Working Paper
No: 2012/06

ESTIMATION OF PRIVATE INVESTMENT IN MANUFACTURING SECTOR AND DETERMINANTS IN INDIAN STATES

Jagannath Mallick

ISID

November 2012

ISID
WORKING PAPER
2012/06

ESTIMATION OF PRIVATE INVESTMENT IN MANUFACTURING SECTOR AND DETERMINANTS IN INDIAN STATES

Jagannath Mallick

Institute for Studies in Industrial Development
4, Institutional Area, Vasant Kunj Phase II, New Delhi - 110 070
Phone: +91 11 2676 4600 / 2689 1111*; Fax:* +91 11 2612 2448
E-mail: info@isid.org.in; *Website:* http://isid.org.in

November 2012

ISID Working Papers are meant to disseminate the tentative results and findings obtained from the ongoing research activities at the Institute and to attract comments and suggestions which may kindly be addressed to the author(s).

CONTENTS

List of Tables

List of Figure

ESTIMATION OF PRIVATE INVESTMENT IN MANUFACTURING SECTOR AND DETERMINANTS IN INDIAN STATES

Jagannath Mallick[*]

[***Abstract***: *This study estimates private investment in the manufacturing sector in Indian states over the period from 1993–94 to 2007–08 by using the unit-level data of ASI. The results show that though the variation in private investment across the major states is declining during this period, still it is high. The empirical analysis shows that private investment in Indian states is explained by its one-year lag, infrastructure, economic factors, fiscal factors and labour factors. This paper contributes to the regional development literature by estimating private investment of the manufacturing sector at the state-level and analysing their patterns and determinants, particularly after the economic reforms.*]

I. Introduction

Private investment is identified as a crucial factor for economic growth at both the national and state levels in Indian economy (see, Everhart and Sumlinski, 2001; Odedokum, 1997; Khan and Reinhart, 1990; Blejer and Khan, 1984; Alhuwalia, 2002; Baddeley *et al.,* 2006; Rao *et al.,* 1999; Krishna, 2004; Mallick, 2012). The inflow of private investment into a state has the potential to generate state income, output, and tax revenue along with providing employment opportunities to local residents. The direct tax returns from profitable investment projects (and indirect returns from central transfers through rising individual incomes within states) have the potential to improve the fiscal positions of individual states. Growth facilitating private investment is market oriented and determined by the rate of returns on investment. The introduction of various economic reform measures in 1991 aggravates the competition for attracting private investment in a variety of ways. For instance, the abrogation of the Industrial Licensing Act favours the investors to choose their preferred state among other states as the investment destination. Further, liberalization measures reduce the degree of control exercised by the Centre in many areas, leaving much greater scope for state-level

[*] Assistant Professor at the Institute for Studies in Industrial Development, New Delhi. E-mail:mallickjagannath@gmail.com

Acknowledgment: I am thankful to Mr Ramesh Kolli for his valuable suggestions. I also thank Ms Puja Mehta and Mr Rakesh Kr Gupta for their assistance.

initiatives in Indian economy. Further, Bhattacharya *et al.* (2004) argued that though the growth rate of GSDP has improved marginally in the post-reform period, at the same time, regional disparity in SDP has widened more drastically. Industrial states are growing more rapidly than backward states by attracting investment.

There is rich literature on the patterns and determinants of total private investment at the national level in the context of Indian economy (see, Mitra, 2006; Atukeren, 2005; Sundararajan and Thakur, 2005; Pradhan *et al*., 1990; Wai and Wong, 1992; Serven and Solimano, 1990 and 1991; Serven, 1998; Rodrik, 1991; Krishnamurty, 1984). Private investment in India is sourced from both the domestic investors and foreign investors. The patterns and the determinants of total private investment differs from that of FDI (Palit, 2007; Sloan-Rossiter, 2008; Chatterjee, 2009; Heshmati and Davis, 2007; Siddharthan 2009, Vijaykumar *etal*., 2010; Morris, 2004). Further, the patterns and determinants of total private investment at the state level are not the same as at the national level. Reserve Bank of India (RBI) data shows that the share of FDI is about 1 % and 3 % of gross national product and gross domestic capital formation during the period 1993–94 to 2004–05 in the Indian economy. Hence, it is expected that the patterns and determinants of private investment at the state level may not be the same as that for the national total private investment and FDI at the state level in Indian economy. Each state of India has its respective role in attracting the private investment into its territory. Though the federal framework of India causes all states to face certain common macroeconomic policies such as monetary policy and trade policy, states do retain extensive control over local administrative regulations, provisioning of infrastructure, state taxation, and provision of basic social services such as health and education. Carlberg (1981) and Wilson (1999) argue that the factor prices determine the flow of capital at the regional level in an economy.

According to Khan and Reinhart (1990) and Khan and Kumar (1997), the elasticity of per capita income due to per capita private investment is higher than the per capita public investment in the developing countries, including India. Further, the similar nature of impact on the income is empirically examined by Mallick (2012) at the sub-national level in the Indian economy as well. He argued that the marginal productivity of private capital is more than the public capital at the state level in the Indian market reforms economy. Hence, the equal distribution of private capital is a policy instrument to reduce the disparity in economic growth among the states. Barro and Sala-i-Martin (1995) argued that the imbalanced regional growth can pose a serious threat to economic development because even small differences in the growth rates, cumulated over a long period of time, would have a substantial impact on the standard of living of the people. Similarly, Chowdhury (2003) identified that inequality in any form has a negative effect on subsequent growth and development and creates economic, social and political

tension among the states in India. In fact the flow of private investment is market oriented and determined by the rate of returns on investment. Further, liberalization has reduced the degree of control exercised by the Centre in many areas, leaving much greater scope for state-level initiatives, which facilitates competition among the states in attracting private investment through various promotional policies and incentives. Hence, given the role and importance of state level private investment in the post economic reform years, it is important to examine the patterns and determinants of investment in manufacturing industries across the states in India. The result of this analysis will help to design policies to achieve a balanced growth among the states. Hence, this study seeks to answer the following research questions.

i) How to measure private investment at the state level in Indian economy?
ii) What are the patterns and determinants of private investment among the states in India?

The study comprises six sections. In order to lay the background of the study, **Section -I** provides a brief introduction about the study in terms of outlining the emerging issues in view of the rising growth of private investment and its role in economic growth. In this context, the study finds out the gaps in the existing literature in the Indian context, and then tries to fill up the research gaps by setting up clearly defined objectives. **Section-II** outlines in detail the conceptual and empirical review of literature, particularly concerning the measurement and determinants of private investment at the national and sub-national levels in India. **Section-III** estimates the private investment for the manufacturing sector at the state level. **Section-IV** analyses the trends and patterns of private investment at the broad industry level, to indicate the strength and weakness among the states in relation to the inflow of private investment in the manufacturing sector. **Section-V** designs the theoretical and empirical framework to explore the determinant factors of private investment at the state level. **Section-VI** describes the methodology and tools for the empirical analysis. **Section-VII** explains the data sources and measurement of variables. **Section-VIII** describes the role of infrastructure in determining the inflow of private investment into states. **Section-IX** provides the results from the empirical analysis to suggest policy for the equitable allocation of private investment, which will reduce disparities in economic growth across the states. **Section-X** summarises the conclusions and policy implications of the study.

II. Review of Literature

The review of literature deals with the measurement of private investment and the determinants of private investment at the national and sub-national levels, in order to answer the above research questions. The central statistical organisation (CSO) is the source for data related to investment and capital stock in India. CSO (1989, 2007) defines

investment as the creation of capital or net addition to the stock of capital. Investment is usually measured by gross capital formation (GCF), which comprises gross fixed capital formation (GFCF) and change in stocks. CSO estimates capital formation at the national level through three approaches, i.e. production (or commodity flow), saving (or flow of funds approach), and expenditure approach. The fluctuating nature of inventories or change in stocks restricts the researcher to use only GFCF as the measurement of investment (Khan and Reinhart, 1990; Blejer and Khan, 1984; Wai and Wong, 1982). Nevertheless, the above national level approaches are not directly applicable at the state level due to non-availability of data as well. Hence, the Regional Accounts Committee (RAC) in 1972 recommended compilation of estimates of GFCF only at state level, rather than compilation of estimates of gross capital formation (GCF)[1]. Report by National Statistical Commission headed by Dr C. Rangarajan in August 2001 and High Level Committee (CSO, 2009) have recommended several measures for improvements in the state level official estimation of public and private GFCF in India.

CSO (2009), comments that most of the states compile the public GFCF. But, the non-availability of state-wise details on capital expenditures in private corporate sector and household sector limits the compilation of estimates of private sector GFCF at the state level. Although data on GFCF with respect to private corporate sector at national level is available from the Studies of Company Finances conducted by the RBI, such details cannot be worked out as companies do not maintain location-wise capital expenditures in their accounts. In the same way, detailed data on GFCF for the unincorporated enterprises or household sector is not available, although data for benchmark years for households is available from the All India Debt and Investment Surveys (AIDIS). In addition, there are problems with respect to AIDIS results, as investment data from this survey shows considerable underestimates. Further, at present, the benchmark enterprise surveys conducted by the CSO/NSSO do not give reliable estimates of GFCF at state level, due to a variety of reasons.

Generally the state level GFCF is estimated by the directorate of economics and statistics (DES) of each state viz. Government of Karnataka (2010) and Government of Haryana (2010) etc. CSO (2009) reviewed the status on the estimation of capital formation at the state level in India. Both public investment and private investment are estimated in Andhra Pradesh (AP), Assam (AM), Haryana (HA), Madhya Pradesh (MP), Rajasthan (RA), Tamil Nadu (TN) and Uttar Pradesh (UP). However, Bihar (BI), Gujarat (GU), Karnataka (KA), Maharashtra (MR), Odisha (OR) and Punjab (PN) estimate only public investment. Government of Karnataka (2010) provides the estimates of private

[1] An estimation of change in stocks is not conceptually viable or feasible at the state level because of the open boundaries of the states. The problem is mainly on account of non-availability of data on goods and services transacted across the state boundaries.

investment in aggregate investment across broad sectors from the period 1999–00 to 2008–09. The Karnataka Economic and Political Weekly Research Foundation (EPWRF) (2003 and 2009) publishes the GFCF at the state level, estimated by DES and others in India. EPWRF (2003) commented that the details of the actual methods adopted by the states are not known. Generally, it is believed that the states apply the same broad methodology as recommended by the sub-group on "State Gross Domestic Product and Expenditure Account". But, there are some variations in methods adopted depending upon the economic structure at a particular point of time and data availability in the individual states.

The state level private investment in India is estimated by Lakhchaura (2004), CSO (2009), Mallick (2013) and Rajeswari *et al.,* (2009). Lakhchaura (2004) provides the estimates of private GFCF from 1993–94 to 1999–2000, CSO (2009) for the year 2004–05 and Rajeswari *et al.* (2009) for the periods from 1999–2000 to 2005–06 at the current prices. Mallick (2013) estimates the private GFCF at constant prices (base year 1999–00) over the periods from 1993–94 to 2004–05. The above estimates cannot be combined with each other, as they are based on different methodologies, data sets and assumptions.

The existing empirical studies look at the impact of investment on economic growth at state level and the issue of convergence of per capita income across the states of India include Baddeley *et al.* (2006), Rao *et al.* (1999), Kurian (2000), Aiyer (2001), Marjit and Mitra (1996), Rao *et al.* (1999), Dasgupta *et al.* (2000), Cashin and Sahay (1996), Krishna (2004) and Nagaraj *et al.* (2000). These studies provide mixed results on the issue of convergence of regional growth in India based on different samples of the states over different time spans. However, due to the unavailability of data on private investment and public investment, many states used loans extended by financial institutions as proxy for private investment (Baddeley *et al*., 2006; Rao *et al*., 1999), credit from scheduled commercial banks for private investment (Purfield, 2006), public expenditure (Rao *et al*., 1999) and developmental expenditure (Baddeley *et al*., 2006) for public investment[2]. These proxies are poor reflections of the extent of private investment and public investment at the state level because they exclude loans extended by various non-financial institutions to private enterprises, foreign investors in the states and public investment as a part of public expenditure.

Mallick (2011) examines the determinants of aggregate private investment at the state level by using the fixed effect regression over the period from 1993–94 to 2004–05. He finds that factors such as income, labour productivity, infrastructure, quality of

[2] The status of non-availability of the estimates of private investment at the state level is highlighted in Lakhchaura (2004), EPWRF (2003 and 2009), Mallick (2008) and Government of India (2009).

governance and economic uncertainty explain the variation in private investment among the states in India. The use of fixed effect may not be applicable in this context, as private investment and some of its determinant factors included in the specification have simultaneous relation. Further, economic uncertainty may not influence the variation of private investment, as it does not vary much within the Indian economy. Mallick (2012) examines the impact of private investment on the state level income in India and finds it to be statistically significant over the periods from 1993–94 to 2004–05. Further, Mallick (2012) provides the evidence of divergence in per capita income between 1993–94 and 2004–05 across the major Indian states, which does not conform to the prediction of the neo-classical growth theory. The states with higher initial levels of per capita income grew faster than states with lower income leading to divergence in per capita income over time. The findings of the paper corroborates with Rao *et al.* (1999), who commented that the divergence in per capita income across Indian states has increased, particularly since economic liberalisation measures were initiated, which reduced the degree of control exercised by the Centre in many areas leaving much greater scope for state-level initiatives and facilitated states to compete with each other in order to attract the market-determined flow of private investment. Further, without empirical support, they commented that the regional pattern of allocation of private investment depends upon resources, institutions, social and economic infrastructure, and policies in Indian economy. Similarly, Bhattacharya *et al.* (2004) argued that widening of regional disparity in the post reform years is due to the inequitable distribution of investment, which is in turn determined by a variety of reasons, like poor income and infrastructure.

Hence, the estimates of private investment at the state level are limited. The existing studies provide data on the total private investment (Mallick, 2013; Lakhchaura, 2004; GOI, 2009; Rajeswari *et al.*, 2009) and agriculture sector (Chand, 2001) at the state level. In the recent high growth scenario—attributed to the non-agricultural sector in the Indian economy—we need to estimate the private investment in a prominent sector among the non-agricultural sectors in the Indian economy. Also, there are few studies that have dealt with the issue of determinants of private investment at the state level in India, such as Chand (2001), Purohit and Reddy (1999) and Mallick (2011). Mallick (2011) explains the determinants of total private investment, whereas others analyse private investment in the agriculture sector at the state level. Hence, there is need for a state level study on the estimation of private investment in a prominent sector, and analyse the patterns and determinants in the Indian economy. The role of manufacturing sector is prominent in the recent high growth scenario of Indian economy. NAS data shows that the share of manufacturing industries in total private investment is about to 43 per cent (34 per cent in the registered manufacturing sector). There is no study on the analysis of private investment at the state level in Indian economy. Hence, this study chooses the registered

manufacturing industries for the detailed analysis to understand the patterns and determinants of private investment among the Indian states.

In the context of above researchable issues, the objectives of the study are as follows:

i) To estimate the state level private investment in manufacturing sector in the Indian economy.
ii) To examine the patterns and determinants of state level private investment in manufacturing sector.

III. Estimation of Private Investment in Indian States

The 20 major states viz. AP, AM, BI, Chhattisgarh (CH), Delhi (DL), GU, HA, Himachal Pradesh (HP), Jharkhand (JH), KA, Kerala (KE), MP, MR, OR, PN, RA, TN, UP, Uttaranchal (UTR) and West Bengal (WB) are included in this paper. The time period of this study starts from 1993–94, as reform policies started influencing the state level economies from this period. The end of the study period is 2007–08 on the basis of availability of unit level data of ASI.

The National Accounts Statistics (NAS) of CSO provides data on GFCF at the both current and constant prices with base year 2004–05 by industry of use. NAS gives data on GFCF for the entire economy and public sector by industry of use, including the 1-digit industry code of NIC. The entire manufacturing industry includes the un-registered and registered sectors. The private investment in the manufacturing industry is the remaining after deducting the public GFCF from the total GFCF in this sector. The unit level data of Annual Survey of Industries (ASI) provides the annual data on GFCF in the registered manufacturing industries by the types of institutions at the current prices. Hence, the total private GFCF in manufacturing is to be distributed among the states on the basis of unit level data for the private enterprises, to estimate the private investment in the manufacturing sector in the Indian states over the period from 1993–94 to 2007–08.

Methodology and Estimates of Private Investment

The study uses the methodology of CSO in defining investment. Investment is measured as the GFCF, which comprises construction, machinery equipment and computer software equipment (NAS, 2007, 2010). The study uses both the unit level data of ASI and the aggregate data of NAS. The indicators related to GFCF in the unit level data are presented in *Appendix Tables A1 and A2*. Unit level data of ASI provides the information on its various blocks. A block provides the PSL No., industry code, description of industry, state code, district code, sector code (i.e. rural and urban), RO/ SRO code and the number of units. The PSL No. and industry code are used for the identification of the

sample. Block B provides information on the ownership, which categorises all the units by the ownership. There are 6 types of ownerships, i.e. (1) wholly Central Government, (2) wholly State and/or Local Govt, (3) Central Government and State and/or Local Government jointly, (4) joint sector public, (5) joint sector private, (6) wholly private ownership. The joint sector private and wholly private ownership are considered as private ownership, while the other four fall in the category of public sector ownership, as defined by NAS.

The indicators related to GFCF are provided in the C block of unit level data. The indicators related to the GFCF are presented in *Appendix Table A2*. Block C provides data on net value of fixed asset (closing as on), net value of fixed asset (opening as on), additions during the year due to revaluation and depreciation provided during the year by types of assets, i.e. land, building, plant & machinery, transport equipment, computer equipment including software, pollution control equipment and others. As per NAS (2010), the GFCF is measured as the net fixed capital formation (NFCF) plus the depreciation. Whereas, NFCF is net value of fixed asset (closing as on) – net value of fixed asset (opening as on) – addition during the year due to revaluation. Hence, the GFCF is equal to net value of fixed asset (closing as on) – net value of fixed asset (opening as on)-addition during the year due to revaluation plus depreciation provided during the year. Further, except land, all other assets are considered as capital creating assets (NAS, 2010).

The information in blocks A, B and C are combined over the years from 1993–94 to 2007–08 to give data on indicators related to GFCF, types of ownerships, types of industries, states, etc., at the enterprise level. Firstly, private enterprises at the state level are picked from the data. Then the above methodology is used to estimate the private GFCF for all the enterprise at the state level. The indicators related to GFCF in the unit level data are at current prices. Hence, the estimated GFCF is also at current prices. There are various limitations including the coverage in the unit level data. NAS provides the aggregate of GFCF for the private sector in India. Hence, the national private GFCF at constant prices (2004–05=100) is distributed over the states on the basis of their share by using the estimated private GFCF from the unit level data of ASI. The estimated private GFCF at constant prices (2004–05=100) is presented in *Appendix Table A3*.

IV. Trends and Patterns of Private Investment in Indian States

The states' share in private investment is presented in *Table 1*. The entire period of the study is categorised into two sub periods, i.e. 1993–94 to 1999–00 and 2000–01 to 2007–08. The first period is considered as the first phase of economic reform, while, the second

period is the second phase of economic reform. The table shows the list of top 5 states that attracted private investment in the first phase: they are MR, GU, TN, UP and KA. The same group of states remains in the list of top 5 in attracting private investment in the second phase as well. The list of bottom 5 states in the first phase includes BH, UT, ASM, CH and DE, while the list of bottom 5 in the second phase includes BH, ASM, DE, KE and HP. The 4th column of *Table 1* presents the state-wise change in rank between the two periods. The improvement of rank in terms of share of private investment is found in CH, OD, UT, HA, WB and TN (i.e. from 17th to 9th for CH, from 14th to 8th for OD, from 19th to 15th for UT, from 9th to 7th for HA, 12th to 10th for WB and 4th to 3rd for TN). However, there is no change in the ranks of MR, GU, KA, AP and BH. The remaining states experience a decrease in the rank in terms of their share in private investment. The above results show the indication of structural transformation in terms of private investment among the Indian states.

Table 1
Share of Private Investment (in %)

State	*1993–99*	*2000–07*	*Change in rank*	*1993–2007*
MR	22.55 (1)	16.95 (1)	0	18.87 (1)
GU	17.81 (2)	16.88 (2)	0	17.20 (2)
TN	9.26 (4)	12.27 (3)	-1	11.24 (3)
UP	9.33 (3)	7.26 (4)	+1	7.97 (4)
KA	8.86 (5)	7.11 (5)	0	7.71 (5)
AP	5.40 (6)	5.94 (6)	0	5.75 (6)
HA	3.32 (9)	4.07 (7)	-2	3.81 (7)
MP	5.11 (7)	2.46 (13)	+ 6	3.37 (8)
RA	4.01 (8)	2.80 (11)	+3	3.21 (9)
PN	2.07 (10)	2.66 (12)	+2	2.46 (10)
WB	1.74 (12)	2.83 (10)	-2	2.45 (11)
OD	1.07 (14)	3.14 (8)	-6	2.43(12)
CH	0.70 (17)	2.94 (9)	-8	2.17 (13)
JH	2.03 (11)	2.05 (14)	+3	2.04 (14)
UT	0.17 (19)	1.68 (15)	-4	1.16 (15)
HP	1.21 (13)	0.90 (16)	+3	1.01 (16)
KE	1.04 (15)	0.84 (17)	+2	0.90 (17)
DE	0.91 (16)	0.56 (18)	+2	0.68 (18)
ASM	0.33 (18)	0.35 (19)	+1	0.34 (19)
BH	0.13 (20)	0.12 (20)	0	0.12 (20)
Major (20)	97.04	93.80		94.91

Source: Author's calculation

The entire period is categorised into three sub periods of equal length to examine statistical significance of the structural transformation in private investment among Indian states. These periods are 1993–94 to 1997–98, 1998–99 to 2002–03 and 2003–04 to

2007–08. The descending order ranks of the states in terms of their share in private investment for the three sub-periods are presented in *Table 2*. The rank correlation coefficient between the first period and second period is 0.95, between first period and third period it declined to 0.85. These correlation coefficients are statistically significant at 1 per cent level of significance. The result indicates that distribution of private investment among the states in the first period is positively associated with the second period and third period. However, the degree of association of first period with the second period is higher than the third period. Fisher's Z test is used to verify whether the difference in the degree of association of first with second period and first with third period is statistically significant. The result of Z test is presented in *Table 3*. The Z statistics is found to be statistically significant at 1 per cent level of significance. This indicates that the structural transformation in private investment across states has taken place and is statistically significant.

Table 2
Ranking of States in Terms of Share in Private GFCF

State	*1993–97*	*1998–2002*	*2003–2007*
AP	6	7	5
ASM	18	18	19
BH	20	20	20
CH	17	17	8
DE	16	15	18
GU	2	1	2
HA	9	6	7
HP	13	16	16
JH	11	11	15
KA	5	3	6
KE	15	14	17
MP	7	10	12
MR	1	2	1
OD	14	13	9
PN	10	12	11
RA	8	9	10
TN	4	4	3
UP	3	5	4
UT	19	19	14
WB	12	8	13

Note: States are ranked in descending order based on the share in Private GFCF
Sources: Author's Calculation

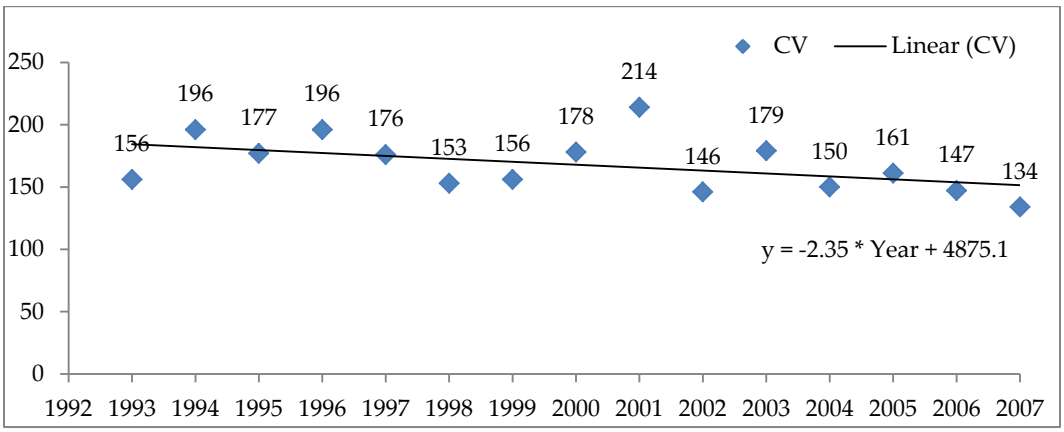
Table 3
Fisher's Z test for Equality of Correlation Coefficients

Rank Correlation Coefficients	*1993–97*
1998–2002	0.953*
2003–2007	0.847*
N	20
Z	-2.48*

Note: * indicates statistical significant at 1 per cent level of significance.
Sources: Author's Calculation using STATA 12.

The above analysis shows that structural transformation in private investment has taken place among the states in India. Some of the states have improved/deterioted in attracting the share of private investment during the period from 1993–94 to 2007–08. The coefficient of variation (CV) measures the scattering of states in terms of their share in private investment, which is plotted in *Figure 1*. The CV ranges from 196 to 134 during this period, which is very high. The trend line analysis shows that there is a negative trend in CV over the period from 1993–94 to 2007–08. The result indicates that the scattering of states in terms of share in private investment is very high and decreasing over this period.

Figure 1
Regional Variation in Private Investment



Source: Author's Calculation

V. Determinants of Private Investment at State Level

The empirical framework for the analysis of determinants of private investment in manufacturing sector is based on neoclassical model of inter-regional economic growth by Carlberg (1981). The model says that inter-regional growth is characterised by free trade, labour and capital movements. The movement of capital and labour occur through

market mechanism by attaining efficiency within the neoclassical framework. Hence, the movement of capital among the regions of an economy directly varies with the factor prices across the region. However, due to the diminishing marginal product of capital, the factor price will be equated across the regions in the long run. The theory is based on the following assumptions (time subscript "t" is dropped to simplify the notation):

1) All regions producing a homogenous output (Y_i) using two inputs, i.e. capital and labour.
2) A distinct neoclassical technology in each region and spatial diffusion may spread technological knowledge.
3) Full employment of resources under perfect competition in product and factor markets.

Hence, the regional production function,

$$Y_i = F_i(K_i, L_i) \tag{1}$$

Where, Y_i, K_i, L_i, and F_i are Aggregate output, stock of capital, labour inputs and neoclassical technology, respectively, in "i" region.

Market Allocation

The nation's endowment in capital K and labour L are given. For simplification, consider there are two regions in an economy. Then $K = \sum_{i=1}^{2} K_i$ and $L = \sum_{i=1}^{2} L_i$. Then, profit function under perfect competition and full-employment of factor of production for the region "i" is:

$$Qi = Yi - K_i\, r - L_i\, w \tag{2}$$

Hence, the first order condition for profit maximization:

$$\partial Y_i/\partial K_i = r \text{ and } \partial Y_i/\partial L_i = w \tag{3}$$

Where, $\partial Y_i/\partial K_i$ and $\partial Y_i/\partial L_i$ are the marginal product of capital and marginal product of labour in region 'i', respectively. However, the second order condition is satisfied since neoclassical technology exhibits diminishing return to substitution. The necessary condition implies that factor prices correspond to marginal products.

Optimal allocation

National output in a two-region economy is $Y = \sum_{i=1}^{2} F_i(K_i, L_i)$ (4)

Let μ and λ, two lagrangian multipliers, be such that $0 \le \mu \le 1$ and $0 \le \lambda \le 1$. Hence, the objective function is to maximize, $Z = \sum_{i=1}^{2} F_i(K_i, L_i) + \lambda(\sum_{i=1}^{2} K_i - K) + \mu(\sum_{i=1}^{2} L_i - L)$

From the first order condition, $\partial F_1/\partial K_1 = \partial F_2/\partial K_2 = -\lambda = r$ (5)

Equation (5) indicates that the market determined rate of return on capital across the regions maximizes the national optimal output (income) in the long run. In other words, the market allocation of capital across the regions maximizes or optimises the national total income, which is efficient. Further, equation (5) indicates that in the long run, allocation of capital will equate the regions' marginal product with the factor price. Hence, higher the factor price or rate of return (r_i) in a region, higher will be the capital inflow into that region.

Hence, it can be written as $K_{i,t} = f(r_i)$ (6)

The flow of capital depends on the net rate of return which is the rate of return minus the tax (Wilson, 1999). Wilson (1999) assumes that in an economy using two factors—i.e. labour and capital for production, while labour is immobile and capital flows from one region to another—the local governments compete to attract capital into their territories through tax competition and provision of public goods. The public good (provided to increase productivity) is financed by imposition of tax on the profit of the capitalist. Hence, the flow of capital is positively affected by public good and negatively affected by the imposition of tax. Overall, the flow of capital depends on the after tax rate of return or net rate of return, which is equalized across the regions in the long run due to the diminishing marginal product of capital. The firms invest to the point where marginal product of capital equals the after tax rate of return. In turn, the gross rate of return on investment depends on the taxation and provision of public goods. The using of taxation as an instrument to attract private investment is criticised by Kiabel (2003). Kiabel (2003) argues that the using taxation (i.e. tax incentives and tax cut) as an instrument is not an efficient strategy to attract private investors. The tax cut and tax incentives may send a wrong signal to the private investors and make them suspicious of the real intentions of the host region. Development of infrastructure is a better instrument to encourage private investors: because it enhances productivity, hence the rate of return on capital. Particularly, Rao *et al.* (1999) comment that physical infrastructure is crucial in explaining the inflow of private investment in Indian states.

Fiscal status of economy influences the inflow of private investors (Kiabel, 2003). The increase in debt burden or fiscal deficit indicates the increase in tax rate in future, and reduces the rate of return on private investment. Hence, the fiscal status of the states negatively affects the inflow of private investment. However, market size is expected to have a positive influence on the allocation of private investment. The larger the market size of the host economy, the greater is the possibility of reaping the advantages of the

scale economies. This reduces the cost of production and hence increases the rate of return (Aggrawal, 2005). Further, the availability of finance as the main source of private investment affects the inflow of private investment positively by increasing the rate of return on investment through reduced interest rates.

Labour cost is expected to have an adverse impact on the flow of private investment. High labour cost raises the cost of production. Hence, other things remaining same, it reduces the rate of return on investment. The unit labour cost is the cost of labour required to produce one unit of output. It is measured as the ratio of labour compensation to output from the production process (Erumban, 2009). It indicates that states with lower unit labour cost are more competitive. Productivity of labour also explains the variation in private investment across the states. By increasing labour productivity refers to the entrepreneur's output will increase while only having the same number of employees. This causes a lower unit cost per item produced and therefore greater efficiency. This may allow the entrepreneur to lower the price of its products to gain more customers and hence enjoy higher profit margins.

The size of the manufacturing sector for the variation in private investment is considered to be crucial. Manufacturing sector is capital intensive in nature. Hence, higher the volume of manufacturing sector in a state, higher will be the private investment. However, the relative share of manufacturing sector to industrial and service sector presents the structure of economy. That means the structure of economy of a state is also important in explaining the variation in private investment at state level.

In sum, equation (6) indicates that the inflow of capital depends on the rate of return on capital. In turn, the rate of return depends on infrastructure, the structure of economy, tax rate, fiscal status, market size, the labour productivity, labour cost and the availability of finance (Wilson, 1999; Kiabel, 2003; Aggrawal, 2005; Rao *et al.*, 1999; and Erumban, 2009).

VI. Methodology

The empirical analysis on the determinants of private investment is based on the theory of Calberg (1981). The analysis includes 20 major states over the period of 1993–94 to 2007–08 by using the panel data model, as it controls the individual heterogeneity of the States, and has more degree of freedom and efficiency (Baltagi, 2004). This paper uses GMM estimator, which has been widely employed in recent empirical literatures on Development Economics due to its advantages[3]. The methodology of Generalized

[3] The GMM panel estimator is good in exploiting the time-series variation in the data, accounting for unobserved individual specific effects, and therefore providing better control for

Method of Moments (GMM) for panel data analysis, proposed by Arellano and Bond (1991) and further developed by Blundell and Bond (1998), is employed here to control for endogeneity in our estimations.[4] Consider the following model.

$$Y_{it} = \beta X_{it} + \lambda Z_{it} + \mu_i + \varepsilon_{it} \quad (7)$$

where, i = 1……20 and t = 1993–94, 1994–95 ... 2007–08.

Y_{it} is private investment of states, X_{it} is the vector of strictly exogenous variables, and Z_{it} is the vector of predetermined and endogenous variables[5].

β and λ are the parameters.

μ_i is the time invariant state specific effect, which captures various characteristics of the state, which are not observable but have a significant role in inflow of private investment. ε_{it} is the error term, with the assumption that μ_i and ε_{it} are independent for each i over all t, and that there is no autocorrelation in the ε_{it}.

The Arellano-Bond (1991) and Arellano-Bover (1995)/Blundell-Bond (1998) dynamic panel estimators are increasingly popular. Both are general estimators designed for situations with 1) \small T, large N" panels, meaning few time periods and many individuals; 2) a linear functional relationship; 3) a single left-hand-side variable that is dynamic, depending on its own past realizations; 4) independent variables that are not strictly exogenous, meaning correlated with past and possibly current realizations of the error; 5) fixed individual effects; and 6) heteroskedasticity and autocorrelation within individuals but not across them. Arellano-Bond estimation starts by transforming all regressors, usually by differencing, and uses the Generalized Method of Moments (Hansen, 1982), and so is called Difference GMM. The Arellano-Bover/Blundell-Bond estimator augments Arellano-Bond by making an additional assumption: that the first differences of instrument variables are uncorrelated with the fixed effects. This allows the introduction of more instruments, and can dramatically improve efficiency. It builds a system of two equations—the original equation as well as the transformed one—and is known as System GMM. Hence, this study uses the System GMM method for the empirical analysis.

endogeneity of all the explanatory variables (Beck *et al*., 2000).

[4] For the detailed explanation on the GMM estimator, see, Green (2000, Chapter 11) and Wooldridge (2002, Chapter 8 and Chapter 14).

[5] Predetermined variables and endogenous variables are assumed to be correlated with only past errors, and both the past and present errors, respectively.

VII. Data Sources and Measurement of Variables

The empirical analysis uses private GFCF at constant prices (2004–05=100), as presented in *Appendix Table A3*. Following Erumban (2009), productivity of labour is measured as the output per employed person. Labour productivity is measured as the ratio of gross value added to the number of persons engaged, sourced from Annual Survey of Industries (ASI). The values at current prices are deflated using the GSDP deflator of the manufacturing sector to convert to real prices. Labour cost is sourced from ASI and converted to constant prices using the GSDP deflator of the manufacturing sector.

Sales tax is used to examine its role in determining the variation in private investment across the states. The fiscal status of the states is measured by the gross fiscal deficit. The data on sales tax and gross fiscal deficit are sourced from 'State Finances: A Budget of Study' of RBI. Sales tax and budget at current prices are converted into constant by the GSDP deflator of economy at the base 2004–05. The state level market size is measured by the per capita GSDP at constant prices 2004–05, sourced from CSO. The availability of finance is measured by outstanding credit extended by the scheduled commercial banks across states, and sourced from 'Money and Banking' of CMIE. The current values are deflated by the GSDP price to convert it into real terms. The structure of economy is measured by the GSDP in the manufacturing sector at the constant prices 2004–05.

The measurement of physical infrastructure by public and private at the state level is a difficult task, because of the non-availability of data. Hence, the analysis of this paper uses total infrastructure, which includes electricity, roadways, railways, telephone facilities and banks. The status of electricity is broadly measured by the gross generation of utility electricity and non-utility electricity. The data is sourced from 'Energy' of CMIE (2010 and 2005). Banking infrastructure is measured by the number of the scheduled commercial banks, which is sourced from 'Money and Banking' of CMIE (2010 and 2005). Road infrastructure for the investor is measured by the urban roads and surfaced roads in km. The data for road infrastructure indicators are sourced from 'Infrastructure' of CMIE (2010 and 2005). Telecom infrastructure is measured by the number of direct exchange lines and the number of telephone exchanges. The data for telecom infrastructure is sourced from 'Infrastructure' of CMIE (2010 and 2005). However, the construction of time series data at the state level is a challenging task, due to the non-availability of data. Nevertheless, health is the major indicator of social infrastructure. Hence, the study uses infant mortality rate (IMR) as the measurement of social infrastructure. Data on IMR is sourced from Ministry of Health and Family Welfare, Government of India.

VIII. Infrastructure and Private Investment

The indicators of infrastructure are Bank, Rail, surfaced road (Sroad), urban road (Uroad), gross generation of utility electricity (Gegut) and no-utility electricity (Gegnut), direct exchange lines (DEL) and the telephone exchanges (Texchange). The descriptive statistics of physical infrastructure variables are presented in *Table 4*. The principle component method is used to construct the composite indices of the state-wise physical infrastructure over the period 1993–94 to 2007–08. As shown from *Table 5*, KMO value is 0.72, which is larger than 0.7. The KMO test reveals whether or not enough items are predicted by each factor. The Bartlett test should be significant (i.e. a statistical significance value of less than 0.05): this means that the variables are correlated highly enough to provide a reasonable basis for factor analysis. The Sampling Adequacy of Bartlett's test is rather high. Therefore, it is suitable for factor analysis.

Table 4
Descriptive Statistics of Infrastructure Variables

Variables	*Minimum*	*Maximum*	*Mean*	*Std. Deviation*	*Observations*
Rail	168	8944	3171.74	2237.545	300
Sroad	619	99372	3.20E4	25120.627	300
Uroad	1887	99175	3.60E4	28398.194	300
Del	54	987	354.41	234.335	300
Texchange	111	5121	1465.53	1084.733	300
Gegut	104	9929	3552.75	2504.084	300
Gegnut	1	20979	2956.58	3155.257	300
Bank	763	9342	3312.10	2009.972	300

Table 5
Results of KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.72
Bartlett's Test of Sphericity	Approx. Chi-Square	1045
	df	28
	Sig.	0.00

Table 6 summarizes the eigen values of the 8 calculated principal components and their proportional explanatory contributions. The eigen values indicate that the first principal component (Prin1) explains about 41.65 per cent of the standardized variance in infrastructure, the second principal component (Prin2) explains another 15.32 per cent, the third principal component (Prin3) another 14.01 per cent, so on. Note that three factors have eigen values (a measure of explained variance) greater than 1, which is a common criterion for a factor to be useful. When the eigenvalue is less than 1, it means that the factor explains less information than a single item would have explained.

The first three principal components explain about 71 per cent of the standardized variance in infrastructure. The factor loadings are presented in *Table 6*. The first principal component, which explains variations in the value of the dependent variable better than any other linear combination of explanatory variables, explains 41.65 per cent of variations. The rotated factor matrix is presented in *Table 7*. The first factor consists of Bank, Rail, Telephone exchanges, urban road and gross energy generation (non-utility). The second factor contains direct exchange lines (DEL) and surfaced road. Finally, the third factor constitutes gross energy generation (Utility). The first three principal components are used to construct a single index by using their standardized variance as the weights.

Table 6
Principal Component Analysis: Eigen values, Proportion Explained

Principal Component	*Initial Eigen values*	*Proportion Explained*	*Cumulative total*
Prin1	3.33	41.65	41.65
Prin2	1.23	15.32	56.97
Prin3	1.12	14.01	70.98
Prin4	.88	10.98	81.96
Prin5	.69	8.67	90.63
Prin6	.41	5.08	95.71
Prin7	.23	2.91	98.62
Prin8	.11	1.38	100.00

Table 7
Rotated Factor Matrix[a]

Variables	*Prin1*	*Prin2*	*Prin3*
bank	**.928**	.083	-.066
Rail	**.919**	.125	-.071
Texchange	**.859**	-.002	.194
Uroad	**.666**	.352	-.227
Gegnut	**.593**	-.225	.517
Gegut	-.107	.159	**.880**
DEL	.098	**.623**	.107
Sroad	.036	**.807**	-.027

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization
a Rotation converged in 6 iterations

Physical infrastructure is the crucial determinant of private investment. The correlation of private investment with the 8 indicators of infrastructure and infrastructure index is calculated for the period 1993–94 to 2007–08 across the 20 states. The relationship between private investment and infrastructure is examined by using panel data, and presented in *Table 8*. The correlation of private investment with gross energy generation

of utility electricity is found to be highest (0.78), followed by surfaced road (0.69), telephone exchanges (0.68), direct exchange lines (0.61), and gross energy generation of non-utility electricity (0.54), bank (0.52), rail (0.45) and others. The correlation of private investment with the infrastructure index is 0.54.

Table 8
Components of Infrastructure

Rail	*URoad*	*Sroad*	*DEL*	*Texchange*	*Gegut*	*Gegnut*	*Bank*	*INFRA*
0.45	0.01	0.69	0.61	0.68	0.78	0.54	0.52	0.54

However, the nature of relationship of private investment with the infrastructure for the individual states will be different from the pooled data. The correlation of private investment with infrastructure is presented in *Table 9*. For instance, in case of AP, correlation with urban road is found to be highest (0.85), followed by bank (0.84), surfaced road (0.83), telephone exchanges (0.72), gross energy generation of utility electricity (0.66) and others. The development of direct exchange lines and rail could have raised private investment in AP. Similarly, the development of surfaced road, rail and telecom infrastructure could have attracted more private investment into Orissa. The nature of relationship of private investment with infrastructure across states over this study period is presented in *Appendix Table A5*.

Table 9
Private Investment and Infrastructure

States	*Rail*	*URoad*	*Sroad*	*DEL*	*Texchange*	*Gegut*	*Gegnut*	*Bank*	*INFRA*
AP	0.35	0.85	0.83	0.32	0.72	0.66	0.07	0.84	-0.13
AM	-0.39	0.71	0.76	0.54	0.60	0.03	0.32	0.69	0.30
BI	0.09	0.51	0.59	0.38	0.47	-0.31	0.33	0.78	0.67
Ch	0.18	0.62	0.71	0.63	-0.66	0.30	0.46	0.73	0.54
DE	-0.01	0.41	0.01	0.33	0.40	0.36	-0.21	0.45	-0.09
GU	0.15	0.32	0.41	0.29	0.43	0.57	0.66	0.65	0.57
HA	0.13	-0.33	0.84	0.59	0.86	0.83	0.66	0.91	-0.05
HP	0.73	-0.11	0.64	0.21	0.42	0.69	0.13	0.80	0.45
JH	0.51	0.25	0.60	0.42	0.51	0.50	0.11	0.69	0.47
KA	0.17	0.63	0.52	0.47	0.49	0.62	0.51	0.70	-0.48
KE	-0.28	0.03	0.64	0.43	0.42	0.60	0.31	0.72	0.14
MP	0.20	0.43	-0.31	0.00	-0.08	0.45	0.28	0.30	0.18
MR	0.72	-0.28	-0.07	0.34	0.29	0.54	0.62	0.68	0.43
OR	0.41	0.48	-0.35	0.53	0.57	0.62	0.83	0.89	0.31
PN	0.42	-0.64	-0.55	0.47	0.62	0.64	0.67	0.88	0.05
RA	-0.60	-0.37	0.71	0.28	0.34	0.57	0.63	0.77	-0.44
TN	0.31	-0.39	0.74	0.58	0.69	0.86	0.83	0.94	0.64
UP	-0.33	0.36	0.53	0.19	0.32	0.65	0.37	0.78	0.43
UT	-0.61	-0.07	0.76	0.45	0.55	0.68	0.72	0.95	0.61
WB	0.22	0.58	0.31	0.66	0.70	0.67	0.64	0.72	0.42

IX. Empirical Results and Discussions

Based on the methodology of the GMM estimator, the data on the 20 major states of India are used to empirically investigate the determinants of private investment (PGFCF) in the manufacturing sector over the period from 1993–94 to 2007–08. All the determinants are grouped into infrastructure, economic factors and fiscal factors in the analysis. Economic factors include market size, the structure of economy (ECST), availability of finance (AVF), labour cost (LC) and labour productivity (LP). However, infrastructure is represented through physical infrastructure (INFR) and infant mortality rate (IMR). While fiscal factor includes the gross fiscal deficit (GFD) and sales tax rate (STR). However, the market size, measured by the GSDP is determined by private investment. Hence, there could be simultaneity between private investment and market size in the regression. Similarly, the inflow of private investment encourages the firms to use modern labour saving technologies that increase productivity. Therefore, labour productivity and market size are endogenous in the regressions.

The result of GMM system estimation is presented in *Table 10*. *Firstly*, the economic factors are found to be statistically significant in explaining the variation in private investment in the manufacturing sector. The estimation shows that the one year lag of private investment is positive and statistically significant at 1% level in regression. This suggests that the agglomeration of industries has a positive effect on the inflow of private investment at the state level in the Indian economy. In our estimation, all economic factors are found to be statistically significant with the expected signs in regression. The coefficient of market size is found to be positive and statistically significant at 1% level, suggesting that states with bigger market size are expected to get higher share of new investment projects. We find that the availability of finance is statistically significant in explaining private investment at the state level in Indian economy, which is in line with the findings at national level studies in Blejer and Khan (1984) and Wai and Wong (1982). The availability of finance has a positive impact on the inflow of private investment at the national level. The structure of economy measured by the GSDP of the manufacturing sector is found to be statistical significant and with the positive signs in the regression. Therefore, our empirical results show that economic factors are responsible for the variation in private investment of the manufacturing sector across the Indian states.

Secondly, labour factor, including labour productivity and labour cost, is statistically significant in explaining private investment in the manufacturing sector across the Indian states during this period. The coefficient of labour cost is found to be statistically significant and negative in the estimation result. However, labour productivity is found to be statistically significant and positive in the regression estimation. Hence, higher the labour productivity of a state, the higher will be the inflow of private investment into

that state. Further, lower the labour cost of a state, the lower will be the inflow of private investment into that state.

Table 10
System GMM Estimation Results

Independent Variables	*Dependent Variable: PGFCF*
L1. PGFCF	0.42 * (0.05)
Economic Factor	
MSZ	0.05* (0.01)
AVF	0.02 *(0.009)
ECST	36262* (6894.8)
Labour Factor	
LC	-0.000317*** (0.0002)
LP	0.00007* (0.00002)
Infrastructure	
PINFR	357.45 (1665.66)
L1. INFR	-2194.9 (1879.3)
L2.INFR	2488.5** (1581.38)
IMR	-8.65 (33.65)
Fiscal Factor	
STR	-322.59 (389.05)
GFDR	-367.6* (123.92)
Constant	-3257.6 (3647.12)
Observation	260
States	20
Instruments	357
Wald chi2(12)	1235.4*

Notes: *, ** and *** indicate statistical significance at 1%, 5% and 10% respectively. The figures in the parentheses are the standard error estimates.
Source: Author's calculations using STATA 12.

Thirdly, the study includes GFD and STR as the fiscal factors to explain the variation in private investment in the manufacturing sector across the Indian states over the period from 1993–94 to 2007–08. The result shows that the coefficient of GFD is negative and significant at the 1% level in regression, which suggests that private investment is lower in states with higher GFD and vice versa. Further, the result shows the negative sign of the sales tax rate and statistically insignificant in determining the private investment in the manufacturing sector.

Fourthly, infrastructure includes both physical infrastructure and social infrastructure. Physical infrastructure is found to be positive and significant at 10% level in the estimation. The states with better infrastructure attract higher private investment in the

manufacturing sector than the other states in India. It is important to know that the two year lag effect of physical infrastructure determines the private investment of the manufacturing sector across states. The one year lag and the current infrastructure status do not have any role in the inflow of private investment in the manufacturing sector. Social infrastructure, represented through the IMR, is found to be statistically insignificant. The other indicators of social infrastructure could not be used for this study due to the limited scope for generating the time series data from 1993–94 to 2007–08 for the major 20 states of India.

In short, agglomeration of industries, economic factor, labour factor, fiscal factor (i.e. gross fiscal deficit) and infrastructure explain the variation in private investment of the manufacturing sector in the major Indian states over the period 1993–94 to 2007–08. The empirical findings of this result are in line with the arguments of Bhattacharya and Sakthivel (2004) and Ahluwalia (2000). Bhattacharya and Sakthivel (2004) identified income and infrastructure as the crucial factors for inflow of private investment in the Indian states. Similarly, Ahluwalia (2000) argued that private investment is potentially highly mobile across states and is likely to flow to states which have good infrastructure.

X. Conclusions and Policy Implications

This study estimates the private investment of the manufacturing sector at constant prices (2004–05=100) at the state level by utilising the enterprise level data of ASI with the national level data and methodology of NAS. The study estimates and analyses private investment of the manufacturing sector during the period from 1993–94 to 2007–08 covering 20 major states. It is important to note that structural transformation in terms of private investment across the states occurred during this study period. In other words, there is increase in the inflow of investment to the poor states during the second phase of economic reform; as a result, the variation in private investment of the manufacturing sector across states has a negative trend. Economic factor, labour factor, infrastructure, fiscal factor and agglomeration are the main determinants of inflow of private investment in the manufacturing sector at the state level in India. Particularly, one year lag of private investment, physical Infrastructure, market size, availability of finance, the structure of economy, labour cost, labour productivity and gross fiscal deficit are statistically significant in explaining private investment in the manufacturing sector across states in India. Though the variation in private investment has decreased during this study period, still it is high to achieve balanced economic growth across the Indian states. Hence, the policy should be designed by focusing on the above determinant factors to reduce the inequality in development at the state level in India.

APPENDIX

Table A1
Information in Block A and B of ASI Unit Level Data

Block A	*Block B*
1. PSL No.	ID
2. Industry Code (5–digit level of NIC–98)	
3.Description of Industry	Type of ownership (1,2..,6) Wholly Central Government (1), Wholly State and/or Local Government (2), Central Government and State and/or Local Government jointly (3), Joint Sector Public (4), Joint Sector Private (5) Wholly Private Ownership (6)
4.State Code	
5. District Code	
6.Sector (Rural–1, Urban-2)	
7.RO /SRO code	
8. No. of Units	

Source: Unit level data base of ASI

Table A2
Information in Block C of ASI Unit Level Data

SNo	*Types of Assets*	*Gross Value (Rs.)*	*Depreciation (Rs.)*	*Net Value (Rs.)*	*Net Value (Rs.)*
		Addition during the year due to revaluation	*Provided during the year*	*Opening as on*	*Closing as on*
1	Land				
2	Building				
3	Plant &Machinery				
4	Transport equipment				
5	Computer equipment including software				
6	Pollution Control Equipment				
7	Others				

Table A3

Estimates of Private GFCF at Constant Prices (2004–05=100) in Manufacturing Sector

State	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*
AP	5692	3191	6242	6683	8415	8604	6217	4037	2918	7226	7026	9839	15057	23970	24641
AM	455	184	417	386	524	378	404	311	253	527	450	830	730	1489	1031
BI	66	112	126	234	58	157	304	258	131	103	112	133	163	527	545
Ch	616	336	791	705	1627	596	1201	719	382	1149	3360	7455	11450	11708	10600
DE	791	501	990	1049	1618	1505	1102	769	461	1229	787	1402	1366	1329	1510
GU	9375	13308	20468	27870	35594	18352	23546	9018	42142	15541	14728	21485	62224	49879	54140
HA	1599	1774	2559	3715	2953	6050	9048	3705	3725	6575	4634	10141	7866	12241	15994
HP	927	913	1451	1912	2066	1650	1204	759	514	739	952	1119	2908	3552	3887
JH	1038	1748	1967	3660	908	5274	2354	4594	1784	2254	1668	3196	7574	3535	8109
KA	3299	4445	7263	9309	13994	23614	11959	12323	9430	11539	7531	13787	12430	23880	22467
KE	1105	610	1203	1278	1625	1815	1001	761	836	964	1013	1727	1585	2037	4419
MP	4521	2467	5802	5167	11931	7795	4906	2376	1360	2155	2767	5207	5365	7682	12284
MR	13756	19720	27152	41298	34480	25334	26282	14261	9699	18322	34172	37442	38566	56565	61389
OR	1093	230	1130	482	3013	1963	998	1435	3336	1322	1570	2098	13267	8343	18749
PN	1585	1363	2201	2855	2820	3265	3201	1599	1416	5553	2176	5892	5698	8601	11558
RA	2993	2226	3868	4662	5277	4156	10222	2056	2210	2159	3360	5012	6341	7985	15528
TN	7430	6280	9295	13151	7759	16797	16512	12921	5148	13309	18997	27512	30792	34361	52653
UP	9354	4906	9714	10274	12233	24021	7293	5116	5036	6190	11662	12890	19411	21919	33563
UT	191	100	198	210	250	370	125	145	152	569	408	2171	3426	8040	11826
WB	1589	940	1862	1969	2818	2598	2727	4280	10278	2997	2222	4661	5809	6063	8768

Sources: Authors Calculation based on Unit level data of ASI and Aggregate data of NAS

Table A4
Linear Trend of Private Investment

State	*Coefficient of Liner trend*	*Rank*
AP	1085.00	4
AM	54.03	18
BI	19.66	20
Ch	799.65	8
DE	34.31	19
GU	2380.00	1
HA	773.49	9
HP	124.33	16
JH	293.10	14
KA	887.38	6
KE	113.44	17
MP	147.46	15
MR	2016.50	3
OR	843.38	7
PN	513.33	11
RA	422.53	12
TN	2376.30	2
UP	1038.80	5
UT	549.89	10
WB	421.63	13

Table A5
Private Investment and Infrastructure over the Periods

Year	*Rail*	*URoad*	*Sroad*	*DEL*	*Texchange*	*Gegut*	*Gegnut*	*Bank*	*INFRA*
1993	0.72	0.16	0.89	0.80	0.78	0.90	0.31	0.77	0.67
1994	0.49	0.03	0.75	0.83	0.67	0.90	0.14	0.54	0.44
1995	0.58	0.15	0.86	0.82	0.74	0.91	0.25	0.61	0.56
1996	0.51	0.09	0.82	0.82	0.72	0.89	0.19	0.55	0.45
1997	0.57	0.02	0.70	0.72	0.74	0.84	0.30	0.56	0.53
1998	0.66	0.07	0.83	0.73	0.82	0.76	0.42	0.78	0.62
1999	0.53	-0.10	0.81	0.77	0.79	0.85	0.31	0.54	0.57
2000	0.47	-0.08	0.76	0.78	0.74	0.79	0.31	0.63	0.56
2001	0.37	-0.14	0.44	0.38	0.49	0.49	0.55	0.28	0.34
2002	0.49	-0.13	0.80	0.81	0.80	0.90	0.49	0.60	0.58
2003	0.52	-0.07	0.83	0.85	0.82	0.81	0.48	0.64	0.68
2004	0.51	-0.18	0.72	0.81	0.78	0.88	0.49	0.61	0.71
2005	0.51	-0.15	0.60	0.55	0.66	0.77	0.84	0.45	0.67
2006	0.55	-0.14	0.72	0.70	0.81	0.92	0.62	0.60	0.71
2007	0.61	-0.14	0.70	0.68	0.78	0.88	0.69	0.64	0.78
Average	**0.54**	**-0.04**	**0.75**	**0.74**	**0.74**	**0.83**	**0.43**	**0.59**	**0.59**

References

Ahluwalia, M.S. (2002) "Economic performance of states in post reforms period," *Economic and Political Weekly*, May 6, Pp. 1637–1648.

Aiyer, Shepherd (2001): "Growth Theory and Convergence across Indian States: A Panel Study," Paper 8 in Tim Cullen, Patricia Reynolds and Christopher Towel,(Eds.) *India at the Crossroads: Sustaining Growth and Reducing Poverty*, International Monetary Fund.

Annual Survey of Industries (Various years), Volume-1, Ministry of Statistics and Programme Implementation, Central Statistical Organisation, Kolkata.

Atukeren, Erdal (2005), "Interaction between public and private investment: evidence from developing countries," *Kyklos*, Vol. 58, No. 3, Pp. 307–330.

Blejer, Mario I. and Moshin S. Khan (1984), "Government Policy and Private Investment in Developing Countries," IMF Staff Papers, Vol. 31, No. 2, Pp. 379–403.

Baddeley, M., K. McNay and R. Cassen (2006), "Divergence in India: Income differential at the state level, 1970-97," *Journal of Development Studies*, Vol. 42, No. 6, Pp. 1000–1022.

Bhattacharya, B.B. and S. Sakhivel (2004), "Regional Growth and Disparity in India: Comparison of Pre-and Post-Reform Decades," *Economic and Political Weekly*, Vol. 39, No. 10, Pp. 1071–1077.

Baltagi, B.H. (2001) *Econometric Analysis of Panel Data*, West Sussex PO191UD, John Wiley & Sons, Ltd., England.

Barro, Robert J. and Xavier Sala-i-Martin (1995), *Economic Growth*, McGraw-Hill: New York.

Carlberg, M. (1981), "A Neoclassical model of interregional economic growth," *Regional Science and Urban Economics*, Vol. 11, No. 2, Pp. 191–203.

Chowdhury, Khorshed (2003) "Empirics for World Income Distribution: What does the World Bank Data Reveal?", *The Journal of Development Areas*, Vol. 36, No. 2,, Pp. 59–83.

CSO (1989; 2007), "National Accounts Statistics: Sources and Methods," Ministry of Statistics and programme implementation, Government of India.

Dasgupta, D., P. Maiti, R. Mukherjee, S. Searcher and S. Chakraverti (2000), "Growth and Interstate Disparities in India," *Economic and Political Weekly*, July 1, Pp. 2413–2422.

Dollar, D., G. Iarossi and T. Mengistae (2002),"Investment Climate and Economic Performance: Some Firm Level Evidence from India," Working Paper No. 143, Center for Research on Economic Development and Policy Reform, Stanford University.

EPWRF [Economic and Political Weekly Research Foundation] (2003), State Domestic Products: 1960-61 to 2000-01, Mumbai, India.

Everhart, Stephen S., M A. Sumlinski (2001), "Trends in private investment in developing countries, statistics for 1970-2000 and the impact on private investment of corruption and the quality of public investment," International Finance Corporation, Discussion paper No. 44, The World Bank, Washington DC.

Ferro, M., D. Rosenblatt and N. Stern (2004), "Policies for Pro-Poor Growth in India," in Kaushik Basu (Ed.) *India's Emerging Economy*,, New Delhi: Oxford University Press, Pp. 153–183.

Government of Haryana (2009), "Estimates of Gross Fixed Capital Formation in Haryana," Department of Economics and Statistical Analysis.

Government of India (2009), "Report of the High Level Committee on Estimation of Saving and Investment, New Delhi, Pp. 223–232..

Government of Karnataka (2010), "Estimation of Public and Private Investments and Consumption of Goods and Services in Karnataka," Directorate of Economics and Statistics.

Greene, W.H. (2006), *Econometric Analysis*, Dorling Kindersley, New Delhi.

Greene, J and D. Villanueva (1991) "Private Investment in Developing Countries: An Empirical Analysis," IMF Staff Papers, Vol. 38, No. 1, Pp. 33–58.

Gujarati, D.N. (1995), *Basic Econometrics*, Third Edition, McGraw-Hill, International Editions, Singapore.

Kiabel, B.D. (2003), "Corporate tax incentives in Nigeria," *American Economic Review*, Vol. 5, No. 1, Pp. 60–70.

Krishna, K.L. (2004), "Patterns and determinants of economic growth in Indian states," Working Paper 144, ICRIER, New Delhi.

Khan, M.S. and M.S. Kumar (1997), "Public and Private Investment and The Growth Process in Developing Countries," *Oxford Bulletin of Economics and Statistics*, Vol. 59, No. 1, Pp. 69–88.

Krishnamurthy, K. (1984), "Inflation and Growth: A Model for India," Indian Economic Review, Vol. 19, No. 1, reprinted in K. Krishnamurty and V. Pandit, *Macroeconometric Modelling of the Indian Economy*, Hindustan Publishing Co., 1985.

Kurian, N.J. (2000), "Widening regional disparities in India; Some indicators," *Economic and Political Weekly*, February 12, Pp. 538–50.

Lakhchaura,, Prakash (2004), "Capital formation at state level," Indian, Ministry of Statistics and Programme Implementation (mimeo).

Mallick, Jagannath (2012), "Impact of Private Investment on States Income in India," presented in the 32nd Annual Conference of International Association for Research on Income and Wealth (IARIW), Boston, USA, August 5–11.

_____ (2013), "Public expenditure, private Investment and states income in India," forthcoming in the *Journal of Development Areas*, Vol. 47, No. 2.

_____ (2011), "Determinants of Private Investment in India: An Application of Panel Fixed Effect Model," *Indian Journal of Economics and Business*, Vol. 10 (1).

Marjit, S. and S. Mitra (1996), "Convergence in regional Growth Rates: Indian Research Agenda," *Economic and Political Weekly,* August 17, Pp. 2239–242.

Mitra, Pritha (2006), "Has government investment crowded out private investment in India?" *American Economic Review*, Vol. 96, No. 2, Pp. 337–341.

Nagaraj, R., A. Varaudakis and M.A. Veganzore (1997), "Long Run Growth Trends and Convergence Across Indian States," Technical Paper, Development Centre No.131.

Odedokum, M.O. (1997), Relative effects of public versus private investment spending on economic efficiency and growth in developing countries," *Applied Economics*, Vol. 29, No. 10, Pp. 1325–36.

Oshikoya, T.W. (1994), "Macroeconomic Determinants of Domestic Private Investment in Africa: An Empirical Analysis," *Economic Development and Cultural Change*, Vol. 42, No. 3, Pp. 573–596.

Pal, P. and J. Ghosh (2007), "Inequality in India: A survey of recent trends," Working Paper Number 45, Department Social and Economic Affairs, United Nations, New York.

Pradhan, B.K., D.K. Ratha and A. Sarma (1990), "Complementarity between public and private investment in India," *Journal of Development Economics*, Vol. 33, No. 1, Pp. 101–16.

Purfield C. (2006), "Mind the Gap—Is Economic Growth in India Leaving Some States Behind?" International Monetary Fund, Working Paper No. 103.

Rao, A.S (2004), "Inter State Disparities in the Development of Tertiary Sector in India," *Indian Journal of Regional Science*, Vol. 36, No. 2, Pp. 93–105.

Rao, M.G., R.T. Shand and K.P. Kalirajan (1999), "Convergence of incomes across Indian states: A divergent view," *Economic and Political Weekly*, Vol. 34, No. 13, Pp. 769–778.

Rodrik, D. (1991), "Policy uncertainty and private investment in developing countries," *Journal of Development Economics*, Vol. 36, Pp. 229–243.

Serven, L. and A. Solimano (1990), "Private Investment and Macroeconomic Adjustment in LDCs: Theory, Country experiences and Policy Implications," World Bank No,66, Washington DC.

Serven, L. and A. Solimano (1991), "Adjustment Policies and Investment Performance in Developing Countries: Theory, Country Experiences and Policy Implications," Policy Planning and Research, Working Paper Series 606, World Bank, Washington DC.

Servén, L. (1998), "Macroeconomic Uncertainty and Private Investment in Developing Countries: An Empirical Investigation," World Bank, WPS 2003, Washington DC.

Siddharthan, N.S. (2009) "FDI, Determinants, Constraints and impact: India – China Comparison," in Manmohan Agarwal (Ed.), *India's Economic Future*, Social Science Press, New Delhi, Pp. 71–102.

Sloan-Rossiter, M. (2008), "FDI in Three Southern Indian States: Determinants and Implications for Development," *World Outlook: An Undergraduate Journal of International Affairs*, Number 35, Spring.

SIA (1999) Newsletter, Secretariat for Industrial Assistance, Department of Industrial Policy & Promotion, Ministry of Commerce & Industry, Government of India, New Delhi, India.

Sundararajan, V. and S. Thakur, (1980), "Public investment, Crowding out, and Growth: A Dynamic Model Applied to India and Korea," IMF, Washington DC, Vol. 27, No. 3, Pp. 814–55.

Venkatesan, V. and S. Varma (1998), "Policy competition among the states in India for attracting direct investment," NCAER, New Delhi.

Solow, R.M. (1956), "A contribution to the theory of economic growth," *Quarterly Journal of Economics,* Vol. 38, No. 49, Pp. 5189–5200.

____ (1994), "Perspectives on growth theory," *Journal of Economic Perspectives*, Vol. 8, No. 1, Pp. 45–54.

Wai, U. Tun. and Chorng-Huey Wong (1982), "Determinants of Private Investment in Developing Countries," *The Journal of Development Studies*, Vol. 19, No. 1, Pp. 19–36.

Wilson, J.D. (1999), "Theories of Tax Competition," National Tax Journal, Vol. 52, Pp. 269–304.

List of ISID Working Papers

WP2012/05	Regional Disparities in Growth and Human Development in India, *Satyaki Roy*
WP2012/04	Social Exclusion and Discrimination in the Labour Market, *T.S. Papola*
WP2012/03	Changing Factor Incomes in Industries and Occupations: Review of Long Term Trends, *Satyaki Roy*
WP2012/02	Structural Changes in the Indian Economy: Emerging Patterns and Implications, *T.S. Papola*
WP2012/01	Managing Global Financial Flows at the Cost of National Autonomy: China and India, *Sunanda Sen*
WP2011/04	Trends and Patterns in Consumption Expenditure: A Review of Class and Rural-Urban Disparities, *Satyaki Roy*
WP2011/03	The Global Crisis and the Remedial Actions: A Non-Mainstream Perspective *Sunanda Sen*
WP2011/02	Spatial Organization of Production in India: Contesting Themes and Conflicting Evidence, *Satyaki Roy.*
WP2011/01	India's FDI Inflows: Trends and Concepts, *K.S. Chalapati Rao & Biswajit Dhar.*
WP2010/12	On the Sustainability of India's Non-Inclusive High Growth, *Surajit Mazumdar*
WP2010/11	Operation of FDI Caps in India and Corporate Control Mechanisms, *K.S. Chalapati Rao & Biswajit Dhar.*
WP2010/10	Indian Capitalism: A Case That Doesn't Fit? *Surajit Mazumdar.*
WP2010/09	Big Business and Economic Nationalism in India, *Surajit Mazumdar*
WP2010/08	Aligning with both the Soviet Union and with the Pharmaceutical Transnational's: Dilemmas attendant on initiating Drug Production in India, *Nasir Tyabji.*
WP2010/07	The Arduous Route to ensuring some Minimum Public Shareholding in Listed Companies, *K.S. Chalapati Rao.*
WP2010/06	Managing Finance in Emerging Economies: The Case of India, *Sunanda Sen.*
WP2010/05	Social Science Research in Globalising India: Historical Development and Recent Trends, *T.S. Papola.*
WP2010/04	Private Industry and the Second Five Year Plan: The Mundhra Episode as exemplar of Capitalist Myopia, *Nasir Tyabji.*
WP2010/03	Trading in India's Commodity Future Markets, *Sunanda Sen and Mahua Paul.*
WP2010/02	Industry and Services in Growth and Structural Change in India: Some Unexplored Features, *Surajit Mazumdar.*
WP2010/01	Does the Current Global Crisis remind us of the Great Depression? *Sunanda Sen.*
WP2009/02	Footwear Cluster in Kolkata: A Case of Self-exploitative Fragmentation, *Satyaki Roy.*
WP2009/01	Garments Industry in India: Lessons from Two Clusters, *Satyaki Roy.*

* Already Published. Most of the working papers are downloadable from the institute's website: http://isidev.nic.in/ or http://isid.org.in/

About the ISID

The Institute for Studies in Industrial Development (ISID), successor to the Corporate Studies Group (CSG), is a national-level policy research organization in the public domain and is affiliated to the Indian Council of Social Science Research (ICSSR). Developing on the initial strength of studying India's industrial regulations, ISID has gained varied expertise in the analysis of the issues thrown up by the changing policy environment. The Institute's research and academic activities are organized under the following broad thematic areas:

Industrialization: Land acquisition, special economic zones, encroachment of agricultural land, manufacturing sector, changing organized-unorganised sector relationship, rise of service economy in India, training and skill formation etc.;

Corporate Sector: With special emphasis on liberalization-induced changes in the structures of the sector, corporate governance, individual firms/groups, emerging patterns of internationalization, and of business-state interaction;

Trade, Investment and Technology: Trends and patterns of cross-border capital flows of goods and services, mergers & acquisitions, inward and outward FDI etc. and their implications for India's position in the international division of labour;

Regulatory Mechanism: Study of regulatory authorities in the light of India's own and international experience, competition issues;

Employment: Trends and patterns in employment growth, non-farm employment, distributional issues, problems of migrant labour and the changes in workforce induced by economic and technological changes;

Public Health: Issues relating to healthcare financing, structure of health expenditure across states, corporatisation of health services, pharmaceutical industry, occupational health, environment, health communication;

Media Studies: Use of modern multimedia techniques for effective, wider and focused dissemination of social science research to promote public debates;

Other Issues: Educational policy and planning, role of civil societies in development processes etc.

ISID has developed databases on various aspects of the Indian economy, particularly concerning industry and the corporate sector. It has created On-line Indexes of 197 Indian Social Science Journals (OLI) and 18 daily English Newspapers. More than one million scanned images of Press Clippings on diverse social science subjects are available online to scholars and researchers. These databases have been widely acclaimed as valuable sources of information for researchers studying India's socio-economic development.

Institute for Studies in Industrial Development
4, Institutional Area, Vasant Kunj Phase II, New Delhi - 110 070
Phone: +91 11 2676 4600 / 2689 1111; *Fax*: +91 11 2612 2448
E-mail: info@isid.org.in; *Website*: http://isid.org.in

ISID