence theory that suggests that over time poor nations may grow faster to catch up with the rich nations. The figure shows that higher amount of TFP in low-income economies than in high income economies and upper middle economies. TFP contributes to 50% of economic growth in low-income economies.

The countries ranked according to their TFP are presented in Table A.2 given in the appendix. Developed countries are high in rank while countries that are ranked low belong to the low-income category. New Zealand has the highest productivity and Ukraine has the lowest, whereas India also ranks quite low (97).

We start our empirical estimation with static panel data model given in Table 6. The dependent variable of all the regressions is the log of TFP. Therefore, a positive coefficient indicates an increase in productivity. The results given in the table suggest that globalization indicators have been largely increasing productivity with the exception of imports. Imports have a negative and significant coefficient in all the three categories. The results are similar in all the three categories but differ in the magnitude of the coefficient. However, for reasons of robustness and endogeneity, we repeat the estimation procedure by the country group with the use of Generalized Method of Moments (GMM) by Arellano and Bond (1991). The results are presented in Table 7 and have been explained in greater detail below.

The results are not very different from those obtained in the static panel data estimation. The results suggest that globalization indicators with the exception of imports have been increasing productivity.

Exports have a positive and significant impact on productivity in all the three categories which support our predicted sign. Many studies have provided empirical evidence in support of export-led growth hypothesis (World Bank, 1993). International trade through various transmission mechanisms leads to increase in knowledge transfer, the size of the market and thus an improvement in economic growth. The coefficient of exports is highest in low-income economies and lowest in high-income economies. This evidence is also supported by Wang *et al* (2004) who find that for developed countries, the benefits of international trade may be less important and low labour costs competition from trade with developing countries may be severe. In contrast, imports have been negative and significant which does not match the predicted sign. The evidence is supported by Tybout (2000) who points out that the effect of productivity depends on both the market structure and institutional factors. Under imperfect competition, with an increase in imports, import substituting domestic market shrinks causing investment and hence productivity to eventually deteriorate.

In case of FDI, we expect a negative relation in the case of low-income economies; however, FDI has positive and significant results for all the three categories in our analysis. The coefficient of FDI is highest for the high-income group and lowest for the low-income category. The results show that a certain level of economic development is essential as it increases the technical absorptive capability of the economy. Wang *et al* (2004) find that with a large volume of international trade and inward FDI and a high level of human capital, developed countries benefit the most from FDI.

ICT has been measured by the internet users and the evidence suggests that it has raised productivity in the globalization period. Investments in ICT and knowledge creation have been important engines of economic growth and help in realizing the productivity potential of new innovations (OECD, 2003). Knowledge measured by patents is significant and positive for the advanced economies in our study.

Of the control variables health has had an ambiguous effect on TFP, its effect being negative in high-income countries and positive in upper-middle -income countries whereas, both the variables of health and knowledge are insignificant for the low-income economies. Due to missing data, the number of observations is reduced dramatically resulting in lower t-statistics[2].

To gain a deeper insight into how the factors differ in their contribution across the various income categories, we have decomposed to show the contribution of trade and financial globalization variables based on the final GMM panel regression results. The contribution to the overall annual percentage change of the TFP of each variable was computed as the average annual change in the variable times the regression coefficient of the variable from the GMM.

In Figure 2 it can be seen globalization continues to have the highest share in TFP in most categories. The contribution has been the highest in the low-income category. Figure 3, 4, 5, and 6 represent the decomposition in the various categories of income. We see that the change in TFP

[2] In the case of the benchmark model, we tried looking at the models which gave us best results for the different income categories. In case of high-income and upper-middle -economies, when we dropped the agricultural employment and industrial employment variables the results have been significant for most of the variables. This is mostly due to poor data availability in both these variables. In case of low- income category, on dropping both the employment variables and health expenditure the results have improved slightly in terms of significance of globalization variables and the explanatory powers.

coefficient was 1.87% in the overall group which is similar to low-income and upper middle income groups. Low-income groups have the biggest increase which is 1.96%. On the other hand, in the high income economies, we see that the TFP change has been negative of -.05%.

The highest contribution to the average change in TFP over the period 1993-2012 as can be seen in the overall category comes from FDI which is not uniform among the various groups. FDI contributes to .73% of the 1.87% annual average increase in TFP. This is followed by exports and ICT. Together they have contributed .64%.

In the high income economies, there has been a decrease in TFP. FDI has had a major impact in the high income groups also. However in the Upper Middle Income and Low-income groups FDI has a minimal effect on the average change in TFP. Low-income and Upper Middle Income economies have a dominant contribution of exports in increasing TFP. Imports on the other hand have been reducing productivity in all the categories. However, in low-income and overall groups, we can see that the negative effect of imports is not high enough to offset the positive one from exports. The impact of ICT has contributes to increasing productivity wherever significant.

5. India's Policy Implications

In this section, we have looked at the effects of TFP on economic growth by conducting policy simulations. There has been a special emphasis on India as even though it belongs to the lower middle income group, it is one of the fastest growing economies. Various policy simulations can be carried to show that the productivity in India could be higher if we adopt growth strategies that exist in high income and upper middle income country groups. These simulations can help us in drawing important policy lessons to help India improve its productivity and thus the economic growth.

The methodology of carrying out the policy simulation can be explained here. We have looked at the growth decomposition for India which explains the relationship between TFP growth and economic growth for India over the study period. We have further compared the actual growth rate and predicted growth rates of India. The predicted TFP has been estimated in a two-step process. In the first step, we multiply the coefficient of the variable[3] with the average of the variables over the income group. The second step involves taking a summation of the product estimated in the first step.

There has been a considerable step up in the economic growth rate of India after adopting the broad-based economic reforms. It is important to see whether the growth in India has been caused by factor accumulation or TFP to derive policy lessons for sustained long-term economic growth.

Figure 7 shows the growth decomposition for India. The decomposition has been subdivided into four-year periods. There has been a dip in economic growth in the periods 1997-00 and 2000-2004 and TFP has been the lowest in those two periods as compared to the periods shown in the figure. The figure clearly shows that economic growth has been higher in the periods where TFP has also been higher.

Figure 8 shows the countries which belong to different income country groups. Countries such as New Zealand, China, and Korea belong to high income and upper middle income countries whereas countries like Kenya, Pakistan belong to the low-income country groups. As can be seen in the figure,

[3] As has been given in table 7 (Estimations Results of Dynamic Panel Data).

countries characterised by high income have a higher level of TFP, whereas Kenya and Pakistan, etc have a low amount of TFP. India belongs to the lower middle income group and the contribution of TFP is 18%, which is higher than Kenya and Pakistan but much lower than New Zealand. In India, capital and TFP contribution are the higher followed by labour contribution to economic growth. This is the case in Korea and China as well. However, the countries belonging to the low-income group such as Bangladesh, Pakistan and Kenya have a higher contribution of labour in economic growth.

Figure 9(a), (b), show the policy simulations that have been carried out. Figure 9(a) shows the actual and predicted TFP growth rates of India. Predicted growth is based on theestimation result of high-income and upper middle income countries as has been given in table 7 .Figure 9(b) shows the actual and predicted growth rates of India . The predicted growth rates have been estimated using the same methodology as has been explained for predicted TFP growth rates.Predicted growth again here is based on the estimation result of high income and upper middle income countries.In both figure 9(a) and figure 9(b) the predicted values of India according to the high income coeffiecnts, have shown to be higher than actual TFP growth rate. Whereas the predicted TFP growth rate and predicted GDP growth rate according to the upper middle income coefficients have been lower than the actual growth rates of India. This shows that India despite belonging to lower middle income group has fared better than some of the advanced economies in the period of economic globalization.

We can thus infer that the growth strategies adopted by the devleoped economies can help India in closing the economic gap between India and the advanced nations. The growth strategies of the rich and advanced economies comprise of both sound economic policies and institutional arrangements.Export-oriented industrialisation strategies has been the reson of achieving a high rate of success in many economies especially in East Asia . The same can be observed for the case of India as well. The predicted growth rates of TFP are higher in High Income and and economic globalization has successfully raised the productivity in these economies as can be seen in Table 7.

6. Conclusion

We look at the impact of economic globalization on economic growth through TFP. For this, we have explored the relationship between globalization variables and TFP by using panel data approach for the period 1993-2012 based on the data for 113 economies, followed by decomposition exercises and policy simulations for evaluating the impact of economic globalization on economic growth.

The decomposition exercises indicate that at the economic growth in the low-income economies is catching up with the rich nation which is in line with the convergence theory. The importance of TFP in economic growth both at the aggregate level and low-income economies is clearly pointed out, of which globalization explains 20% and 60% respectively.

Our findings also suggest that with the exception of imports, all other indicators contribute in improving productivity growth across all categories of development. However, international trade is beneficial for low-income economies than the advanced economies. FDI contributes more in developed countries which have the technical absorptive capability and the desired level of human capital.

The policy simulations indicate that TFP has improved economic growth and India, despite belonging to low-income category of economies has fared better than some of the advanced economies

thus pointing to the fact that we can look into the growth strategies of high-income economies, to improve the productivity of India and put it on a sustainable growth trajectory.

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APPENDIX A

Table A.1: Sample of Countries

High Income	Upper Middle Income	Low-income
Australia	Albania	Armenia
Austria	Algeria	Bangladesh
Bahamas, The	Argentina	Benin
Belgium	Azerbaijan	Bolivia
Brunei Darussalam	Belarus	Burkina Faso
Canada	Belize	Cambodia
Chile	Botswana	Cameroon
Croatia	Brazil	Congo, Dem. Rep.
Cyprus	Bulgaria	Congo, Rep.
Czech Republic	China	Egypt, Arab Rep.
Denmark	Costa Rica	El Salvador
Equatorial Guinea	Cuba	Eritrea
Estonia	Dominican Republic	Gambia, The
Finland	Ecuador	Guatemala
France	Gabon	Honduras
Germany	Hungary	India
Greece	Jordan	Indonesia
Hong Kong SAR, China	Kazakhstan	Kenya
Iceland	Lebanon	Kyrgyz Republic
Ireland	Macedonia, FYR	Lesotho
Israel	Malaysia	Madagascar
Italy	Mauritius	Mauritania
Japan	Mexico	Moldova
Korea, Rep.	Namibia	Morocco
Latvia	Panama	Mozambique
Lithuania	Peru	Pakistan
Luxembourg	Romania	Paraguay
Macao SAR, China	South Africa	Philippines
Malta	Thailand	Senegal
Netherlands	Turkey	Sierra Leone
New Zealand	Venezuela, RB	Swaziland
Norway		Tanzania
Poland		Togo
Russian Federation		Uganda
Singapore		Ukraine
Slovak Republic		Uzbekistan
Slovenia		Vietnam
Spain		West Bank and Gaza
Sweden		
Switzerland		
Trinidad and Tobago		
United Kingdom		
United States		
Uruguay		

Table A.2: Rank of Countries According to TFP

Country	Income Group	Rank -TFP	Country	Income Group	Rank -TFP	Country	Income Group	Rank -TFP
New Zealand	HI	1	Lithuania	HI	41	Morocco	LMI	81
Belize	UMI	2	France	HI	42	Paraguay	LMI	82
Luxembourg	HI	3	Estonia	HI	43	Cameroon	LMI	83
Equatorial Guinea	HI	4	El Salvador	LMI	44	Mozambique	LI	84
Iceland	HI	5	Italy	HI	45	Sierra Leone	LI	85
Macao	HI	6	Argentina	UMI	46	Macedonia	UMI	86
Ireland	HI	7	Turkey	UMI	47	Philippines	LMI	87
Brunei Darussalam	HI	8	Uruguay	HI	48	Burkina Faso	LI	88
Norway	HI	9	Mauritius	UMI	49	Senegal	LMI	89
Uganda	LI	10	South Africa	UMI	50	Kenya	LI	90
Bahamas, The	HI	11	Germany	HI	51	Eritrea	LI	91
Malta	HI	12	Botswana	UMI	52	Belarus	UMI	92
Denmark	HI	13	Spain	HI	53	China	UMI	93
Singapore	HI	14	Venezuela,	UMI	54	Pakistan	LMI	94
Israel	HI	15	Slovak Republic	HI	55	Indonesia	LMI	95
Panama	UMI	16	Czech Republic	HI	56	Benin	LI	96
Chile	HI	17	Hungary	UMI	57	India	LMI	97
United Kingdom	HI	18	Gabon	UMI	58	Togo	LI	98
Namibia	UMI	19	Guatemala	LMI	59	Uzbekistan	LMI	99
Canada	HI	20	Lebanon	UMI	60	Vietnam	LMI	100
Australia	HI	21	Jordan	UMI	61	Gambia, The	LI	101
Finland	HI	22	Peru	UMI	62	Madagascar	LI	102
Hong Kong SAR, China	HI	23	Korea, Rep.	HI	63	Kazakhstan	UMI	103
Netherlands	HI	24	Mexico	UMI	64	Bangladesh	LI	104
Belgium	HI	25	Bulgaria	UMI	65	Thailand	UMI	105
Sweden	HI	26	Cuba	UMI	66	Congo, Dem. Rep.	LI	106
Croatia	HI	27	Romania	UMI	67	Lesotho	LMI	107
Slovenia	HI	28	West Bank and Gaza	LMI	68	Russian Federation	HI	108
United States	HI	29	Albania	UMI	69	Tanzania	LI	109
Dominican Republic	UMI	30	Malaysia	UMI	70	Armenia	LMI	110
Poland	HI	31	Ecuador	UMI	71	Kyrgyz Republic	LMI	111
Switzerland	HI	32	Bolivia	LMI	72	Moldova	LMI	112
Austria	HI	33	Cambodia	LI	73	Ukraine	LMI	113
Costa Rica	UMI	34	Congo, Rep.	LMI	74			
Cyprus	HI	35	Japan	HI	75			
Latvia	HI	36	Egypt,	LMI	76			
Swaziland	LMI	37	Brazil	UMI	77			
Trinidad and Tobago	HI	38	Algeria	UMI	78			
Azerbaijan	UMI	39	Honduras	LMI	79			
Greece	HI	40	Mauritania	LMI	80			

Note: The abbreviations used for HI, UMI, LMI, and LI are high income, upper middle income and lower middle income and low-income groups

Source: Own Calculation

Table A.3: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Log (Total Factor Productivity)	2261	-0.27	1.03	-9.27	7.86
Export-GDP	2214	-1.04	0.64	-2.93	0.86
Import-GDP	2214	-0.95	0.58	-3.35	1.08
Internet	2098	1.42	2.64	-9.3	4.57
FDI	2081	0.59	1.85	-12.71	4.45
Agricultural Employment	1549	2.26	1.25	-2.31	4.49
Industry Employment	1538	3.13	0.33	0.96	3.79
Health Expenditure	1981	1.81	0.39	0.37	2.84
Education	906	2.63	0.34	1.17	3.5
Patent	1560	6.34	2.43	0	12.53

Source: Own Calculation

Table 2: Production Function Estimates

Dependent Variable: Log (GDP per capita)				
	Overall	**High Income**	**Upper Middle**	**Low**
Log (Per Capita Capital)	0.724***(27.4)	0.788***(21.24)	0.71***(33.6)	0.55***(17.58)
Log (Labour)	0.072***(2.64)	0.264***(4.47)	0.116***(3.03)	0.029(1.01)
Constant	0.655*(1.74)	-2.541***(-3.23)	0.217(.43)	2.29***(5.36)
R-Squared	0.63	0.78	0.68	0.31
No. of Obs.	2484	903	676	916

Source: Estimated by using equation (4)

Table 3: Returns to Scale

	Overall	**High Income**	**Upper Middle**	**Low**
α (Capital Share)	0.724	0.788	0.705	0.552
$\alpha+\beta-1$	0.072	0.264	0.116	0.029
B (Labour Share)	0.348	0.476	0.411	0.477
$\alpha+\beta$ (Returns to Scale)	1.072	1.264	1.116	1.029

Source: Estimated by using equation (4)

Table 4: Decomposition (In average annual percent)

	Output Growth	Capital Growth	Labour Growth	TFP Growth
Overall	4.66	2.79	0.61	1.27
High Income	3.31	2.68	0.53	0.11
UMI	4.32	3.06	0.74	0.53
Low	6.8	2.19	1.17	3.45

Source: Estimation from equation 10

Table 5: Decomposition (Contribution in percent)

	Contribution of Capital	Contribution of Labour	Contribution of TFP
Overall	59.83	13.03	27.16
High Income	81.09	15.83	3.09
UMI	70.76	17.06	12.19
Low	32.16	17.18	50.67

Source: Estimation from equation 10

Table 6: Estimation Results of Static Panel Data

Model No	1.1	1.2	1.3	1.4	2.1	2.2	2.3
	Dependent Variable : Log (Total Factor Productivity)						
	Full Model				Benchmark Model		
	Overall	High Income	Upper Middle	Low	High Income	Upper Middle	Low
	FE	FE	RE	RE	RE	RE	FE
Export-GDP	0.099(1.47)	0.239***(2.81)	-0.086(.89)	0.725***(4.55)	0.261***(3.07)	-0.086(.89)	1.089***(7.75)
Import-GDP	0.192***(3.02)	0.034(.41)	0.049(.48)	-0.135(-1.11)	-0.018*(1.71)	0.049(.48)	-0.443***(-4.17)
FDI	0.003***(4.29)	0.017(.31)	0.002**(1.99)	0.004***(2.99)	0.115**(2.07)	0.002**(1.99)	0.005***(3.26)
Internet	0.001***(5.11)	0.001***(4.5)	0.003***(4.44)	0.005***(5.37)	0.001***(3.24)	0.003***(4.44)	0.006***(5.76)
Health Expenditure	-0.017***(3.74)	-0.019***(-4.12)	-0.035***(-3.36)	-0.006(-.78)		-0.035***(-3.36)	-0.018**(-2.35)
Patent	0.027***(6.17)	0.025***(5.45)	0.032***(3.95)	-0.029**(-2.33)	0.029***(6.47)	0.032***(3.95)	-0.079***(-7.04)
Education	0.001**(2.25)	-0.002***(-5.14)	0.005***(4.41)	-0.002**(-2.19)	-0.002***(-4.76)	0.005***(4.41)	-0.002(-1.52)
DCP	0.029***(6.37)	-0.006(-1.23)	0.055***(5.7)	0.108***(11.37)	-0.013***(-2.98)	0.055***(5.7)	0.127***(12.49
Agricultural Employment	-0.001(.94)	-0.014***	-0.002(-1.3)	-0.003(-1.38)	-0.017***(-6.95)	-0.002(-1.3)	
Industry Employment	0.013***(6.02)	0.013***(6.08)	0(-.12)	0.001(.26)	0.010***(4.84)	0(-.12)	
Constant	5.591***(56.75)	5.114***(41.18)	8.896***(47.26)	4.914***(23.56)	5.098***(46.69)	8.896***(47.26)	5.006***(38.62)
R-Squared	0.29	0.27	0.54	0.74	0.25	0.54	0.68
No. of Obs.	1062	587	276	199	646	276	253
Hausman Test	0.003	0.03	0.309	0.3	0.28	0.3	0.07
Lm Test	0	0	0	0	0	0	0

Note: Figures in parentheses indicate t –values based on robust standard errors. ***/**/* indicate significance at 1%, 5%, 10% respectively.

Source: Estimated using equation 8

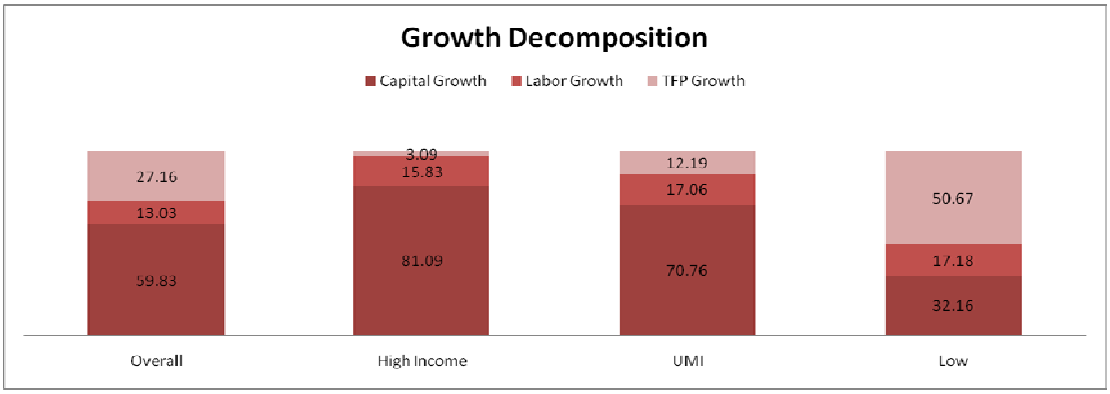
Table 7: Estimation Results of Dynamic Panel Data

Model No	2.4	2.5	2.6	2.7	3.1	3.2	3.3
	Dependent Variable : Log (Total Factor Productivity)						
	Full models				Benchmark		
	High	UMI	Low	Overall	High	UMI	Low
L.TFP	1.765***(-3.09)	0.572*(-1.72)	1.367***(-5.75)	0.996***(-98.39)	0.983***(21.38)	1.305**(2.74)	1.542***(5.21)
L2.TFP	-0.852*(-1.73)				-0.041*(-1.68)	-0.995*(-1.75)	-0.662**(-2.14)
L3.TFP					0.060*(2)		
Export-GDP	0.186***(-3.56)	-0.004(-0.03)	-0.314(-0.81)	0.063**(-2.2)	0.066*(1.73)	0.228*(1.81)	0.223*(1.72)
Import-GDP	-0.197**(-2.69)	-0.333*(-1.84)	0.073(-0.4)	-0.048*(-1.71)	-0.08*(-1.73)	-0.692**(-2.05)	0.012*(1.69)
FDI	0.006(-0.18)	0.002(-1.32)	-0.003(-1.09)	0.001(-0.77)	0.037*(1.83)	0.004**(2.05)	0.001(0.98)
Internet	0(-0.81)	0.003*(1.76)	-0.003(-1.06)	0	0(-0.61)	0.006*(1.78)	0.001*(1.86)
Health Expenditure	0(-0.07)	-0.001(-0.04)	0.02(-1.03)	-0.002(-0.73)	-0.002*(-1.91)	0.034*(1.88)	
Education	0.001*(-1.78)	-0.002(-0.83)	0.005(-1.22)	0.000**(-2.08)	0(0.03)	-0.002(-1.11)	-0.001(-0.80)
DCP	0.005(-0.89)	0.004(-0.38)	-0.056(-1.65)	-0.004***(-3.00)	-0.005(-1.47)	-0.015(-1.07)	0.006(-0.19)
Knowledge	-0.001(-0.37)	0.008(-0.87)	-0.014(-1.04)	0.002(-1.18)	0.003**'(2.38)	0.017*(1.72)	0.004(-0.48)
Agriculture Employment	0.002*(-1.77)	-0.005(-1.10)	0.002(-0.81)	0(-0.9)			
Industry Employment	-0.001(-1.02)	-0.002(-0.50)	0.002(-0.34)	0(-1)			
Constant	0.381***(-2.84)	4.438(1.25)	-2.026*(-1.71)	0.01(-0.12)	0.022(0.15)	6.463**(2.17)	0.652(-1.19)
F Statistic	1621.96	51.56	1307.01	18933.25	1250.42	26.57	577.03
No. of Obs.	587	276	199	1062	590	313	277
AR (2)	0.77	0.75	0.3	0.07	0.201	0.213	0.35
Hansen	0.24	0.99	0.27	0.564	0.439	0.483	0.809
Instruments	14	13	13	13	8	14	12
No of groups	38	27	28	77	38	27	28

Note: Figures in parentheses indicate t –values based on robust standard errors. ***/**/* indicate significance at 1%, 5%, 10% respectively.

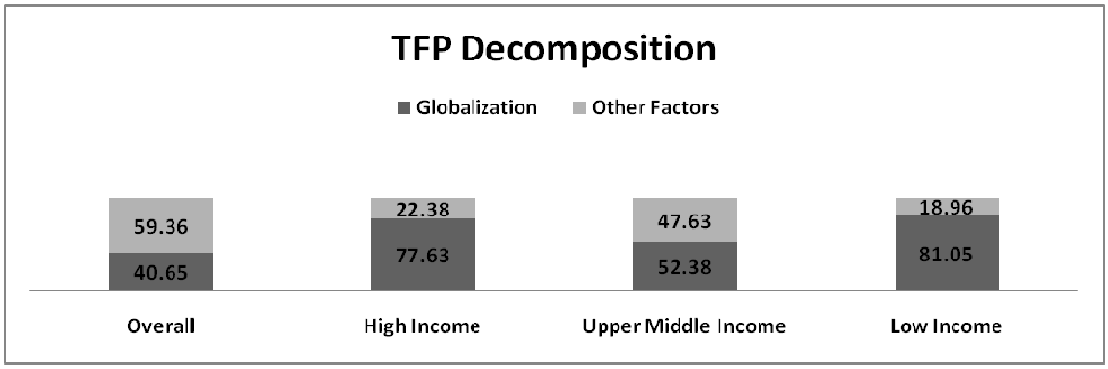
Source: Estimated using equation (9)

Figure 1: Growth Decomposition for Different Income Country Groups



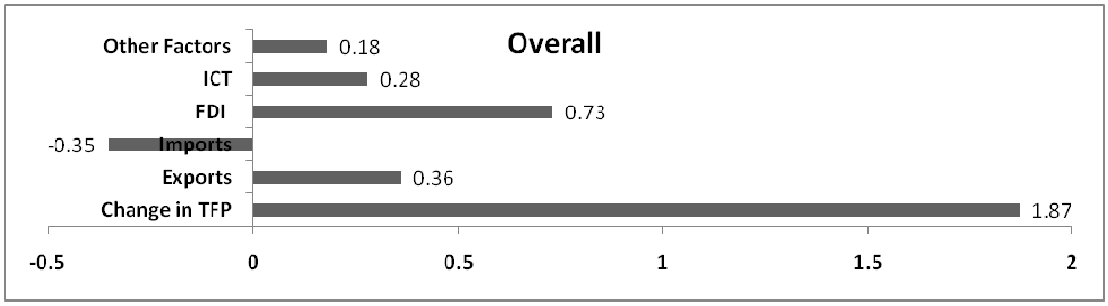
Source: Estimated using equation 10

Figure 2: Decomposition of Change in TFP



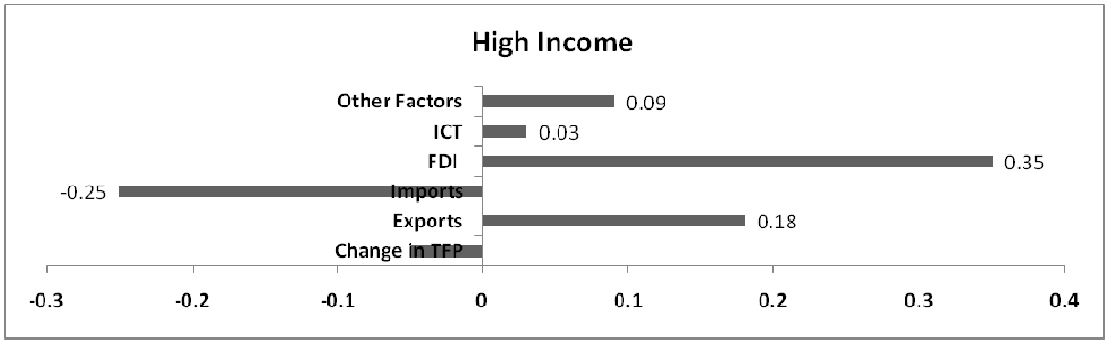
Source: Estimated as per the methodology given in section 4

Figure 3: Decomposition: Overall Category



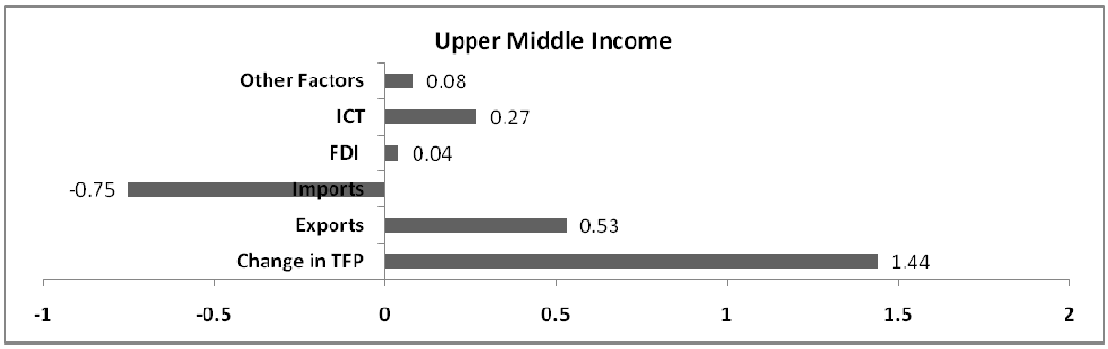
Source: Estimated as per the methodology given in section 4

Figure 4: Decomposition: High Income Category



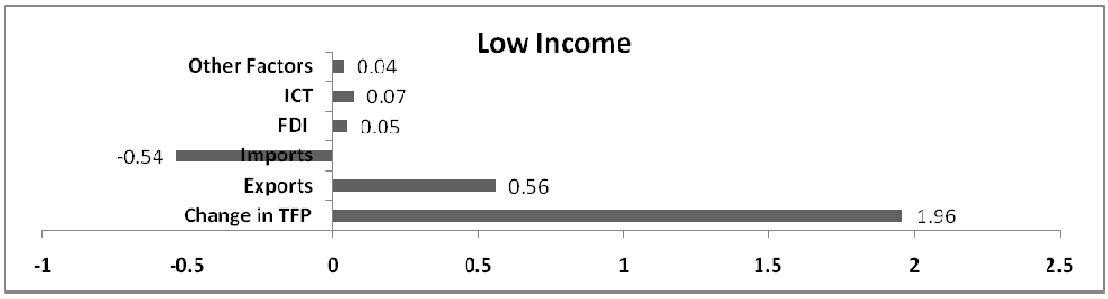
Source: Estimated as per the methodology given in section 4

Figure 5: Decomposition: Upper Middle Income Category



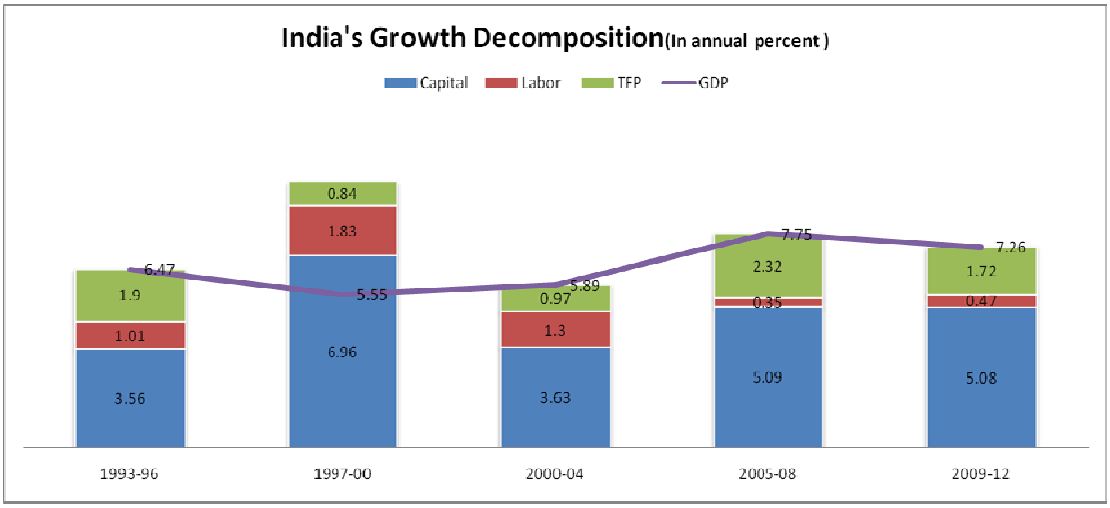
Source: Estimated as per the methodology given in section 4

Figure 6: Decomposition: Low-income Category



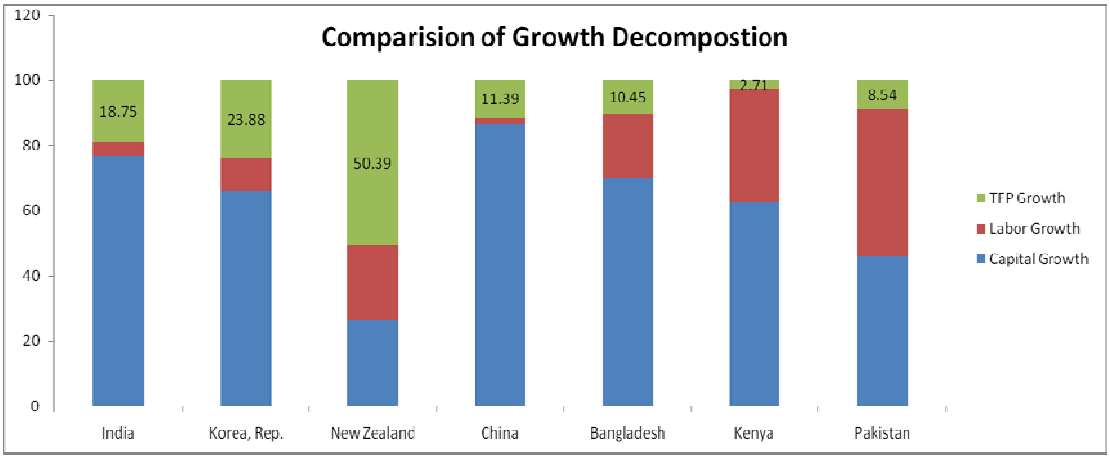
Source: Estimated as per the methodology given in section 4

Figure 7: India's Growth Decomposition



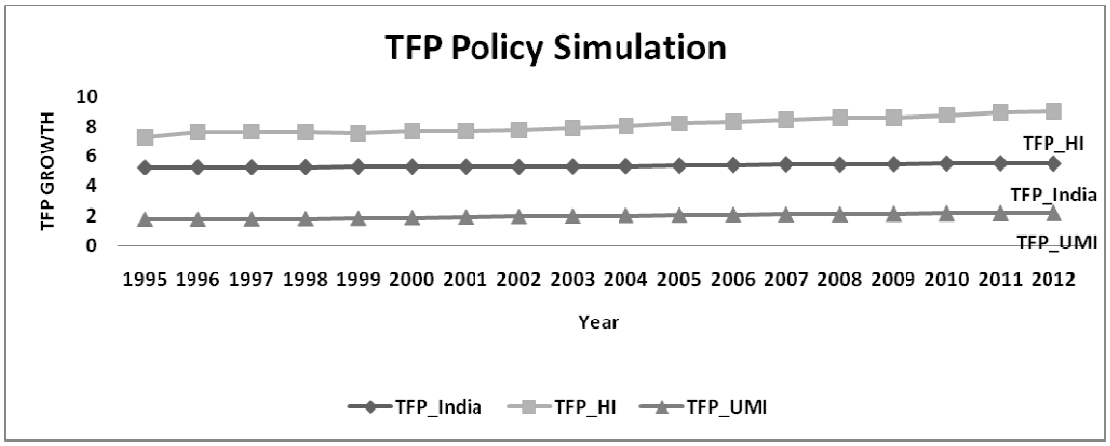
Source: Estimated using equation 10

Figure 8: Comparison of Growth Decomposition



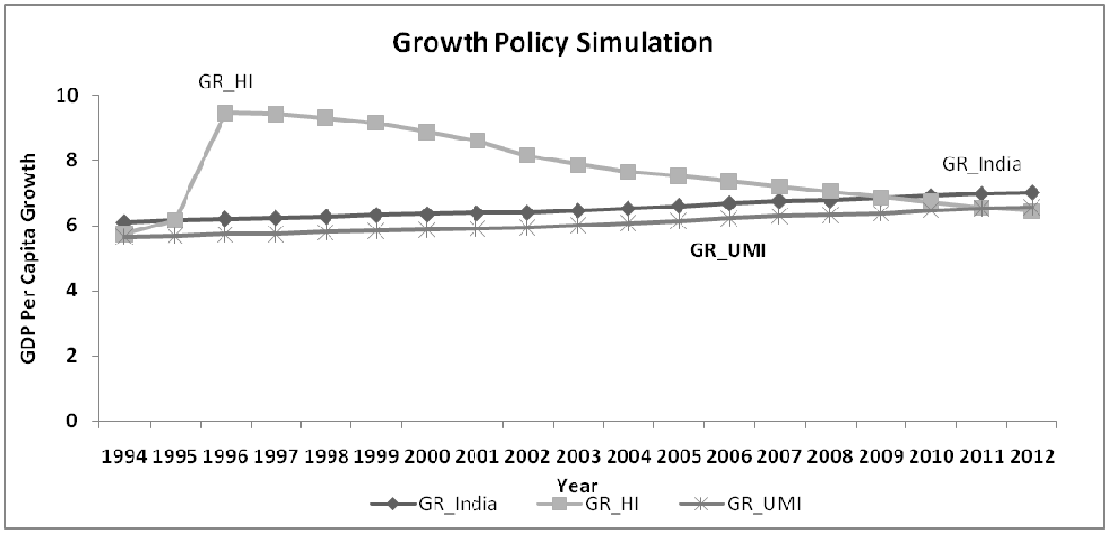
Source: Estimated using equation 10

Figure 9 (a): Policy Simulation for India on TFP Growth



Source: Estimated as per the methodology given in section 5

Figure 9 (b): Policy Simulation for India on Economic Growth



Source: Estimated as per the methodology given in section

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