“Growth is one aspect of the process of economic development” (Sen, 1983). But, analysing the issue of economic growth is a complex phenomenon. This issue addresses as to why some economies grow fast while some others grow slow. Growth of an economy depends upon a multiplicity of factors, which can be broadly divided into two constituent parts – factor inputs, measuring quantity of factors, and total factor productivity (TFP), measuring quality of factors. In fact, changes in output that cannot be accounted for by observable changes in factor utilization, is termed as TFP. Growth accounting provides a framework for allocating changes in an economy’s observed output into the contributions from changes in its factor inputs and a residual (or, equivalently, TFP). The key issue of growth accounting is to study the role of TFP in economic growth. The study of growth accounting becomes imperative in view of the limited availability of factors of production, particularly in developing economies like India.

There is a broad consensus among the economists and policy makers that the dominance of inspiration (i.e., TFP) component can lead to sustainable output growth, since it ensures efficient utilization of key resources. The output growth generated merely through factor accumulation is associated with diminishing returns to scale and is, therefore, not sustainable in the long-run, as suggested by Young (1992); Krugman (1994); Cororation and Caparas (1999); Fuentes (2006); Mahadevan (2007); Sosa et al., (2013), etc.

Presently, with the increasing role of markets in the era of globalization and liberalization in conjunction with the restricted role of government, the Indian economy has been facing a stiff competition from the outside world. Therefore, it becomes pertinent to put more emphasis on productivity growth, not only to increase output, but also to improve the competitiveness of an industry, both in the domestic as well as international markets. However, both the components have their own individual importance to augment the output growth and, therefore, a harmonious
increase in the components is required to attain the maximum potential growth of output

After the process of liberalization, initiated in mid-eighties, there has been significant acceleration in the growth rate of the Indian economy. The long-standing barrier of the so-called Hindu Rate of Growth of around 3.5 percent has been comprehensively broken and the Indian economy has been cruising along at the rate of around 8 percent per annum till 2007 and in the range of 5 to 6 percent subsequent. However, the state of Punjab, which at certain point in time happened to be the most progressive state of India, is now termed as one of the slowest growing state. Since its phenomenal growth during mid-1960s, Punjab is now facing economic crisis of unprecedented scale. Unfortunately, the state has been continuously slipping in its relative rankings. At present (i.e., 2009-10), of the 28 odd states, Punjab occupies 8th position from the top (with per capita GSDP at 2004-05 prices equaling Rs 42831/-; next to Haryana, Maharashtra, Gujarat, Tamil Nadu, Kerala, Uttrakhand and Himachal Pradesh; Government of Punjab, 2012). It was a widely held belief that after the introduction of reforms in India, Punjab would get a big-push towards the road to economic prosperity. However, the trends in post-reform period portrayed a reversal for the state; performance of the Indian economy, in general, and a number of other have overtaken Punjab, so far as per capita income is concerned (Singh and Singh, 2002). The agrarian economy seems to have attained a plateau and has registered a significantly poor growth on agriculture front as well. This drives home the overall story of Punjab’s steady relative decline, even though in absolute terms its performance may not be that bad.

On the other hand, Haryana, which was carved out of Punjab state, and used to be known as its poor cousin, has edged past the Punjab state on most of the economic parameters of development (Ahuja, 2007). With Haryana’s growth rate having even crossed national growth rate, the state has left behind its ‘big brother’ Punjab. Thus, in order to bring out the constraining factors in the growth process, the present in-depth study was carried out, which concentrated on the quantitative analysis of different sources of economic growth in Punjab vis-a-vis the Indian economy, in general, and Haryana, in particular.
Objectives of the Study:

The study was carried out with the following specific objectives:

1. To examine long-term growth behaviour of output (at aggregated/disaggregated levels) in Punjab and Haryana states vis-à-vis the overall Indian economy;

2. To analyze nature and speed of structural changes in output of the three economies;

3. To detect presence and direction of inter-sectoral linkages in output from major sectors of the three economies;

4. To generate (time series) estimates on capital stock at aggregated/disaggregated levels for both Punjab and Haryana states, and to study growth behaviour therein;

5. To estimate partial factor productivities and total factor productivity (TFP) in each of the three economies;

6. To perform growth accounting analysis, and to examine differentials, if any, in relative contribution of different factors of production and TFP in output growth; and

7. To examine the relationships, if any, between total factor productivity of different sectors and public expenditure on developmental activities in the three economies.

Hypotheses Tested:

The study was directed to validate, or otherwise, the following set of hypotheses:

1. Income in each of Punjab, Haryana and the Indian economy has grown in an accelerated manner during the study span;

2. Total factor productivity has improved over the study span in each of the three economies;
3. Relative contributions of factor inputs and TFP in the Punjab and Haryana states are comparable, and are in consonance with those in the overall Indian economy;

4. Technological change in each of the three economies is Hicks-neutral;

5. Rate of technological progress among the three economies is comparable; and

6. Expenditure on developmental activities, in general, and social services, in particular, induces a significant effect on TFP growth in each of the major sectors of the three economies.

In order to get assistance towards formulation of the methodology in respect of present investigation, as also to fill certain gaps in the existing literature, nearly 100 relevant studies were reviewed.

**Chapter Scheme**

For accomplishing the aforementioned objectives and for examining validity, or otherwise, of the hypotheses, the study has been organised into *eleven* chapters in all. The first chapter is introductory in nature, highlighting need and objectives of the study. The second chapter presents a detailed review of the related literature. Chapter-III is devoted to the description of data sources and various analytical tools/techniques used for the analysis. Growth performance, structural transformations and inter-sectoral linkages with respect to income in Punjab and Haryana States *vis-à-vis* the Indian economy have been analysed in Chapter-IV. In Chapter-V, an attempt has been made to estimate capital stock for Punjab and Haryana states, as also to study its growth performance *vis-à-vis* the overall Indian economy. Chapter-VI is devoted to an investigation of partial factor productivities and employment elasticity of output in Punjab, Haryana and the Indian Economy. Chapter-VII, VIII and IX deal with *growth accounting analysis* using, respectively, *Factor Share Approach*, *Production Function Approach* and the *Non-parametric Malmquist Index Approach*. An examination of relationships, if any, between TFP of each major sector and developmental expenditure has been dealt with in Chapter-X. And, finally, Chapter-XI (*i.e.*, the present one) summarises the findings and brings out useful policy implications derived from the study.
Database:
The empirical analysis was confined to the period of 30 years from 1980-81 to 2009-10. The requisite data (at current and constant prices) for the Indian economy as a whole, on variables, viz., Net Domestic Product (NDP) and Net Fixed Capital Stock (NFCS) were sourced from various issues of National Accounts Statistics, while for Punjab and Haryana states, the data on Net State Domestic Product (NSDP) were sourced from various issues of Statistical Abstracts of the corresponding states. However, capital stock series for the two states were generated through perpetual inventory method (as per the detailed methodology outlined in Sethi and Kaur, 2012). Data on working force (taken as a proxy for labour force) were compiled for different sectors/ sub-sectors of the states of Punjab and Haryana, and overall Indian economy at the census years of 1981, 1991 and 2001. Through the usual compound growth rate law, interpolations were made so as to generate regular time series on working force in each of the activities.

Data on domestic product and capital stock were available in parts at differential base years; therefore, by making use of information in respect of the overlapping years, the time series were spliced together so as to get comparable series at 2004-05 constant prices. Aggregations were then made (for each of income, capital stock and working force) in respect of major components viz., Primary [PRM, comprising of Agriculture and Allied Activities; Forestry and Logging; Fishing; and Mining & Quarrying]; Secondary [SEC, comprising of Registered Manufacturing; Unregistered Manufacturing; Construction; and Electricity, Gas & Water Supply]; Tertiary-1 [TR1, comprising of Railways; Transport by Other Means; Storage; Communication; and Trade, Hotels & Restaurants]; Tertiary-2 [TR2, comprising of Banking & Insurance; Residential Buildings and Dwellings; Public Administration; and Other Services]; Aggregated Tertiary [TRT, comprising of TR1 and TR2]; and Aggregated Income [AGG, comprising of PRM, SEC, and TRT].

Data on electricity consumption (considered as a proxy variable for energy) for Punjab, Haryana and the Indian economy were sourced from various issues of Statistical Abstracts of Punjab/ Haryana states. Data were available in respect of five activities viz., Agriculture, Industrial, Commercial, Domestic and Public Lighting. For the purpose of proximity with domestic product and capital stock, data on
electricity consumption were re-defined as, Primary [PRM, comprising of Agriculture]; Secondary [SEC, comprising of Industrial]; Tertiary-1 [TR1, comprising of Commercial]; Tertiary-2 [TR2, comprising of Domestic and Public Lighting]; Aggregated Tertiary [TRT, comprising of TR1 and TR2]; and Aggregated electricity consumption [AGG, comprising of PRM, SEC, and TRT].

Data on distributive shares of factor incomes in India were compiled from various issues of National Accounts Statistics. Notably, the information was available differently for different spans of time and were, therefore, grossly non-comparable in nature. Suitable adjustments had, therefore, to be made so as to achieve some sort of consistent time series on factor incomes (i.e., compensation to employees as a reward for labour, and interest as a reward for capital). It may further be pointed out that such data on factor incomes were not available at the states’ level and, therefore, the same information (compiled at the national level) had to be used for the two states as well.

Data on revenue expenditure incurred for developmental activities in social sector in Punjab, Haryana and the Indian economy were culled out from the various issues of Reserve Bank of India Bulletin for the period 1985-86 to 2009-10. Data on developmental expenditure consisted of two broad categories viz., Social Services [consisting of Education, Sports, Art & Culture (ESA); Medical, Public Health, Nutrition & Family Welfare (MPF); Water Supply & Sanitation (WSS); Housing (HSG); Urban Development (URD); Welfare of Scheduled Caste, Scheduled Tribes and Other Backward Classes (WSB); Labour and Labour Welfare (LLW); Social Security & Welfare (SSW); Relief on Account of Natural Calamities (RNC); Others (OTH, consisting of expenditure on Information & Publicity, Secretariat-Social Services, Other Social Services, etc.)] and Economic Services [consisting of Agriculture & Allied Activities (AGR); Rural Development (RDP); Irrigation & Flood Control (IFC); Energy (ENG); Industry & Minerals (IAM); Transport & Communications (TAC); Science, Technology & Environment (STE); and General Economic Services (GES, consisting of Secretariat Economic Services, Tourism, Civil Supplies etc.)]. Data on these variables were available at current prices only. Using NDP/NSDP deflators, the data were transformed at 2004-05 constant prices for all the three economies.
With the Indian economy having undergone a series of drastic macroeconomic policy changes by way of liberalization, globalization and privatization, there indeed was an urgent need to study the impact of such policy reforms on the pace and pattern of growth of the three economies. Therefore, the entire study period was divided into two sub-periods: pre-reforms (i.e., from 1980-81 to 1990-91) and post-reforms period (i.e., from 1990-91 to 2009-10), so as to gauge the impact of economic reforms.

**Analytical Techniques:**

Depending upon the nature of analyses in the study, a variety of statistical/econometric tools and techniques were made use of, as enlisted below:

(A) For the analysis of long-run growth performance of income (and, similarly, of capital stock), as many as 14 alternative trend relationships in time variable ‘t’ were estimated from each of the data series. These were: Simple Linear (SLR); Parabolic (PRB); Cubic (CUB); Log-Linear (LLN); Log-Parabolic (LPB); Log-Cubic (LCB); Exponential (EXP); Exponential-Parabolic (EPB); Exponential-Cubic (ECB); Geometric (GEO); Hyperbolic (HYP); Modified Exponential (MEX); Gompertz (GOM); and Logistic (LGS). The best-fit path was selected on the basis of the indicator I due to Sethi (2008). From the so-chosen path, relative growth rates were estimated to examine validity of alternative hypotheses of acceleration, constancy or deceleration in the growth paths. Then following the methodology as outlined in Sethi (2010), turning points, if any, were detected along the growth path and kinked growth rates were estimated on either side of the turning points.

(B) In order to examine the nature of structural transformations with respect to domestic product (as well as capital stock), relative shares of different components of domestic product/capital stock were computed as a percentage of aggregated domestic product/capital stock during the study span for Punjab, Haryana and Indian economy. For studying the speed of structural transformations, analysis based upon two indexes [viz., θ due to Moore (1978) and ξ due to Sethi (2003)] was performed for major aggregates of domestic product/capital stock in Punjab and Haryana states as also in the overall Indian economy.
(C) For identifying the inter-sectoral linkages among major components of income, we have made use of distributed lagged modeling (DLM) approach. With the objective to check the problem of auto-correlation, if any, we resorted to Cochrane-Orcutt’s (1949) approach (as applied to the trend-stationary time series, attained with the help of the pre-identified equations of the best fit), which is known to be advantageous one in the sense that it is capable of handling even higher order autoregressive scheme (Gujarati, 2004). Such models were estimated upto the maximum lag length (p) of 6 years. Following Stock and Watson (2003), choice of the optimum lag length (p) was made through Akaike’s Information Criterion (AIC). Nature and extent of inter-sectoral linkages was assessed (as indicated in Sethi, 2003) through the statistical significance of the computed values of $R^2$ for the estimated DLM.

(D) For the purpose of estimation of capital stock for Punjab and Haryana states, we resorted to the perpetual inventory method. This econometric method has been devised to estimate the value of physical capital stock of an industrial sector or of the overall economy; beginning with a benchmark stock value for capital held, and expressing all values at constant prices, known additions to stock (i.e., capital formation) are added and known disposals as well as depreciation are subtracted period-by-period. In this way, historical series is obtained for the growth of capital stock in a given economic activity over a period of time. Initial capital stock ($K_0$) was worked out for the year 1980, through the approach as proposed by Kruger (2003). Depreciation rate was obtained by following Nehru and Dhareshwar (1993). The adopted methodology has been elaborately mentioned in Sethi and Kaur (2012).

(E) In order to examine the productivity of each of the factor inputs, various partial factor productivities, viz., capital productivity, labour productivity, and productivity of electricity consumption were worked out for all the major sectors in respect of each of Punjab, Haryana and the Indian economy. Besides the partial productivity indices of factor inputs, some other structural ratios like capital-labour ratio (or, equivalently, capital intensity or capital deepening) and capital-output ratio were also computed. Further, following Ahmad (1981), an index of efficiency of labour was estimated as the difference between actual and desired rates of growth of labour productivity.
(F) In order to estimate employment elasticity of output, two alternative approaches were adopted: (i) *Arc elasticity of employment* method, through which the elasticity \( \varepsilon \) was obtained as the ratio of proportionate change in employment (L) to that in output (Y) during one year’s period, and (ii) *Multivariate log-linear regression model* (as used by Kapsos, 2005) using *time dummy variable*, \( D_t \), duly interacted with log NDP (or, log NSDP).

(G) For the estimation of total factor productivity, we have sought the help of three approaches viz., (i) *Factor Share Approach* (involving *three different indices* viz., Kendrick, 1961; Solow, 1957; and *Translog Index*), where contribution made by each factor input and TFP to the growth rate of national income was computed as the product of the growth rate of each factor input with its relative share in the national income; (ii) *Production Function Approach* (involving *Cobb-Douglas, CES* and *Translog Production Functions*); and (iii) *DEA-based Malmquist Productivity Index*, wherein total factor productivity (TFP) index was further decomposed into efficiency change (EFCH) and technical change (TECH) components. Further, efficiency change was decomposed into pure efficiency change and scale efficiency change.

(H) For examining the relationship, if any, between total factor productivity and developmental expenditure, *panel-data based step-up and step-down multiple regression analysis approach* through both *fixed effects* and *random effects* modeling [using three alternative versions, *viz.*, walhus (due to Wallace and Hussain, 1969); amemiya (due to Amemiya, 1971), and nerlove (due to Nerlove, 1971)] has been employed. Choice between fixed effects and random effects was made using *Hausman’s (1978) test*.

It may be mentioned that the analytical computations in the study were made in almost entirety through a variety of the computer programmes developed/ suitably adapted (such as *micEconCES, nonparaeff, plm, etc.*) in *R-language* by my teacher, Prof. (Dr.) Amarjit Singh Sethi.
Main Findings:

The main findings that have emerged from the study have been summarised chapter-wise, as follows:

Chapter-IV: Growth Performance, Structural Transformations and Inter-Sectoral Linkages in Income – An Analysis for Punjab and Haryana States vis-a-vis the Indian Economy

As regards the long-run growth performance, behavioral growth paths in respect of the various components of income were observed, in general, to be non-linear in nature at aggregated/dissegregated levels in both Punjab and Haryana states and also in the overall Indian economy. Majority of the sectors followed third-degree trend path functions; that is, CUB, ECB and LCB turned out to be the best representatives in majority cases. Absence of log-linear functional form, from having portrayed as the best-fit path, has lead us towards the rejection of constancy hypothesis regarding income in all the three economies, thereby indicating that none of the components of domestic product has registered a constant rate of growth during the study period. Notably, in majority sectors of Punjab, Haryana and the overall Indian economy, income has exhibited U-shaped growth pattern during the entire study span (thereby refuting the hypothesis of income growth at accelerated rates). But the overall growth performance of Haryana state has been better than that of the overall Indian economy, while Punjab state has been lagging behind. Further, turning points in the time series of income in almost all the sectors of Haryana have occurred comparatively earlier than those of the Punjab state, which indicates that rates of growth in major components of real NSDP of Haryana have undergone acceleration earlier than those of Punjab and, moreover, at comparatively higher rates. Pooled rates of growth in each of the components of income in both the states as well as for the overall Indian economy were highly significantly different from zero. The rate of growth of NSDP in Punjab (= 4.33 percent per annum) state was perceptibly lower than that (= 5.99 percent per annum) of Haryana and of the overall Indian economy (= 5.88 percent per annum), thereby indicating that the growth performance of income in Haryana state outweighed that of Punjab state and also of the overall Indian economy.
As regards structural transformations, relative share of primary sector in income was observed to have declined over a period of time in all the three economies considered, whereas the relative shares of tertiary and its sub-sectors had increased, particularly during post-liberalization period. Relative share of secondary sector has remained, more or less, stagnant, which indeed is a cause of concern. Further, in Haryana state as also in the overall Indian economy, speed of structural change was faster during pre-liberalization than that during post-liberalization regime, which indicates that these economies witnessed its development process at a stage, earlier than that in the Punjab state.

The analysis based upon distributed-lagged modeling revealed the income from tertiary sector to have led over that from both primary and secondary sectors in each of the two states. In Punjab, income from secondary sector did not exhibit any perceptible inter-sectoral linkages, except with the income from less productive tertiary sector. However, in Haryana, income from secondary sector was observed to be influencing income from primary sector, which may be viewed as a healthy sign for the state’s economy. On the other hand, in case of the overall Indian economy, almost all the major sectors, viz., primary, secondary and tertiary sectors were found to be strongly inter-linked with each other in one way or the other, which is an indicator conducive for the attainment of inclusive growth.

Chapter-V: Estimation of Capital Stock in Punjab and Haryana States: A Comparative Analysis vis-à-vis the Indian Economy

The regular time series, generated with the help of perpetual inventory method for Punjab and Haryana states for the period 1980-81 to 2009-10 revealed that the stock of capital in each of the economic activities in both the states has undergone growth, though at differential pace and pattern. As regards the long-run growth performance, behavioral growth paths traced by net fixed capital stock (NFCS) were observed, in general, to be non-linear in nature at aggregated/disaggregated levels in both Punjab and Haryana states and also in the overall Indian economy. Real Estate and Dwellings (RED) sector in Haryana was the only exceptional case wherein log-linear equation turned out to be the best representative. Fit of long-term trend paths (as gauged through the values of \( \varphi \)-coefficient of predictability) was very satisfactory for almost all the components of net fixed capital stock in both the states.
as well as for the overall Indian economy; the coefficients were seen to be to the
tune of 0.94 or more, with the only exceptions of electricity, gas & water supply in
Punjab and fishing sector in Haryana. Thus, in general, time series on capital stock
for all the components of NFCS have temporally propagated in a closely predictable
manner. In a large majority of cases, the third-ordered functional forms (viz., LCB or
ECB or CUB) happened to be the most appropriate underlying relationships for
different components of NFCS in the three economies. Specifically, the equations
like SLR, LLN, EXP, GEO, HYP and LGS were observed to be of the poorer-fit.
Absence of LLN and EXP functions indicates that various components of NFCS
have experienced non-linear paths with differential rates of growth in all the three
economies. As per the pattern of relative growth rates, growth performance of a
large majority of the components of NFCS in Haryana state and also of the Indian
economy has been comparatively better than that of the Punjab state; in majority
sectors of former two economies, NFCS has grown (especially during post-
liberalisation policy regime) at asymptotically increasing rates, while in Punjab, the
same has grown at falling rates. The analysis based upon kinked growth rates has
revealed that at the most two turning points had occurred in the behavioural growth
paths of various components of NFCS in the three economies. In case of Haryana
and the overall Indian economy, rates of growth after the turning point were, in
general, faster than those before the turning point. However, in case of Punjab, only
tertiary sector had portrayed such a pattern. The pooled rates of growth in different
components of NFCS in the three economies were, in general, highly significantly
different from zero.

As regards the structural transformations, tertiary sector continued to occupy
throughout the study span, dominant share in the aggregated capital stock in each of
Punjab state and the overall Indian economy. But, in Haryana state, it has been the
comparatively more productive secondary sector that continued to attain the highest
share throughout, thus indicating that on capital front, relative position of Haryana state
has certainly been superior. Further, the analysis based upon the index $\xi$ exhibited that
in Punjab state as also in the overall Indian economy, the speed of structural
transformation was faster during post-liberalisation period, while in Haryana state, the
situation was just the opposite. On the whole, it may be remarked that growth
performance with respect to various components of capital stock has been far superior in Haryana compared to the Punjab state.

Chapter-VI: Partial Factor Productivity and Employment Elasticity in Punjab, Haryana and the Indian Economy

Results of the analysis presented in this chapter have revealed that in a majority sectors in Haryana state as also in the overall Indian economy, output growth was faster than growth in inputs (particularly capital and labour), while such a phenomenon could be experienced by none of the sectors in case of the Punjab state, thereby presenting a sorry state of affairs for the (Punjab) state.

As regards the partial factor productivities, it has been observed that in Punjab state, growth rate in capital productivity (i.e., Y-K ratio) in all the sectors (except tertiary-2 sector) was negative during the study span; the slowest rate of growth in productivity was noticed in case of secondary sector. On the other hand, growth rate in Y-K ratio in all the major sectors of Haryana state was observed to be positive, meaning thereby that there has been much more effective utilization of capital input in the state, as compared to Punjab. As far as the Indian economy is concerned, primary and secondary sectors witnessed negative growth in capital productivity, while in tertiary and its sub-sectors, the same happened to be positive. At the aggregated level, growth rate in Y-K ratio in Haryana outweighed that in Punjab and also in the overall Indian economy. Thus, as far as growth rate in Y-K ratio is concerned, the performance of Haryana state has been the superior most. Nevertheless, over the reforms period, we have noticed that in majority sectors and also at the aggregated level of all the three economies, productivity of capital input has deteriorated during post-reforms period.

Regarding growth in labour productivity, in the Punjab state, primary sector was the lone activity to have registered positive growth. However, almost all the sectors in Haryana and the overall Indian economy have experienced positive rate of growth in the productivity. Tertiary-2 sector in Haryana was the lone exception to have portrayed negative rate of growth in the measure. Although some improvement in the rate of growth of labour productivity was noticed by way of economic reforms at the national level, yet no perceptible improvement in the rates was registered at the
individual states’ level. The findings, thus, signify that although liberalization policies have shown desirable results at the aggregated level, yet there appear to be certain lacunae in the implementation of the reforms measures across the two states.

As far as productivity of electricity consumption is concerned, negative growth rate has been observed in almost all the sectors of three economies considered, except in secondary sector of Haryana and the Indian economy, wherein the productivity growth happened to be positive. The findings thus provide an indication towards an inefficient and ineffective usage of the important source of energy in all the three economies considered, which really needs drawl of immediate attention. However, over the reforms period, productivity of electricity consumption has improved in almost all the sectors of the three economies.

As regards capital-labour (K-L) ratio, it was observed that at the aggregated level, the ratio has grown at a positive rates in both Punjab and the overall Indian economy, but at a negative rate in Haryana state. Further, growth rate in K-L ratio in all the sectors (except tertiary-2) of the Punjab state exceeded that in labour productivity, thus implying, once again, an inefficient usage of capital in the state. On the contrary, pace of growth in labour productivity was higher than that in K-L ratio in all the sectors of Haryana. In the country as a whole, growth in labour productivity was slower than that in K-L ratio in primary as well as secondary sector, but the picture was the other way round in tertiary-1 as well as in tertiary-2 sector. Moreover, the effect of capital productivity on the labour productivity in Punjab was comparatively poorer vis-à-vis the other two economies considered. Further, the index of efficiency of labour force, which was meant to compare actual rates with the desired rates of growth of labour productivity, evinced that Punjab performed well in respect of tertiary sector, Haryana in primary sector, while the country as a whole in all but secondary sector.

As regards employment scenario, both the adjoining states as well as the Indian economy as a whole have witnessed perceptible structural changes. For instance, during the entire study period, relative share of primary sector in employment has declined – from 61.45 to 26.12 percent in Punjab, from 65.13 to 44.11 percent in Haryana and from 70.66 to 54.66 percent in India. And, relative shares of each of
secondary and tertiary sectors in employment have increased temporally in each of the three economies. Although relative share of primary sector in employment has come down temporally, yet the sector continues to absorb a major chunk of the work force, especially in Haryana and the overall Indian economy.

As regards the impact of economic growth on employment, we found the existence of a comparatively low employment elasticity of economic growth, particularly in the overall Indian economy, thereby indicating the prevalence of jobless growth, which might induce increased poverty and inequalities in the distribution of income.

**Chapter-VII: Growth Accounting Analysis in India with Special Reference to Punjab and Haryana States – Evidence through Factor Share Approach**

In this chapter, we have made an elaborated attempt to analytically gauge the contribution of factor inputs, viz., capital and labour, and of total factor productivity to output expansion in major sectors of the neighbouring states of Punjab and Haryana vis-à-vis the overall Indian economy. Findings from the analysis revealed that the three indexes (viz., Kendrick, Solow and translog) of TFP were in a close agreement with each other in the sense that each one of these exhibited a similar pattern of TFP changes over the study span. As per these indexes, in both the states as well as in the overall Indian economy, pattern of productivity changes has all along been highly erratic in primary sector during the entire study span. The likely reason could be that agriculture sector depends primarily upon natural conditions, which, in fact are quite uncertain. In secondary sector, the picture has been rather depressing, particularly of the Punjab state. Even the services sector of Punjab state has undergone technical retrogression during the study span (except for the decade of 1980s). At the aggregated level, it was observed that in Punjab, TFP values fluctuated around unity; whereas, in Haryana as also in the overall Indian economy, the values happened to exceed even two at certain points of time, thereby presenting a comparatively far poor picture of the Punjab state. Nevertheless, in both the states, all the sectors were observed to have experienced a deceleration in TFP growth during post-reforms vis-à-vis the pre-reforms era, while at the country level, TFP growth showed an improvement in primary and tertiary-1 sectors.
As regards the nature of technical progress, we have noticed, in general, the prevalence of Hicks’ neutral technical progress at the aggregated/disaggregated levels in each of the three economies, thereby supporting our null hypothesis framed at S. No. 4 (Chapter-I). Further, the growth accounting analysis, based upon factor share approach indicated that TFP contributed the most in output growth, at the aggregated level in both the states during pre-reforms period, while labour acted as a prime mover during post-reforms period. Whereas, in the overall Indian economy, it was the TFP that acted as the major source of economic growth during the entire study span. However, the relative contribution of total factor inputs (which reflects the clubbed effect of capital and labour) has turned out to be higher than that of TFP in each of the three economies considered.

Chapter-VIII: Sources of Output Growth – Evidence through Production Functions Analysis

In order to examine various other parameters like rates of technical change, returns to scale, output elasticity with respect to factor inputs and also the elasticity of substitution among the factor inputs, three different production functions (viz., Cobb-Douglas, Constant Elasticity of Substitution and Transcendental Logarithmic) were estimated for all the three economies, by taking domestic product as output, and capital, labour and electricity consumption (treated as a proxy for energy) as three inputs. As per the expectations, different production functions produced different sets of estimates. Of the three production functions, Cobb-Douglas formulation represented the best-fit, as values of $R^2$ were, in general, very high and that a majority of the regression coefficients were statistically significant. Moreover, the estimates of elasticity of substitution from CES specification were not significantly different from unity and that the estimates obtained through translog production function were suspected to be suffering from the problem of multicollinearity, thereby providing further justification in favour of the Cobb-Douglas specification. Studies like those due to Solow (1957), Barthwal (1975), Rajalakshmi (1985), Bairam (1990), Singh and Ajit (1995), Sethi (1997), etc., also noticed the Cobb-Douglas production function to be the most appropriate and consistent functional form. Therefore, we also could put more emphasis on the results obtained through the C-D production function. Findings based upon the
production function revealed that at the aggregated level as well as in majority sectors in the three economies, output has been more responsive to relative changes in labour than capital and energy, thus calling for the need to pay more attention on labour input for ensuring faster growth in the economies. So far as the rate of technical progress is concerned, Punjab has been lagging behind the overall Indian economy, while Haryana has surged ahead of both Punjab and the overall Indian economy. Thus, the hypothesis that the rate of technological progress among the three economies is comparable, stands invalidated. Further, it was also observed that at the aggregated level, both Haryana state and the overall Indian economy have been operating under increasing returns to scale, whereas Punjab has experienced only constant returns to scale. In a nut-shell, the findings have, once again, pointed towards the prevalence of low productivity in the Punjab state, compared to the overall Indian economy, in general, and Haryana state, in particular.

**Chapter-IX: Total Factor Productivity Growth – Evidence through DEA-based Malmquist Productivity Index Approach**

Further, with an objective to examine as to whether output growth in each of Punjab, Haryana and the overall Indian economy has been primarily driven by *inspiration* (i.e., TFP) or by *perspiration* (i.e., factor accumulation) component or by both, output-oriented DEA based *non-parametric Malmquist Productivity index* approach was adopted, again considering net domestic product as output and labour, capital and energy as three inputs. The approach could also enable us to make a suitable decomposition of the TFP growth into its constituent components. The analysis has thus revealed that during the entire study span, output growth in Haryana state exceeded that in the overall Indian economy, while the growth in Punjab state has been far slower. This possibly happened because in the Punjab state, the inspiration component contributed negatively, while in each of Haryana state and the aggregated Indian economy, both inspiration and perspiration components contributed, in general, positively. But growth in factor accumulation has surpassed that in TFP in all the sectors in both Haryana state and the Indian economy. However, at the aggregated level in Haryana state, contribution of TFP was slightly higher than that of factor inputs. Consequently, the findings have led us to the rejection of the hypothesis of comparability in the relative contribution of factor
inputs and total factor productivity in the three economies considered. Further, poor performance of TFP growth in majority sectors of Punjab has been due to technical change rather than efficiency change. On the other hand, technical progress (due to innovations, etc.) has acted as a dominant source of productivity gains in Haryana state as well as the overall Indian economy, while technical efficiency deteriorated in these economies. Primary sector was noticed to be the lone exception having been associated with a negative contribution of TFP in output growth in all the three economies and during all the periods/sub-periods. Furthermore, economic reforms have not been able to bring about improvement in TFP growth in either of the three economies, thereby altogether refuting our hypothesis that: ‘Total Factor Productivity has improved over the study span in each of the three economies.’

Chapter-X: Estimation of Functional Relationship between Total Factor Productivity and Developmental Expenditure

In this chapter, we have analyzed the impact of developmental expenditure on total factor productivity in Punjab, Haryana and the Indian economy, using both panel data based step-down and step-up multiple regression approach. The estimation was carried out through both fixed effects and random effects modeling, using three alternative versions, viz., walhus (due to Wallace and Hussain, 1969); amemiya (due to Amemiya, 1971); and nerlove (due to Nerlove, 1971). Choice between fixed effects and random effects was made using Hausman’s (1978) test. It was observed that both step-up and step-down analysis ultimately provided us with the identically convergent results at the aggregated level. Therefore, keeping in the view the computational convenience, only step-down multiple linear regression analysis was made use of for examining the relationship between TFP and the public expenditure at sectoral level. Results from the analysis revealed that various components of revenue expenditure affected total factor productivity differently in different sectors. At the aggregated level, revenue expenditure on Social Security & Welfare, and Relief on Account of Natural Calamities were found to be positively influencing total factor productivity, while an increase in expenditure on General Economic Services negatively affected total factor productivity, possibly due to government expenditure on General Economic Services (like secretariat- economic services, tourism, civil supplies etc.,) in an ineffective and inefficient manner. Thus, there is a
need to ensure proper monitoring & implementation of the expenditure. Though there were certain components of expenditure that affected TFP in primary sector significantly, but the value of $R^2$ happened to be very low. We may thus say that developmental expenditure has failed to produce desirable results, so far as productivity performance of the primary producing activities is concerned, which might be due either to making public expenditure for less productive purposes or to improper implementation/monitoring of funds. The measures are specifically important for the Punjab state, whose fiscal position is already very fragile. In secondary sector, revenue expenditure on Industry & Minerals, Infrastructure like Transport, Communication, Science & Technology had significant impact on TFP in this sector. Therefore, policies need be designed to provide these basic facilities to the secondary sector in order to enhance productivity in the sector so that sustainable growth could be achieved. On the other hand, in tertiary and its sub-sectors, revenue expenditure on Social Security & Welfare Activities also induced positive and significant effect on TFP in the sectors. In addition to this, expenditure incurred on Agriculture & Allied activities, and Rural Development also affected TFP significantly, which indicated the presence of strong inter-linkages among primary and tertiary sectors. Further, revenue expenditure on General Economic Services (like Tourism, Civil Supplies etc.) is one such factor, which brought about a negative effect on TFP in tertiary sector and aggregated economy. The findings thus suggest that public expenditure on this particular component needs be curbed/utilized effectively so as to enhance total factor productivity in the three economies. On the whole, the findings do not support the proposed hypothesis that ‘Expenditure on developmental activities, in general, and social services, in particular, has a significant impact on TFP growth in each of the major sectors of the three economies.’

Policy Implications

Some of the useful policy implications which could be drawn from findings of the present study are:

1. Over a period of time, relative share of primary sector in income has declined, particularly in the aggregated Indian economy and the Haryana state, but there
has not been a commensurate decline in employment in the sector, thereby indicating the prevalence of low productivity in the sector. Concerted efforts, therefore, need be made for releasing the disguised manpower engaged in this sector. Promotion of non-farm activities (like dairying, beekeeping, piggeries, fish-culture, etc.) and agro-based industrialisation in rural regions may assist in this direction. Furthermore, adequate budgetary allocations (rather than resorting to populist and other vote-catching measures leading to rapidly growing expenditure on non-developmental activities) need instead be made towards strengthening of rural infrastructure.

2. In the light of the findings on the determinants of TFP growth, there is a need not only to make increased allocation of public resources towards social sector and economic activities, but also a need to ensure proper monitoring & implementation of the expenditure, particularly in respect of the primary sector. The measures assume particular importance in respect of the Punjab state, whose fiscal health has been depleting rapidly.

3. As only a few inter-sectoral linkages could be detected among broad aggregates of income in Punjab and Haryana states; therefore, there is an urgent need to, somehow, strengthen backward and forward linkages, as growth in one sector would presumably induce development in the other sector(s) in a inter-perpetuating manner. Agro-based industrialization (especially in rural regions) may prove fruitful, not only by way of boosting income generation from secondary sector, but also by paving way for employment generation in more productive activities in rural areas, thereby making the growth process truly inclusive in nature.

4. As in majority sectors of Punjab state (compared to Haryana and the overall Indian economy), capital stock (especially during post-liberalisation policy regime) has grown at falling rates, there is thus a need to pay focused attention towards the same. Since capital stock is known to be the engine of growth, therefore the deterioration in economic health of the state could be rooted in the irrational pattern of capital investment. Our state government needs to focus on developmental activities by way of reorientation of investment planning and
strategy. Congenial environment needs be created in the state (may be through strengthening of Capital Investment Subsidy Scheme) for the promotion of manufacturing sector.

5. High capital intensity, coupled with low productivity of both labour and capital (particularly in the state of Punjab) is, indeed, a cause of concern. Focused attention, therefore, needs be paid, not only for creation of capital but also towards efficient use of capital and also to use capital judiciously along with labour. There is a dire need for introduction and implementation of better technology and skill formation of workers through training programmes so as to achieve an improvement in capital and labour productivity. Industry Associations and Governments at various levels must attend to this all-important task of expanding and improving the skill endowment of our labour force.

6. Keeping in view the declining growth in productivity of electricity consumption, there is an urgent need to adopt suitable energy conservation policies like: reconsideration of continuation with populist measures of free/ unmetered/ unaccounted/ subsidised distribution of electricity across the board (because, such measures lead to inefficient/ wasteful usage of the source of energy); rationalization of the tariff structure; strict enforcement of laws to check thefts and corrupt practices; efficiency improvement; etc.

7. In the light of a slowdown in employment elasticity, particularly in respect of the overall Indian economy (thus indicating the prevalence of the phenomenon of jobless growth), strategy for employment generation needs be addressed to include such policies which could augment productive employment opportunities in the economies. The demand side strategy lies in the pursuit of sector specific policies or to identify and stimulate economic activities (like small-scale industrialisation, agro-processing, construction, etc.) which are known to be labour-absorbing in nature. On the other hand, the supply side interventions should be in capacity building and enhancing the skill endowment of the labour force. There must be constant efforts to identify gaps in skills and to provide training to make available the skills that are in short supply.

8. Since in the case of all the three economies, in general, and Punjab economy, in
particular, it was the factor accumulation (or perspiration component) that played the pivotal role in the growth of these economies, therefore, it calls for the need to strive for a productivity-driven economic growth, so as to achieve sustainability in the growth process. As it has been noticed that technical regress is responsible for negative TFP growth in Punjab state. Emphasis needs be laid on strengthening infrastructure investment and scientific research in order to develop indigenous technological capabilities which can match international standards to improve productivity levels in the liberalised regime, so as to promote lagged province (i.e., Punjab state) to catch up with its counter-part faster. Further, in the era of ever-increasing competition, we need to identify the areas with a comparative advantage to make our production process effective and efficient, particularly in Haryana and the overall Indian economy so as to accelerate TFP growth.

9. Since revenue expenditure on infrastructure like transport, communication, science & technology had significant impact on TFP in secondary sector; therefore, policies needs be designed to provide these basic facilities to this sector in order to enhance its growth and relative share in income. As, it has been noticed that growth of this sector has been by-passed, by leap-frogging directly to services sector, but without the growth of commodity producing sectors, service-led growth may not be sustainable in the long-run. Moreover, growth of secondary sector could help in putting workers away from the trap of disguised unemployment from primary sector. Strong R & D wing should be encouraged through effective policy frame by the government of India to evaluate the adoptability of modern techniques and to develop indigenous techniques so as to increase productivity.

10. One of the likely reasons for Haryana state to have portrayed a far better picture (in comparison to the Punjab state) lies in its locational advantage (being in the vicinity of the National Capital Region, NCR). However, Indian economy, in general, and the Punjab state, in particular, can gain significantly (via trade-led growth), if concerted efforts are made at the governmental level to ensure cordial relations with neighbouring Pakistan.
Thus, at the end we may say that what is badly needed is *Good Governance* or *More Proactive Role* of the government for improving the performance of, particularly the Punjab state, on productivity front. As also mentioned by Charron (2010), high level of corruption has been prevailing in the two states, with a value for composite corruption score of 4.59 for Punjab and still higher of 5.16 for Haryana, *vis-a-vis* a far less score of 3.01 for the adjoining state of Himachal Pradesh. Thus, corruption free economy is the need of the hour for tracking back the economy on the path of development. Moreover, for the states (particularly, Punjab) to surge ahead, it is imperative to address regional problems in order to enhance the TFP, which has become virtually synonymous with economic growth. All-out efforts to accelerate growth of these economies are required for ensuring balanced growth in all the sectors (*agriculture, industry as well as services*). Only then, the growth would be inclusive in nature in the real sense, so that the thematic objective, “*Faster, Sustainable and More Inclusive Growth*” could be realised during the 12th Plan.

**Limitations of the Present Study and Directions for Future Research**

No doubt, the present study is an elaborative attempt to examine the sources of growth at the aggregated/disaggregated levels of Punjab and Haryana states *vis-a-vis* the overall Indian economy, yet no research investigation could possibly be treated as complete in itself. Our study is no exception. It also has certain limitations associated with it, and these suggest potential directions for further research. The first and the foremost limitation of the study is that it had to be confined to only two states, *viz.*, Punjab and Haryana. The primary reason for doing so was the non-availability of data on ‘Capital Formation’, required to generate sufficiently long and regular time series on the very basic variable, *i.e.*, ‘Capital Stock’ for rest of the Indian states. Thus, the further research into estimating capital formation (and, hence, capital stock) for rest of the Indian states would be a valuable addition to the extant literature. Next, the data in respect of factor incomes, *i.e.*, compensation to employees (as a reward for labour) and interest (as a reward for capital) were not available at the states’ level and, therefore, the same information (compiled at the national level) had to be used for the two states. Consequently, a potential direction for future research could also be the estimation of the factor incomes at states’ level. Another interesting direction for future research would be to investigate the impact
of various other quantitative and qualitative factors like human capital, education, health & nutrition, taxes & subsidies, environmental factors, meteorological parameters, etc., on total factor productivity of the economy. Lastly, an analytical comparison of the sources and rate of growth in India as against some other economies at the global level, could also contribute to a more systematic explanation of the question so often raised, viz., as to ‘Why growth rates differ?’