The Globalization and Sources of Regional Income Growth Disparity in India and the People's Republic of China (PRC)

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Abstract:

The paper contributes to the debate on globalization and regional disparities in economic growth in India and the People's Republic of China (PRC), which are the two largest emerging countries. The paper uses the dynamic panel spatial Durbin Model (SDM) for the empirical analysis during 1993-2010, which draws following important results. First, the high regional income disparity is mainly due to the secondary and tertiary activities in both the countries. The growth accounting approach suggests that the source of high regional inequality is due to disparities in total factor productivity growth in the PRC, and this and capital intensity are the regional imbalances sources in India. Second, the globalization represented by FDI is found to be significant in regional per capita income growth in both the countries, while its neighborhoods effect is positive in the PRC only. Third, the income growth in neighboring regions influences that of a given region positively. Whereas, the brain drain effect of the human capital is found in both the countries which are due to the migration of educated people. Fourth, the conditional convergence is evidenced in both counties. The study suggests that the policy makers should consider the role of globalization and neighborhood relationship in addition to human capital and physical investment for designing policies to reduce income disparities in the emerging countries.

Keywords: Globalization, Regional Income Growth, Dynamic spatial panel, Emerging economies

JEL Classifications: F02; F06, F43; R11; R12; L1

This work was done at the University of Hyogo, Japan during the International Research Fellowship of The Japan Society for the Promotion of Science (JSPS) of the first author. The initial draft of the work was presented at Leibniz Institute of Agricultural Development in Transitional Economies (IAMO) Forum 2017, Halle, Germany.

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1. Introduction

There is burning debates among the academician and policy-makers on the issue of the middle-income trap (MIT) of an economy. The income inequality at the regional and individual levels are identified as one of the factors of the MIT of an economy (Aiyar et al. 2013; Egawa, 2013; Islam 2015). The globalization and economic integration have affected the emerging countries in various ways. They have facilitated the transfer of technology and substantially increased international trade and foreign direct investment (FDI) which contributed to the production efficiencies. Especially, the FDI inflows bring advanced technology and modern management skills to host economies, which enhances productivity directly and indirectly affecting through the human capital, infrastructure, domestic firms, agglomeration effects, spillover effects across firms and regions etc (Ramirez, 2006; Bode et al, 2009; Cheung and Lin, 2002). Further, some studies establish that the globalisation increases income inequalities within the countries, especially in the emerging countries like India and the People's Republic of China (PRC), through the inter-regional competition and demand for skilled labor (Hale et al. 2007). However, other studies establish that the globalization increases income inequalities within the countries through the inter-regional competition (Candelaria et al. 2013; Ezcurra and Rodríquez-Pose, 2013; Wan and Chen, 2007; Zhang and Zhang, 2003).

The persistence of regional imbalances in economic growth and development in the context of the emerging countries like People's Republic of China (PRC) and India is a hot debate (Li and Wei, 2010; Mallick, 2014, 2013b). The growth of an economy is driven by the growth of input and productivity. The input–driven growth is achieved through the increase in factors of production. The productivity-driven growth is the growth in output that cannot be explained by the growth in total inputs. It is normally credited to the improvement in knowledge, the management of human capital, organizational structure, skills attainment and efficient use of factors of production.

The empirical questions to analyse are; what are the sources of the regional income growth disparities, how the neighborhood relationship and globalization affect the regional growth and whether the regional income growth is converging. The main purpose of this paper is to examine the patterns of per capita income in the three broad sectors, and to

analyze the sources of growth of income to understand the mechanism of the regional imbalances. It is important to know as to whether, and to what extent, the globalization and neighborhood relation affect the inter-regional growth. The policies should target the important sources and factors of regional imbalances to reduce the disparities and poverties. There is a dearth of studies dealing with these issues in the context of India and the PRC. They are the middle-income countries (MICs) and the two largest emerging economies. They have been broadly following similar patterns of growth and inter-regional disparity, after the initiation of substantial economic reform measures. Further, the relevance of this issue in these two countries is largely due to (i) these countries rising international trade and FDI inflows; (ii) advancement of technologies that have reduced production cost; (iii) the changing federalism structure from co-operative to competitive; and (iv) persistence of inter-regional income inequalities within the country. This is important to reduce the regional disparity to avoid the MIT. Therefore, it becomes pertinent to make a detailed and comparative analysis on these issues by considering these two countries.

However, the existing studies are not without controversies, they vary widely depending on the methodology and data sources used and the measurement of variables. They do not explicitly discuss the sources of the regional disparities and both the direct and indirect impact of globalization as mentioned above. The explicit analysis of the sources of economic growth will identify as to whether the variation is due to the factor inputs or the total factor productivity growth (TFPG). Most importantly, the factors such as inter-regional trade, technology diffusion, knowledge spill over, labor migration and capital movement, etc. that make the regions geographically interdependent in the countries like India and the PRC. The economic growth of the neighboring regions may affect the given region. The spatial effects, particularly spatial autocorrelation and spatial heterogeneity, must be taken into account when analyzing economic growth at the regional level. Hence, it is important to consider the spatial distributions and neighboring interactions to study inter-regional variations. In the context of the present issues, both economic growth and their various factors including the degree of globalization may have neighborhood effects. The spatial effect of human capital will indicate the brain drain effects. Unfortunately, there is no study that addresses this issue by taking into account the regional neighborhoods effects of both dependent and independent variables. Hence, the present study takes into account all the lacunas to deal with the research issues.

The study has wider policy implications for the emerging and MICs in general, and India and the PRC in particular. Therefore, the present study attempts to strengthen the existing literature by making several contributions. First, the study examines the patterns of regional income to identify the main activities that are responsible for the regional income disparities. Second, based on the Solow's growth accounting approach, the per capita income growth is decomposed into the employment rate, total factor productivity growth (TFPG), and contribution of human capital and capital intensity, which identifies the sources of regional growth imbalances. Third, the study empirically evaluates the effect of globalization on the regional income growth by taking account of the spatial interactions. Fourth, the study establishes as to whether the regional per capita income is converging. Finally, the study provides policy implications to reduce regional income disparities, and to achieve higher regional and national economic growth.

The remainder of the study is organized as follows. The data, theoretical and empirical approaches are described in section 2. The pattern of regional per capita income is briefed in section 3. The sources of the regional income growth are examined in section 4. The empirical analysis is presented in section 5. Section 6 offers conclusions and policy implications.

2. Data and Empirical Approaches

2.1. Data

The study uses annual data in the Indian states and the PRC''s provinces from 1993 to 2010. The study follows a three sectoral classification of economies; primary, secondary and tertiary sectors to examine the patterns of per capita income. The gross state domestic product (GSDP) at the base year 2004–05 is taken from Central Statistical Organization (CSO), for India. The sectoral level provincial data on income in the PRC is taken from the National Bureau of Statistics of China (NBSC).

Further, the study uses data on capital stock, labor person and labor income share to decompose per capita income growth into the contributions due to the growth of the employment rate, capital intensity and TFPG. There are limitations of the availability of state-level investment data in India as discussed in Mallick (2012; 2013b; 2013 a; 2014). Also, there are no ready-made data on the regional employment. Hence, this paper follows the approaches as adapted in Mallick (2017a) for the data on regional capital stock and

labor in India. The provincial investment data in the PRC are sourced from NBSC, which are converted into constant prices by using regional income implicit deflators. The perpetual Inventory Method (PIM) is adapted to estimate capital stock by using initial capital stock in 1993 from Li (2003).[1] The regional labor data are also sourced from NBSC.

The estimates of labor and income at the regional level and sectoral levels, and regional capital stocks in both countries are controlled by the national aggregate data from the Asian Productivity Organization (APO 2016) for the international comparison. The labor income share data at the regional level is a challenging task. Hence, the study uses the national labor income share from APO (2016) for both countries.

The data on other variables used in the empirical analysis, are mainly sourced from NBSC (for PRC), and CSO, annual reports of University Grant Commission and Secretariat of Industrial Assistance (SIA) (for India). The detailed variables, measurement and data sources of the variables included in the empirical analysis are described in Table A1.

2.2. The sources of Economic growth

The standard Cobb-Douglas production function defines the level of output as a function of total factor productivity and capital and labor as the factors of production. The Cobb-Douglas production function under the constant returns to scale is written as;

$$Y_{it} = A_{it}{K_{it}}^{1-\alpha}(HK_{it}L_{it})^{\alpha} \qquad \text{where } 0< \alpha <1 \qquad (1)$$

Here Y, A, K, and L represent the level of output and total factor productivity (TFP), physical capital stock, labor force, respectively. HK is a measure of the human capital stock that is embodied in the labor force. α and 1-α denote the elasticity of labor and physical capital stock. The component 'A' captures the TFP effect on output growth.

This study captures the role of globalization through the FDI inflows. As noted by Ramirez (2006), FDI contributes to the economic growth through the indirect channels rather than the direct input to production or as the part of capital formation.[2] FDI affects

[1] The capital depreciation rate 7 % is applied.

[2] Some studies such as Cypher and Dietz (1997) and Plasschaert (1994) noted that FDI flows leads to a net drain on the country's scarce resources rather than increasing the investable resources of the host country. They generate substantial reverse flows in the form of remittances of profits and dividends to the parent companies, and through the intra-firm transfer pricing. Hence, the net contribution of FDI to private capital formation is: (gross FDI inflows) – (the repatriation of profits and dividends to the parent companies). Ramirez (2006) also noted that the net contribution of FDI to capital formation in Chile is far lower than the gross FDI inflows, and even negative for some years.

the economic growth through the technological change and efficiency change, and productivity spillover effects across the regions and firms etc (Ramirez, 2006; Bode et al, 2009; Cheung and Lin, 2002). Hence, here it is assumed that the effect of FDI on growth operates through variable A, and the effect of FDI on 'A' also depends on the human capital. Taking the natural logarithm of both sides of equation (1)

$$\ln(Y_{it}) = \ln(A_{it}) + (\alpha) * \ln(L_{it}) + (\alpha) * \ln(HK_{it}) + (1-\alpha) * \ln(K_{it}) \quad (2)$$

By deducting $\ln(Y_{it-1})$ from both sides of equation (2), it can be rewritten as below;

$$\ln(Y_{it}/Y_{i\,t-1}) = \ln(A_{it}/A_{i\,t-1}) + (\alpha) * \ln(L_{it}/L_{i\,t-1}) + (\alpha) * \ln(HK_{it}/HK_{i\,t-1}) + (1-\alpha) * \ln(K_{it}/K_{i\,t-1}) \quad (3)$$

The left side of the equation (3) is the growth rate of income. The first term of the right side of the equation the total factor productivity growth (TFPG), which is also known as the Solow's residuals. The second, third and fourth terms in the right-hand side of the equation are called as contribution of labor, human capital and capital respectively. The equation (3) can be rewritten to represent the decomposition of the labor productivity growth (LPG) into the TFPG, contribution of human capital and capital intensity.[3]

As FDI can contribute to the economic growth indirectly through productivity, the impact of globalization represented by FDI inflows on the per capita income growth across the regions in India and the PRC can be evaluated by the following specification.

$$GPY = f(FDI, HK, INV) \quad (4)$$

Where GPY is the growth of per capita income, HK is the human capital and INV is the physical investment. The physical investment and human capital are used as the control variables in the empirical analysis, which have been emphasized in Barro and Sala-i-Martin (1995), Islam (1995), Mankiw et al., (1992), Solow (1956), etc. Human capital affects economic growth by improving productivity (Schultz 1975; Welch 1970; Romer 1990; Benhabib et al. 1992; Lucas 1988; Kremer and Thompson 1993). Productivity growth has a significant relationship with the quality of human capital, through the technological competence of the workforce. Human capital also generates positive externalities (Lucas,

[3] $Y_{it}/L_{it} = A_{it}K_{it}{}^{1-\alpha}(HK_{it})^{\alpha}(L_{it})^{\alpha-1} = A_{it}(K_{it}/L_{it})^{1-\alpha}(HK_{it})^{\alpha}$, where K_{it}/L_{it} is the capital intensity and Y_{it}/L_{it} is the labour productivity. Similarly by taking natural logarithm, the equation becomes; $ln\ LP_{it} = ln\ A_{it} + (1-\alpha) * ln(K_{it}/L_{it}) + \alpha * ln\ HK_{it}$. Now, deducting $ln\ LP_{it-1}$ from the above equation gives the LPG as the sum of TFPG, contributions due to capital intensity and human capital.

1988; Mallick, 2017b). The physical capital formation is used very often as the input of economic growth in the empirical studies (Mallick, 2013a, 2014; Rao et al, 1999; Zhang 2002; Biggeri 2003; Zhang and Zhang 2003). Whereas, the impact of FDI on economic growth is expected to be more than the domestic physical investment, especially in the developing countries (Graham and Krugman, 1991). A foreign firm enjoys lower costs, and higher productivity and efficiency than its domestic counterparts in the hosting country, which is the result from the combination of advanced management skills and modern technologies. These are transferred to developing countries, mainly through FDI inflows (Baldwin and Dhaliwal 2001; Baldwin and Gu, 2005; Blomstorm and Kokko 1998; Criscuolo, 2005).

2.3. Empirical Methodology

The empirical analysis on the impact of globalization on the economic growth through the channels of boosting productivity includes 20 major States in India and 30 provinces in the PRC from 1993–94 to 2010–11. A panel data equation can be written as follows.

$$Y_{it} = \partial + \beta * EX_{it} + \mu_i + \varepsilon_{it} \quad (5)$$

Where, i = 1, 2, .. n (n=20 for India and n=30 for the PRC) and t = 1994-95, 1995-96, .., 2010 – 11. Y_{it} is the per capita income growth and EX_{it} is the vector of explanatory variables. The error term is a composite residual consisting of time invariant individual-specific components μ_i, and a disturbance term ε_{it} that satisfy the Classical Linear Regression model assumptions. Further, FDI and investment may be endogenously related to the income growth, and the lag years of income growth may be one of the regressors as discussed in the growth convergence literature. These issues can be tackled through a dynamic panel Generalized Method of Moments (GMM) estimators.[4]. The dynamic representation of the panel equation (1) is as follow:

$$Y_{it} = \alpha Y_{it-1} + \delta X_{it} + \lambda Z_{it} + \mu_i + \varepsilon_{it} \quad (6)$$

Where Y_{it-1} is a one year lag of income growth, X_{it} is the vector of strictly exogenous variables and Z_{it} is the vector of predetermined and endogenous variables. Where, α, δ and λ are the parameters. There are two approaches to estimate the dynamic panel data; difference GMM and system GMM. The lagged value of the explanatory variables is used

[4] This methodology also takes into account the non-observable individual specific effects.

as the instruments in the difference GMM. This approach has statistical problems, when the first difference of the regressors are persistent, that makes the lagged levels of Z and Y as weak instruments. The use of weak instruments increases the variance of the coefficient, which becomes bias in small samples. Arellano and Bover (1995) and Blundell and Bond (1997) develop a system of regressions in differences and levels to reduce the potential bias and inaccuracy associated in the difference GMM. The lagged levels of the explanatory variables are the instruments in the regression in differences, and the lagged differences of explanatory variables are the instruments in the regression in levels in the system GMM.

However, the panel data do not capture the spatial interaction or correlation among the regions. The sign of spatial correlation is issue specific. For instance, in the context of economic growth, the spatial correlation is expected to have a positive effect. However, in some cases, for instance the location of investment, the correlation could be negative or positive. The location of investment in one region may affect positively due to the effects of agglomeration or spill-over. This relation may be negative on the other hand, because the relatively strong business environment of a region, reduces the location of investment in its neighboring regions. These kind of spatial interaction effects can be controlled through spatial regression models (Belotti et al 2016). Spatial autoregressive (SAR) model and Spatial Durbin model (SDM) are commonly used in regional economic development. The SDM model takes account the spatial effect of both dependent and independent variables (Belotti et al 2016). The SAR model is the spatial case of the SDM model, which takes into account the spatial effect of the dependent variable only (Ansellin and Bera, 1998). The panel representation of the SAR or spatial lag model can be specified as follows:

$$Y_{it} = \alpha + \rho \sum_{j=1}^{n} w_{ij} Y_{it} + \beta X_{it} + \mu_i + \varepsilon_{it} \qquad (7)$$

Where, $\sum_{j=1}^{n} w_{ij}$ is the classical weight matrix[5], which is a row-standardized matrix of spatial weights describing the structure and intensity of spatial effects. $\boldsymbol{\rho}$ is the spatial autoregressive coefficient or the coefficient of the spatially lagged dependent variable. This indicates the magnitude to which the income growth in one region is determined by the behaviour of its neighborhood. The sign of the value of the $\boldsymbol{\rho}$ parameter indicates the sign of the spatial effects. The error term ε_{it} is again assumed normally distributed and

[5] In this paper, the weight matrix is based on the classical binary connectivity matrix which assume the values of 1 if the two regions share a common border and zero otherwise.

independent of all the regressors, under the assumption that all spatial dependence effects are captured by the spatially lagged variable. Corresponding to the dynamic panel GMM estimator in equation (2), the dynamic SAR Model can be specified as follow (Baltagi et al. 2014).

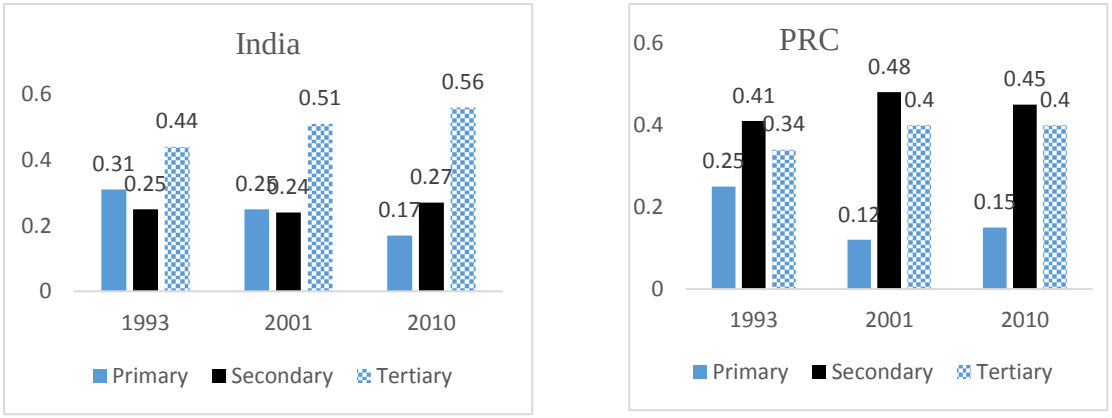
$$Y_{it} = \alpha Y_{it-1} + \rho \sum_{j=1}^{n} w_{ij} Y_{it} + \delta X_{it} + \lambda Z_{it} + \mu_i + \varepsilon_{it} \quad (8)$$

This model can also be estimated by the difference GMM and system-GMM approaches like the non-spatial dynamic panel model. The study applies system estimation in the spatial data framework due to its advantage over the difference GMM as discussed before. The study applies both SAR and SDM specifications of dynamic panel GMM system approach.

3. Regional Disparity in Income

The income structure in the three broad sectors is presented in Figure 1 for India. The income in Indian economy was predominately sourced from the tertiary sector. The primary, secondary and tertiary sector comprises of 31%, 25% and 44 % of the total income in 1993. The income sources from primary sector has declined to 17%, while it has increased to 27% and 56% for the secondary and tertiary sector in 2010. The income structure of India has been changing with the pace of economic reform measures after the comprehensive economic reform measures were introduced in 1991.

Figure 1: Sectoral Income (%)

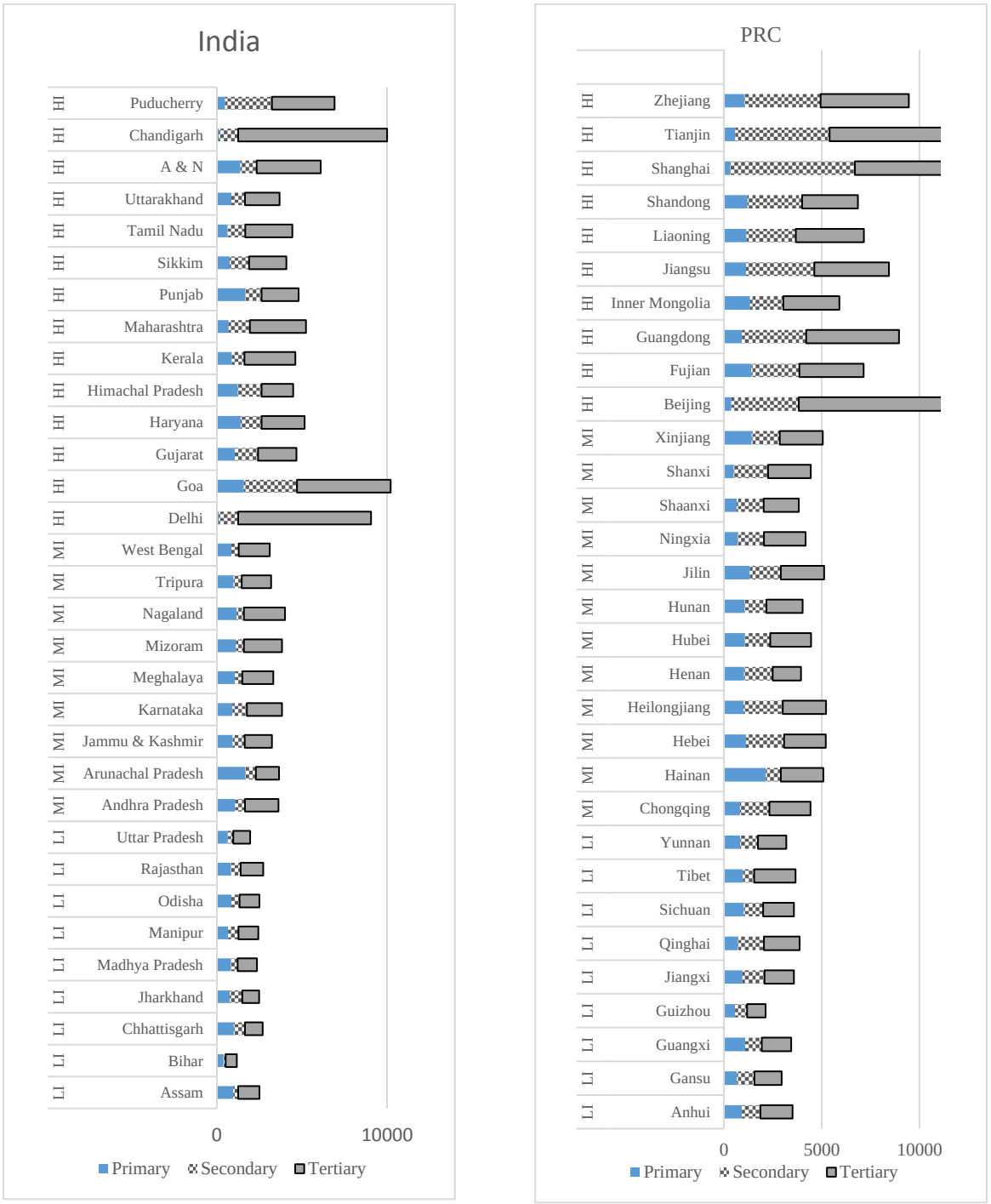


Source: APO

As regards to the PRC, the secondary sector was its major sources of income. The primary sector, secondary sector and tertiary sector accounted for 25%, 41% and 34% of total income in 1993. After reform measures were introduced in 1978, the PRC experienced a rapid and widespread industrialisation, and tertiarisation. Like India, the

income sources from the primary sector has declined to 15%, and the income source from the secondary and tertiary activities have increased to 45% and 40% in 2010. The PRC, as a planned socialist country, had given priority to agriculture and industry, over the tertiary sector. As a result, the service sector's share in value added is lower compared to other market economies with an identical level of development such as India.

Figure 2: Regional Patterns of Per capita income (Annual averages in USD)



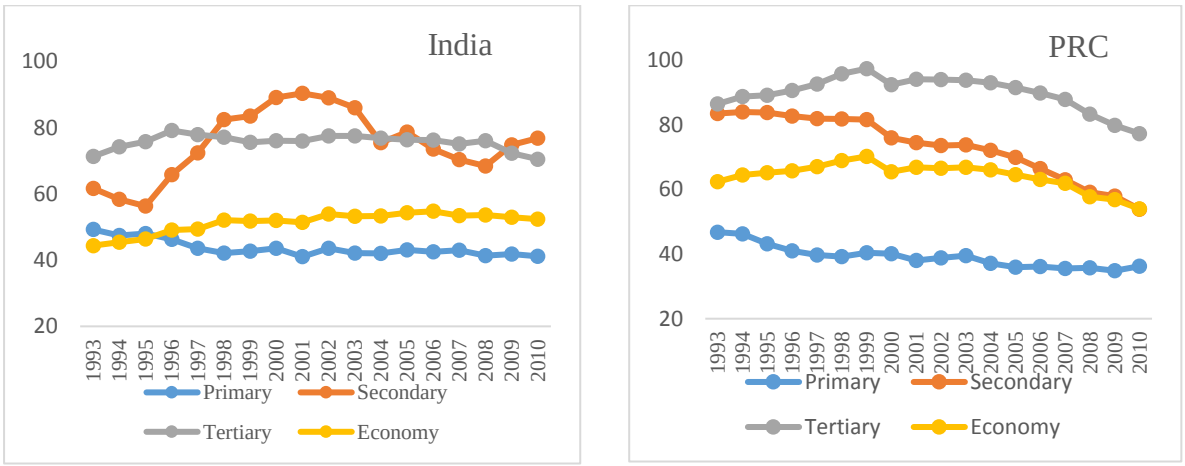
Source: Author's Calculation

The sources of per capita income from three broad activities across the regions in the PRC and India are presented in Figure 2. All the regions are categorized into three groups: - High Income (HI), Middle Income (MI) and Low Income (LI) regions, based on the annual average per capita income in 2006-10. The figure shows that the per capita income in the HI states is mainly sourced from the tertiary sector. The gap in the overall per capita income between HI states and non-HI states is due to the differences in per capita income in the secondary and service sector sectors, while the difference in the service sector is higher than that of the secondary sector. There is no significant income gap in the primary sector between HI states and non-HI states. Further, the income gap between MI and LI states is mainly due to the service sector income as this is not significant in the primary and secondary sectors.

By and large, the patterns of regional per capita income in the provinces of the PRC are similar to that in India. However, the income gap between MI and LI provinces of the PRC is mainly due to the industrial sector unlike India.

The above pattern is clearly reflected in Figure 3, which plots the coefficient of variations in per capita income in the economy as a whole and three broad sectors. The coefficient of variation indicates the regional disparity in per capita income. The figure shows that the per capita income disparity in the secondary and service activities are significantly higher than the overall per capita income disparity in the Indian states. While, that of primary sector is lower than the overall regional income disparity during this study period. The rising trend of the regional income disparity from 44% in 1993 to 52% in 2010 is due to the disparities in the secondary and tertiary sector. The disparity in the primary sector has declined from 49% in 1993 to 41% in 2010.

Figure 3: Coefficient of Variations in Regional Per Capita Income (%)



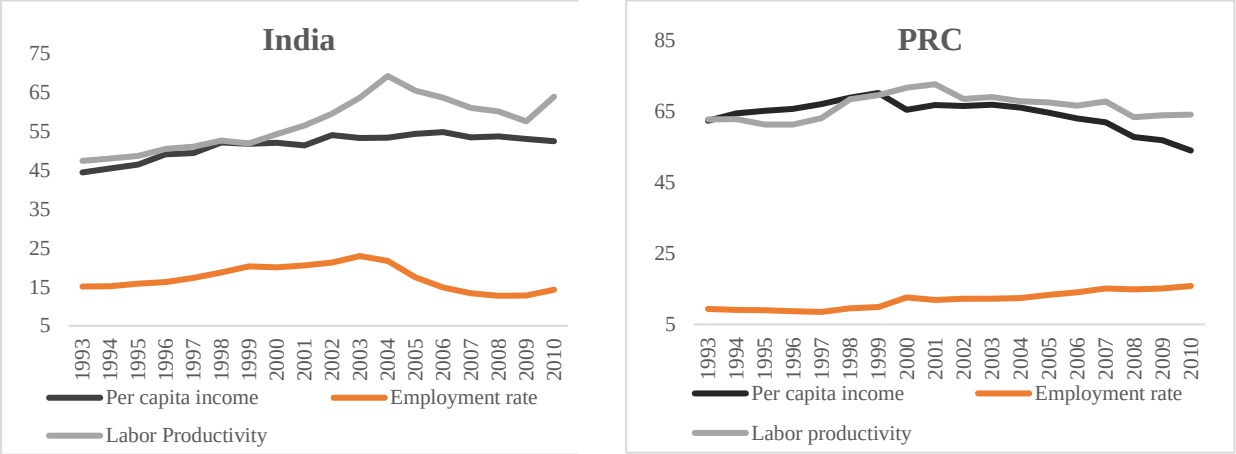
Sources: Author's calculation

The regional disparity in the total per capita income in the PRC is higher than that of India. The disparity in the secondary and service sectors across the provinces of the PRC are higher than that of the economy as a whole. While, the disparity in the agriculture sector is lower than the overall disparity. Though, there is a minor decline in overall disparity, still it is significantly high. Such decline in disparity is mainly due to the secondary sector.

4. Sources of Regional Disparity in Income

The per capita income growth can be decomposed into the growth of employment rate and growth of labour productivity (LPG) as shown in Mallick (2017b).[6] The disparities in labour productivity and employment rate are plotted in Figure 4. This shows that the high disparity in the per capita income is due to that of the labor productivity, and the disparity in labor productivity is significantly higher than that of the employment rate in both countries. Although, the disparity in employment rate declines in the Indian states, it increases in the provinces of the PRC from 9% in 1993 to 15% in 2010.

Figure 4: Coefficient of Variations in Labor Productivity and Employment Rate (%)

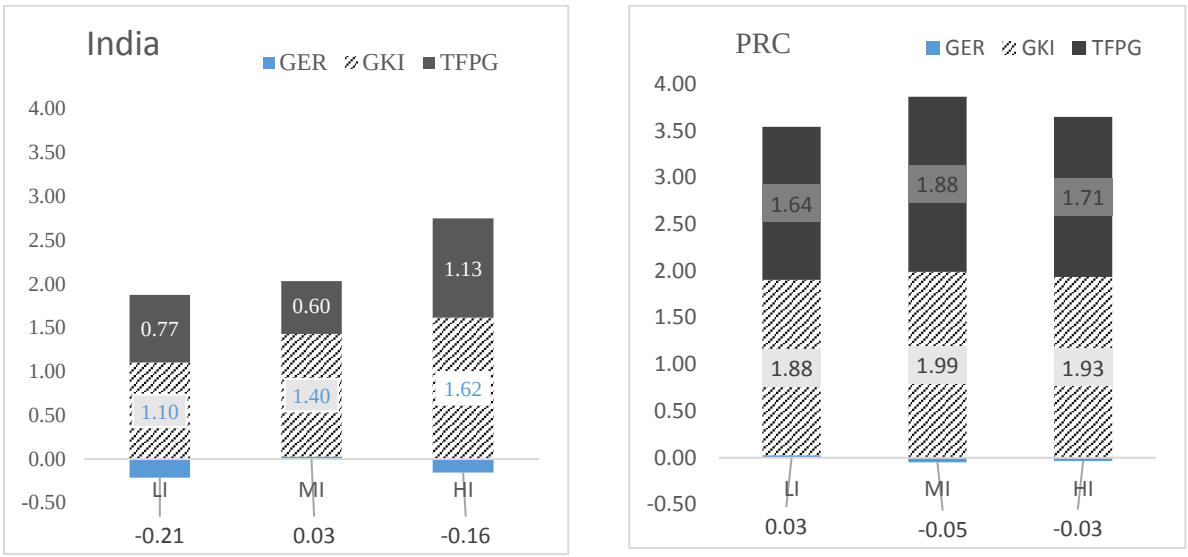


Sources: Author's calculation

Further, the LPG can be decomposed into the contributions due to human capital and TFPG by using Solow's growth accounting approach as explained in the section 2.2. Hence, the per capita income growth for the three groups of regions is decomposed in Figure 5 (see Figure A1 for all the regions).

[6] Per capita income = Y/ total population = (Y/L)* (L/total population)
or Per capita income = LP *E (9)
Where, LP: labour productivity and E: employment rate. Taking natural logarithm and then deducting the log. of LP in the previous year in equation (9) would give us the growth of per capita income as the sum of LPGand the growth of employment rate (GE).

Table 5; **Decomposition of per capita income growth in the three regions (%)**



Sources: Author's calculation

Figure 5 shows that the gap in per capita income growth in the three regions in India is due to the differences in TFPG and the growth of capital intensity. The annual average of the contributions due to the TFPG in HI, MI and LI states are 1.13%, 0.60% and 077%, respectively. The annual average of the contribution of capital intensity in the three regions are 1.62%, 1.40% and 1.10%. The per capita income growth in HI states is larger than the MI states, which is also larger than the LI states. Such nature of patterns of income growth leads to the rising trend of the per capita income in the Indian states.

The figure shows that, though there is no significant gap in terms of the per capita income growth, the LI region's growth rate is lower than the non-LI region's in the PRC. At the same time, there is a significantly high regional disparity in per capita income in the PRC. This means that this disparity is mainly due to the huge gap in per capita income growth in the provinces in the previous years. That disparity has maintained during this study period as the per capita income in the lower income provinces do not grow at a higher pace than the upper income provinces. The gap in income growth is mainly due to the TFPG component during this study period unlike India. The annual average of contributions due to TFPG is 1.73%, 1.88 and 1.64%, and due to capital intensity are 1.93%, 1.99% and 1.88% in HI, MI and LI provinces, respectively.

5. Empirical results

The impact of the globalization on the per capita income growth (GPY) between 1993 and 2010 has been examined through the functional specification (4) by using the dynamic spatial panel data methods. The equation is expected to be dynamic in nature, as the previous years' income growth could be one of the regressors as highlighted in growth convergence literatures. Further, FDI along with capital formation are expected to have endogenous relations (Zhang, 2002; Zhang and Zhang, 2003; Li and Liu 2005). Because, the multinational enterprises look for investment in the regions with higher productivity and economic growth to minimize their cost of production. Hence, the panel SAR and SDM regressions are estimated by using the dynamic GMM system method. The results of four sets of specifications are provided in Table 1 for India and Table 2 for the PRC.

The SAR specification or Model 1 suggests that the auto regression coefficients for the spatial effect is statistically significant with a positive sign in India. This means that the income growth in the neighboring regions affects that of a given region positively. This is due to the technological diffusion, inter-regional trade, migration and capital movement etc. which are not captured in this specification. Further, the impact of globalization as captured through the coefficient of FDI, is positive and statistically significant. This indicates the significance of FDI to boost inter-regional economic growth. The coefficients of the two control variables are statistically significant with the positive sign. This result suggests that human capital and physical investment are the important factor for the variation in economic growth across the Indian states. The findings of this study corroborate with several earlier findings in the context of Indian states (Mallick, 2013b; 2014**)**. Mallick (2013b) finds the positive impact of FDI on inter-state income, which could be through the productivity growth as evidenced in Siddharth and Lal (2004). Similarly, Mallick (2014) established that human capital and physical investment are crucial for inter-state income in India. Further, other studies-with a somewhat different focus such as Kathuria et al (2013) emphasized the importance of human capital in boosting productivity in the Indian states.

The SDM specification or Model 2 provides the additional findings that the spatial effects of investment and human capital are negative. That means due to the inter-regional competition the inflow of investment in one region affects the investment inflows in its neighbouring regions adversely, and hence on the income growth. Similarly, the human

capital in neighboring regions has a negative effect on the economic growth in a given region, which is also evidenced in Olejnik (2008). The increasing human capital in a given region is sourced from the migration of educated people from the neighboring regions, which affects a neighboring regions adversely. This is known as the brain drain effect.

Table 1: Factor of regional per capita income growth (India)

Independent Varriables	Model 1	Model 2	Model 3	Model 4
	SAR	SDM	SAR	SDM
L.GPY	-0.28 (0.03)*	-0.26 (0.03)*	-0.28 (0.03)*	-0.26 (0.03)*
FDI	0.05 (0.03)***	0.045 (0.03)***	0.36 (0.15)*	0.52 (0.16)*
INV	0.12 (0.01)*	0.12 (0.01)*	0.11 (0.01)*	0.11 (0.01)*
HK	1.19(0.17) *	1.72 (0.30) *	1.23 (0.16) *	1.85 (0.26) *
INT1			0.31 (0.013)**	0.45(0.14)*
INT2			0.002(0.004)	0.001(0.004)
wGPY	0.06 (0.01)*	0.11 (0.02)*	0.06 (0.01)*	0.11 (0.02)*
wFDI		0.003 (0.02)		-0.02 (0.02)
wINV		-0.01 (0.004)*		-0.01 (0.004)*
wHK		-0.19 (0.09)**		-0.22 (0.08)*
Observations	320	320	320	320
Regions	20	20	20	20
Wald test	1214.68*	1189.21 *	1313.20*	1302.59*
F test	242.94*	148.65*	187.6	130.26*
(Buse 1973) R2 Adj	0.79	0.79	0.80	0.80
Raw Moments R2 Adj	0.81	0.81	0.81	0.81
Log Likelihood	-538.62	-537.89	-535.34	-533.83
AIC	1.75	1.78	1.74	1.75

Note: *, **, *** significant at 1 percent. 5 percent and 10 percent level. The parenthesis figures are the estimated standard errors.

Further, there may be multicollinearity relations of FDI with physical investment and human capital. Hence, the Model 3 and Model 4 estimate SAR and SDM models by adding two interaction terms, INT1 and INT2 as regressors. The positive (negative) sign of INT1's coefficient indicates that there is crowding-in (crowding out) relation between FDI and physical investment. Similarly, the positive (negative) sign of the coefficient of INT2 suggests that FDI affects human capital positively (negatively).

Model 3 shows that the two interaction effects are statistically significant with positive signs. This indicates that FDI is also contributing to economic growth indirectly by crowding-in the domestic investment and promoting human capital in the Indian states, as evidenced in Mallick (2013b; 2016; 2017b) in India. This finding is in line with some other studies such as Borenzstein et al (1995); Cohen (1993); Romer (1993). Borenzstein

et al (1995) evidenced that the interaction effects of FDI with domestic investment and human capital for the national economic growth are positive in the developing countries. Cohen (1993) finds a positive interaction between human capital and the overall access to foreign financing of developing countries.

Model 3 provides an additional important finding is that the coefficient of FDI is larger than that of capital formation. The values of coefficients of FDI and investment in Model 3 are 0.36 and 0.11 respectively. This indicates that 1 % increase in the share of FDI in GDP leads to 0.36% increase in income growth, and 1 % increase in physical investment rate increases in income growth by 0.11%. It can be inferred, therefore that FDI encourages economic growth than physical investment. The findings corroborate with Mallick (2013b) and Goldar et al (2003) in India. According to Findlay (1978), the multinational enterprises usually operate at the technological frontier. They are well-equipped with new modern technologies and advanced managerial skills, which are lacking with the domestic enterprise in the developing countries (Blomstrom, et al., 1994). This makes foreign firms more productive and efficient than the domestic firms.

Similarly, the interaction terms are incorporated in the SDM specification in Model 4, which provides similar findings as noted in previous models. Further, this is noticed that the one year lag of per capita income growth is statistically significant, and negative in all the models in Table 1. This suggests that income growth is converging across the Indian states with conditioning the spatial correlations, FDI, physical investment and human capital during this study period.

By and large, similar results are found in the context of the PRC's provinces in Tables 2. FDI, physical investment and human capital are significant in all the models. This finding is consistent with Biggeri (2003), Bonnfond, (2014), Xu et al. (2008), Zhang and Zhang (2003), Zhang (2002) and Wei and Hao (2011) to establish the positive impact of FDI, physical investment and human capital on productivity growth, and hence the economic growth in the PRC's provinces. However, the results with regards to the neighborhoods effect of FDI and physical investment are different that of India. There is no neighbor effect of physical investment in the provinces in the PRC. The neighborhoods effect of FDI is positive and significant in the final model, which suggests that FDI has positive externality or agglomeration or spillover effect on its neighborhoods provinces in the PRC. This result is in confirmation with the pioneering study of Coughlin and Segev

(2000). This is also important to note that there is the visible differences in the magnitude of the coefficients of human capital between India and the PRC, which is due to the differences in measurement of human capital. Human capital represented by the enrolment in higher educational institutions, and literacy rate by age 15 and above in India and the PRC, respectively. This finding provides an important message that higher level of education has a larger effect on economic growth, as deduced by Lucas (1988) and Kremer and Thompson (1993).

Table 2: Factor of regional per capita income growth (PRC)

Independent Varriables	Model 1	Model 2	Model 3	Model 4
	SAR	SDM	SAR	SDM
L.GPY	0.01 (0.03)	0.01 (0.03)	0.03 (0.03)	0.02 (0.03)
FDI	0.04 (0.02)***	0.006 (0.03)	0.18 (0.12)***	0.24 (0.13)***
INV	0.02 (0.01)*	0.014 (0.01)***	0.02 (0.01)**	0.015 (0.01)***
HK	0.01 (0.003) **	0.03 (0.01) *	0.01 (0.003) **	0.03 (0.01) *
INT1			0.00 (0.003)	0.00 (0.00)
INT2			0.01 (0.003)**	0.00 (0.003)
wGPY	0.12(0.01)*	0.14(0.01)*	0.11(0.01)*	0.14(0.01)*
wFDI		0.006(0.01)		0.02 (0.10) ***
wINV		0.004 (0.003)		0.003 (0.003)
wHK		-0.005 (0.001)*		-0.006 (0.001)*
Observations	480	480	480	480
Regions	30	30	30	30
Wald test	4320.37*	4343.03*	4432.43*	4474.16*
F test	864.07*	542.87*	633.2*	447.41*
(Buse 1973) R2 Adj	0.90	0.90	0.90	0.90
Raw Moments R2 Adj	0.92	0.92	0.92	0.92
Log Likelihood	-728.03	-727.67	-727.32	-728.56
AIC	1.24	1.26	1.25	1.27

Note: *, **, *** significant at 1 percent. 5 percent and 10 percent level. The parenthesis figures are the estimated standard errors.

However, the analysis of the PRC provides some different results from that of India. The interaction effect between FDI and physical investment is not significant. This is a most debating issues in the PRC. Many scholars believe that FDI promotes PRC's economic growth mainly through factors of production, but it crowd out domestic investment (Huang 2003; Buckley et al. 2002) due to PRC's high saving rates and preferential policies to FDI. However, some other studies were not able to establish such crowding-out effect of FDI (Agosin and Machado 2005; Wang and Li 2004). Further, the positive relationship between FDI and human capital is established through the positive

and the statistical significance of coefficient of INT2 in Model 3. However, this coefficient is not statistically significant in Model 4, which could be due to using a larger number of regressors. Furthermore, the positive and statistically insignificant coefficient of L.GPY, suggests that the growth does not converge in the PRC's provinces unlike India.

Table 3: Regional Convergence of per capita income growth (SAR Estimation)

Independent Varriables	India			PRC		
	Reg. 1	**Reg. 2**	**Reg. 3**	**Reg. 1**	**Reg. 2**	**Reg. 3**
Ly0	-24.46 (15.1)***	-25.08 (15.20)*	-29.19 (15.61)**	-1.47 (067)*	-3.95 (0.88)*	-3.74 (1.09)*
Effective poplation growth	-29.91 (15.73)**	-30.33 (15.73)**	-26.47 (15.40)***	-0.58 (0.33)*	-0.48 (0.31)***	-.49 (0.31)***
Investment		0.08 (0.05)***	0.09 (0.05)***		0.32 (0.08)*	0.31 (0.08)*
HK			10.45 (4.03)**		4.52 (2.2)** *	0.31 (0.08)*
Spatial rho.	0.33 (0.11)*	0.33 (0.11)*	0.32 (0.11)*	0.72 (0.04)*	0.67 (0.05)*	0.67 (0.05)*
R-square	0.22	0.22	0.27	0.20	0.23	0.26
Observations	120	120	120	180	180	180
Regions	20	20	20	30	30	30

Note: *, **, *** significant at 1 percent. 5 percent and 10 percent level. The parenthesis figures are the estimated standard errors.

However, the annual time length's data may not be enough to study the growth convergence (Islam, 1995). Hence the total time period from 1993–1994 to 20010–2011 is divided into three-year shorter time periods to further examine the long-run dynamics of regional income. The neo-classical growth theory has been extensively used to understand the inter-regional differences in income due to its theoretical foundation (Baumol, 1986; De Long, 1988; Barro and Sala-i-Martin, 1995; Mankiw et al., 1992; Shioji, 1993; Cashin, 1995; De la Fuente, 2002). Hence, the theoretical framework as provided in Mankiw et al. (1992) is used to identify the long-run dynamics of per capita income in the Indian states and the PRC's provinces. The dependent variable is the growth of per capita income between the initial year and final year, and independent variables are the natural logarithm of per capita income (ly0), and investment rate and human capital in the initial year in the three-year span period. The SAR estimation in Table 3 confirms that there is the conditional convergence of per capita income and significant positive effect of spatial lag effects in India and the PRC. The findings of the study corroborate with Cashin and Sahay (1996), Aiyer (2001) and Mallick (2014) in India. Some studies in the PRC also evidenced the

conditional convergence (Bonnefond, 2014), which is due to the implementation of regional development programs in the recent years.

6. Conclusions and Policy Implications

This paper provides an explanation for the growing regional income inequality in the emerging countries, with special emphasis on the role of globalization and neighborhoods relations in the Indian states and the PRC's provinces in 1993–2010. The descriptive analysis shows that the sources of regional income inequalities are the activities in secondary and service sector in both countries. The regional disparities in labor productivity are significantly higher than that in the employment rate in both countries. Hence, the former is the main reason for the overall high regional income disparities in both countries. The growth accounting approach establishes that the regional inequalities in TFPG lead to the inequalities in economic growth in the PRC. In India, this and the capital intensity are the sources of imbalances in per capita income growth. Further, the FDI has positive neighborhoods effect in the provinces of the PRC only, which is a policy lesson to the Indian states as well. As the efficiency and productivity of FDI mainly depend on the improved human capital, which is deficient in the lagging regions in India. This makes the FDI spillover effect insignificant in the neighboring states in India.

The empirical analysis establishes a positive impact of FDI on the inter-regional income growth in both countries. The income growth of neighboring regions affects that of a given region positively in both countries. However, the human capital of neighboring regions affects the income growth of the given region adversely in both countries. Only in case of India, the capital formation in the neighboring states affects the income growth of a given states adversely, which is not evident in the PRC's provinces.

The empirical analysis establishes that FDI is crucial for the regional economic growth in both the countries, where FDI broadly represents the degree of economic globalization. Based on the results of the study, regions with a greater degree of economic globalisation or integration, everything else being equal, have higher growth. This is potentially important since the level of international market integration in many emerging countries still has a large potential to grow. Accordingly, policy-makers should pay particular attention to the lagging regions for a greater degree of economic integration with the rest of the world. The results of this paper provide an additional contribution to the

debate by emphasizing the impact of economic globalization and integration on regional income inequality within a country.

The various governments should take the neighborhoods relations into consideration while making policies of human capital investment. Particularly, the low-income regions are at a disadvantage in economic development, employment opportunities and development opportunities. This is not only difficult for them to attract high-quality talents from other states but also hard to keep their own intellectuals. Hence, it is imperative to establish a long-term mechanism of human capital mobility and the promotion of human capital in the lagging regions through the implementation of a variety of policies. For instances, the central government should strengthen the financial support for the lagging regions, through increasing transfer payments and supporting the education in rural underdeveloped areas etc. The promotion of human capital in the lagging regions will lead to positive neighborhoods effect, which will strengthen the spillover effect of FDI to the neighboring regions. Consequently, this will further strengthen the neighborhoods effect of the income growth among the regions.

The paper has few limitations. For instance, FDI is used to represent the degree of economic globalization without considering the international trade component due to the unavailability of international trade data in the Indian states. Similarly, the study noted the brain drain effect of human capital on the neighboring regions of both India and the PRC. However, a few existing studies namely Ramos et al (2009) and Wang and Ni (2015) highlight the heterogeneous effect of the levels of human capital in such relationship. Hence, this needs further analysis by including primary, secondary and tertiary education levels to uncover the detailed neighborhoods relationships.

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Appendices

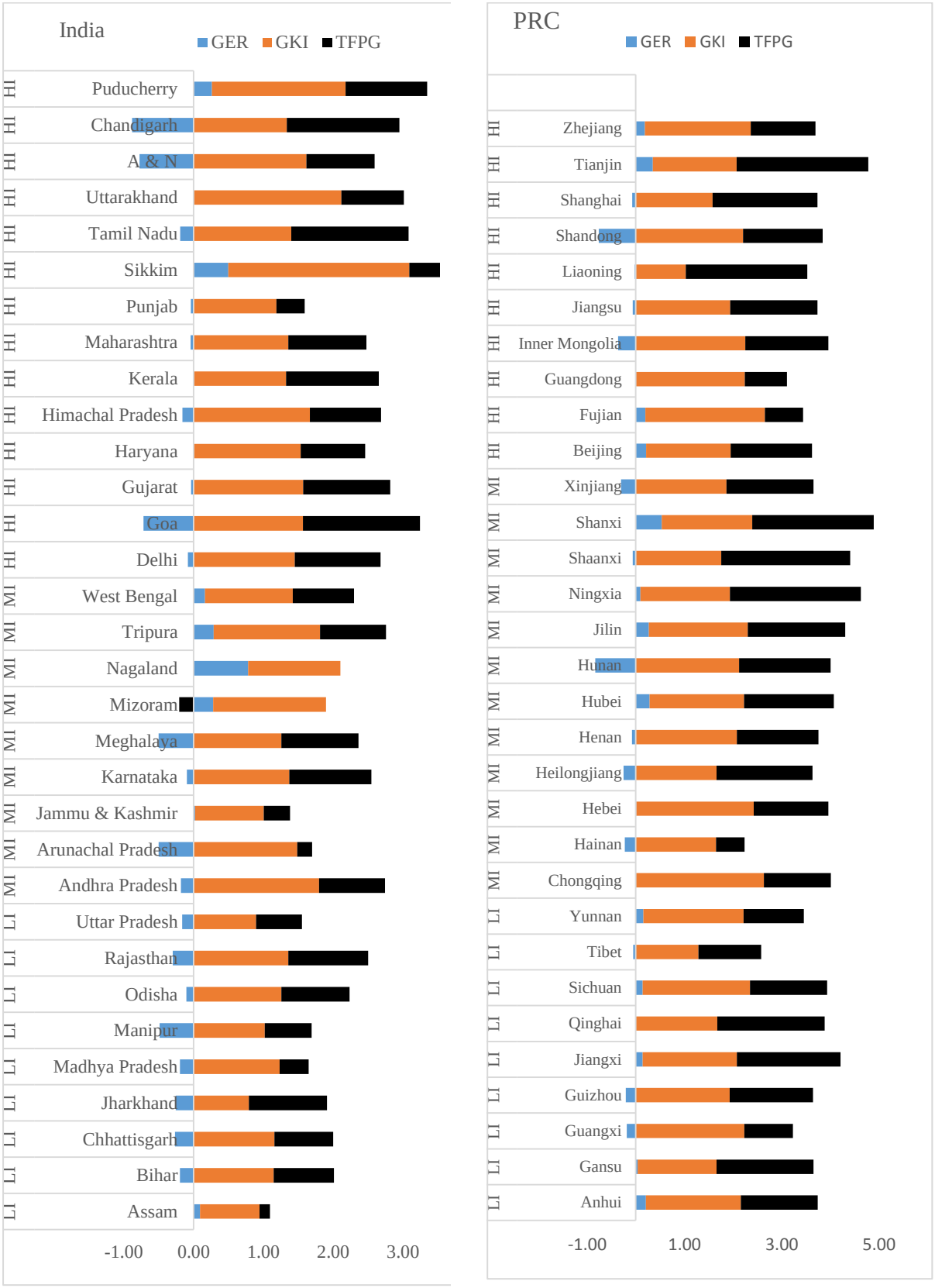
Table A1: Data and Variables

Variables	Measurement	Sources	
		India	People's Republic of China
Income	Regional domestic product	Central Statistical Organisation (CSO)	National Bureau of Statistics of China (NBSC)
Labor	Employed person	Estimated from the National Sample Survey Organisation (NSSO) data following the approaches of Mallick (2017a)	NBSC
Capital	Capital stock	Estimated from the CSO data following the approaches of Mallick (2017a)	Estimated using data from NBSC and Li (2003)
Investment	Percentage of investment in income	Investment is the net addition of capital stock.	Investment data is sourced from NBSC, which is converted to constant prices by regional income deflator
Human capital	The percentage of educated people to total population.	(The percentage of enrolment of students in higher education to total population) Annual reports of University Grant Commissioner of India	(The percentage of literate people of age 15 and over) NBSC
FDI	Percentage of FDI in income	Secretariat of Industrial Assistance (SIA)	NBSC

Table A2. Basic Statistics

	India					People's Republic of China				
Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
GPRDP	340	2.18	1.99	-6.29	9.32	510	3.72	1.43	-2.65	8.65
GRDP	340	2.91	1.95	-5.26	10.2	510	4.10	1.27	-1.69	9.02
FDI	340	0.77	2.34	0	34.2	510	2.63	3.38	0.00	23.46
HK	340	0.95	0.33	0.41	2.2	510	86.46	9.81	33.8	98.3
Investment	340	10.39	10.45	-55.5	76.5	510	22.4	7.2	8.43	50.65

Figure A1: Decomposition of per capita income growth (%)



Sources: Author's calculation