Services Sector Growth in India: Trend, Pattern and Determinants of Services Sector with special reference to Banking and Telecommunication Services

A thesis submitted to Indian Institute of Technology Guwahati
in partial fulfilment of the requirements for the degree of
Doctor of Philosophy

Submitted by

Hemanta Barman

Department of Humanities and Social Sciences
Indian Institute of Technology Guwahati
August 2017

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Declaration

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Guwahati-781039, Assam , India

I hereby declare that the thesis entitled "**Services Sector Growth in India: Trend, Pattern and Determinants of Services Sector with special reference to Banking and Telecommunication Services**", is the result of investigation carried out by me in the Department of Humanities and Social Sciences, Indian Institute of Technology Guwahati, Guwahati, India, under the supervision of Professor Mrinal Kanti Dutta, Professor of Economics in the Department of Humanities of Social Sciences, Indian Institute of Technology Guwahati.

In keeping with the general practice of reporting scientific observations, due acknowledgement has been made whenever the work described is based on findings of other investigations.

(Hemanta Barman)
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Certificate

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This is to certify that the thesis entitled "**Services Sector Growth in India: Trend, Pattern and Determinants of Services Sector with special reference to Banking and Telecommunication Services**", submitted by Mr. Hemanta Barman for the degree of Doctor of Philosophy in Economics in the Department of Humanities and Social Sciences at the Indian Institute of Technology Guwahati, embodies bonafide record of research work carried out under my supervision and guidance.

The present thesis or any part thereof has not been submitted to any other University for award of any degree of diploma.

All assistance received by the researcher has been duly acknowledged.

Professor M.K. Dutta (Professor of Economics)
Thesis Supervisor
Department of Humanities and Social Sciences
Indian Institute of Technology Guwahati

Dedicated to my Family

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Abbreviations

CAGR	Compound Annual Growth Rate
CAR	Capital Adequacy Ratio
CRR	Cash Reserve Ratio
CSO	Central Statistical Office
DEA	Data Envelopment Analysis
DMU	Decision Making Unit
DoT	Department of Telecommunication
FDI	Foreign Direct Investment
FIRE	Financing Insurance, Real estate and business Services
GDP	Gross Domestic Product
GOI	Government of India
GVA	Gross Value Addition
ICT	Information and Communication Technology
MoSPI	Ministry of Statistics and Programme Implementation
NE	Northeast
NSS	National Sample Survey
NTP	National Telecom Policy/New Telecom Policy
RBI	Reserve Bank of India
TFP	Total Factor Productivity
TFPG	Total Factor Productivity Growth
TRAI	Telecom Regulatory Authority of India

भारतीय प्रौद्योगिकी संस्थान गुवाहाटी
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Abstract

As in other countries, the emerging market economies of Brazil, China, India and Russia also have a relatively larger share of services sector in their gross domestic product (GDP). The average contribution of services sector in these large emerging market economies to their GDP is found to be more than 50 percent in 2015. The relatively faster economic growth in these countries is mostly contributed by higher growth in services sector. Among these emerging countries, Indian economy witnessed rapid growth in services sector over the last one and half decades and the sector has become the largest contributor to the economy. However, the pattern of growth in services sector in the economy is somewhat different. Because, while many countries in the world have a smooth transition from a primary sector led economy to a tertiary or service sector led economy through the secondary sector, India has leapfrogged from the primary sector to the services sector led growth, without significant contribution from the manufacturing sector. With such increasing dominance and importance of services sector in Indian economy, it is crucial to examine the trend and pattern in the growth, and factors contributing to services sector growth in the country. With this objective in mind, the present study attempts to examine the trend, its pattern and the determinants of services sector growth in India.

The study is based entirely on secondary data which are gathered from various sources, most of which are Government Ministries and Departments. In addition to these sources, for some instances other sources of data are also utilized whenever found relevant for the study.

It is to be noted that the overall services sector comprises of five sub-sectors namely (i) construction; (ii) trade, hotel and restaurant; (iii) transport, storage and communication; (iv) financing, insurance, real estate and business services (FIRE); and (v) community, social and personal services. Furthermore, the five sub-sectors under the broad headings of services sector are again subdivided into two or more segments except construction. The

existence of several sub-sectors and segments make it difficult to conduct in-detailed study taking all sub-sectors and segments. Therefore, besides investigating the trend, pattern and determinants of various services sub-sector and segments, the present study has taken up two services segments, namely the banking services and the telecommunications services to examine their trend, pattern and determinants at more disaggregated level. The trend in growth, its pattern of banking services are examined using basic banking indicators such as branch expansion, deposit, credit etc. Moreover, the study examines the productivity growth to trace the overall performance of banking services and their determinants. On the other hand, the growth pattern and the determinants of telecommunications services are examined with the help of the concept of teledensity.

Apart from simple arithmetic tools such as percentage, ratio and growth rate, the study adopts various econometric tools under parametric as well as non-parametric framework to fulfil the research objectives of the present study.

Results of the study reveal that, among the sub-sectors, FIRE is the largest contributor while transport, storage and communication registered the highest growth rate compared to the other sub-sectors during the sample period of the present study. The study finds per capita income as the major driver of services segments like transport by other means, railways, banking and insurance, real estate and business services and public administration and defence. Similarly, export is found to be one of the significant determinants for trade, hotel and restaurant, communication, real estate and business services, public administration and defence and other services. However, the effect of splintering (i.e. the use of services as intermediary inputs in other sectors) in driving services sector is found to be statistically insignificant.

The trend in growth in the banking services show a steady progress in banking parameters such as branch expansion, deposit, credit etc. The banking services in India also registered moderate growth in their productivity during the sample period considered in the study. The study finds growth in productivity of banks owned by public sector is higher compared to banks owned by private sector and foreign banks. In the examination of possible explanatory factors of productivity growth in banking services, ratio of non-interest income to total asset is found to be significant and positive while ratio of intermediary cost to total asset, and the size of deposit affect the productivity growth negatively. In addition, macro variable such as fiscal deficit is found to be positive in explaining the productivity

growth among the banks.

In the examination of growth and pattern of telecommunication services, the results of the present study indicate considerable growth in the penetration of telecommunication services in India. The study also observes inter-state gap in the growth of telecommunication services among different states in India. However, the inter-state gap in telecommunication services has been declining over time. The regression analysis carried out to examine the probable determinants of telecommunication services suggests that per capita income, education, the size of the service sector, and network externality are significant determinants of telecommunication services across states in India.

1

Introduction

1.1 Background of the Study

Levels of economic development and the concomitant changes in the economic structure is one of the most extensively explored themes in development economics. In the long run process of economic development, structural change or transformation is regarded as an essential characteristic. Structural transformation in an economy broadly refers to long-term and persistent changes in the economic systems (Chenery et al., 1986; Syrquin, 2007). Francosis Quesnay of the Physiocratic school, provides the basic conceptual foundation of structural characteristics in an economy through the idea of Tableau economique. The Physioctrats categorised different economic activities into three classes, the productive class (cultivators), the sterile class (manufacturing) and idle class (landlords). According to Ray (2012), the basic characteristics of structural change in the process of development of a country are changes in demographic composition, pattern of production, rural-urban composition, changes in occupational composition and international trade. Structural change involves changes in the distribution of resources among different sectors in the economy, changing relative importance of different sectors in terms of output or employment, changing pattern of urbanization, changes in the location of economic activity and other concomitant aspects including demographic composition (Panchamukhi et al., 1989). Many theories in the economic literature can be brought into the explanation of structural changes in an economic system. For example, noted classical economist David Ricardo put forward the theory of rent, where Ricardo explains how the steady process of development and population growth bring in the less fertile and unproductive land into the

production process. According to the theory, at the initial stage of development, only the best and fertile lands are used into the production process as the pressure of population during the initial stage of development is small. In the development process, as pressure of population rises, fertile land become scarce and eventually the scarcity of land become instrumental in changing the composition of productive system by including manufacturing of commodities in the production process. J. Schumpeter, another influential economist argues that it is the technological progress led innovation (also termed as creative destruction) in the economy which brings changes in the existing structure of the economy. Schumpeter's theory of innovation points out innovation as the core of the structural change in the system of the economy. Innovation brought through technological progress destroys the old production system with a new one, leading to change in the existing structure of the economy. Unlimited supply of labour theory, propounded by Arthur Lewis describes the structural change in terms of the transformation of surplus labour from the traditional, overpopulated rural sector to high productivity urban industrial sector. According to the Lewis model, excess labour in the traditional sector with zero marginal productivity can be transferred to high productive urban sectors. This shift of labour force from traditional sector to modern sector brings structural transformation in the economic activity from an agriculture based traditional economy into industry based modern urban economy. Again in one of the major economic growth models, W. W. Rostow presents stages of growth model of development. Rostow's stages of growth model describes transition from underdevelopment to development in terms of series of stages, bringing fundamental changes in the economic system. Chenery (1960) points out that changing level of income are associated with changing pattern in the industrial growth and the pattern of change is specific to each country and closely related to various factors such as geographical size, location and availability of natural resources. Most recently, McMillan and Rodrik (2011) have explained structural change in terms of labour productivity. The movement of labour and other productive resources from agriculture (less productive activities) to modern activities (high productive activities) improves the overall productivity in the economy. The authors term such changes as "growth enhancing" structural change which according to the authors are crucial for economic growth. Syrquin (1998) defines structural transformation as the change in the economic structure accompanied with economic development. The accumulation of capital and changes in the composition of demand, trade, production, and

employment is the core of the transformation.

One of the most notable and acknowledged features in the process of structural transformation is the decline in significance of agriculture with corresponding rise in the manufacturing sector. In the subsequent phases, the services sector leads the economy as the dominating sector. Many scholars including Fisher (1933), Fuchs (1968) and Kuznets (1973) noted that at advanced stage of economic development, services sector leads the economy. According to Fisher (1933), in the first stage of economic development, the economy is mainly concentrated in the primary production while in the second stage, the secondary or manufacturing activities becomes predominant in the economy. During the third stage, increasing portion of human time and effort and capital is diverted in the production of various tangible and intangible services. Kuznets (1973) highlighted six major characteristics of modern economic growth. One of these major characteristics is the structural change in the economy which includes shift of economic activities from agriculture to industry and consequently from industry to services. According to Fuchs (1968), as income rises, demand for services rises rapidly whereas the rise in demand for goods increases at a slow rate. This rapid rise in demand for services shifts the importance of economy towards services.

In the process of economic development, most of the countries across the world have witnessed such structural transformation in their economy with considerably large services sector in the respective economy. Studies such as Cuadrado and Rio (2006), Memedovic and Lapadre (2010) and Jorgenson and Timmer (2011) documented the dominance of services economy across different countries in the world. This is obvious from the fact that service sector became the dominant sector in the world economy by the year 1970, contributing more than 52 percent of the total world production. Emerging market economies such as China, Brazil, Russia and India follow similar trend with relatively large services sector which contributes more than 50 percent of their GDP in 2015 (World Bank, 2017). Among these emerging market economies, India occupies a special place because, while the services sector in Brazil and Russia has contracted in recent years, India has been able to experience much higher growth rate in services sector (8.92 percent) even higher than China (8.32 percent).[1] Moreover, the growth path followed by Indian economy is somewhat different from the other economies as India has leapfrogged from the primary sector to services sector led growth, without significant contribution from the manufacturing sec-

tor in the process of structural transformation. In contrast, most of the countries around the world have a smooth transition from the earlier primary sector led economy to tertiary sector led economy through secondary sector (Dev, 2010). In India, much of the accelerated growth has occurred in the tertiary sector (services) activities in the field of financial services, hotel and restaurant, real estate sector, etc. The services sector in the country has experienced tremendous growth in recent years. The share of services sector in the gross domestic product (GDP) in India has been continuously on the rise. In 1950-51, the sector contributed merely one third of the GDP which increased to more than half in 1991-92. In 2013-14, services sector contributed more than two third of the GDP while contribution of agricultural sector which was the dominating sector during 1950s declined to about 14 percent. Although the annual average growth rate of services sector has remained well above the overall growth rate of the economy for a long time, the acceleration in the growth of services sector started since 1980-81. The phase of rapid annual growth continued over the years and the sector registered annual average growth rates of around 10 percent per annum or more in a few instances during the period from 2004-05 to 2012-13 whereas the aggregate economy grew at an average rate above 8 percent. This changing structure led the economy to a different path dominated by the services sector. In view of this, many authors have attributed the overall growth in Indian economy in recent years to acceleration in the services sector (Babu, 2005; Balakrishnan and Parameswaran, 2007). The literature has documented a number of factors contributing to services sector growth. These are production specialisation or splintering (Bhagwati, 1984; Wolfi, 2005), final demand (Wu, 2007; Wolfi, 2005), rising international trade in services, etc. (Gordon and Gupta, 2004; Eichengreen and Gupta, 2011). The role of technology, transportability and tradability in the expansion of services output is also crucial as technology, transportability and tradability facilitate product specialization or splintering, final demand and export of services (Ghani, 2010).

With such increasing dominance and importance of services sector in Indian economy, it is crucial to examine the magnitude of overall services sector and the factors contributing to services sector in the country. With this objective in mind, the present thesis attempts to examine the trend, pattern and determinants of services sector growth in India. The starting point of the present study is 1980-81. The selection of this time point is based on the argument that the phase of rapid growth in Indian economy began in 1980s and

further accelerated in 1990s (Basu and Maertens, 2007). It is to be noted that the overall services sector comprises of five sub-sectors namely (i) construction; (ii) trade, hotel and restaurant; (iii) transport, storage and communication; (iv) financing, insurance, real estate and business services; and (v) community, social and personal services. Furthermore, the five sub-sectors under the broad headings of services sector are again sub-divided into two or more segments except construction. To understand the trend and pattern of growth and factors responsible for different sub-sectors and segments, separate study for each of the specific segments is considered necessary. Therefore, the present study aspires to assess the performance of various services segments along with the broad services sector.

1.2 Statement of the Problem

Many literatures have analysed the growth pattern and importance of various determinants in the growth of services sector in Indian economy. Studies such as Gordon and Gupta (2004), Eichengreen and Gupta (2011) and Nayyar (2012) examined the services sector in India. Gordon and Gupta (2004) highlighted the rapid growth in the services sector as the striking feature of Indian economy. Employing data for the period 1952 to 2000, their study highlighted the economic liberalization in the 1990s as most important driver of services growth in India. Eichengreen and Gupta (2011) using data for the period 1980 to 2006 observes the significant importance of tradability of services and economic liberalization in the growth of services sector in India. In a more recent study, Nayyar (2012) considering the sample period from 1990-91 to 2008-09 examines important determinants of India's services sector. The study shows positive relation of levels of GDP, trade in services and liberalization with the expansion of services sector in India. However, as mentioned above, the services sector comprises of five broad sub-sectors and various segments within each of the sub-sectors. Thus, individual attention to each of the specific segments is necessary to examine trend and pattern in the growth and the determinants of these services segments.

Therefore, to examine the trend and pattern in growth of services sector, its sub-sectors and their segments, the present thesis goes beyond the existing studies in many grounds. For example, in addition to the use of more recent dataset, the present study examines the trend and pattern of growth of each of the sub-sectors and segments separately. Moreover, the study examines important determinants of each of these segments individually.

Furthermore, the present study makes an attempt to carry out detailed analysis of the

trend, pattern and determinants of two of the segments individually. These two segments are the banking services and the telecommunications services.

Many studies (for example Bhattacharyya et al. (1997b); Kumbhakar and Sarkar (2003); De (2004); Rezvanian et al. (2008)) have analysed the performance of banking services. However, only a limited number of studies such as Das and Ghosh (2006), Reddy and Nirmala (2013) and Kumar and Gulati (2014)) examines the determinants of banking services in India. Therefore, the present study contributes to the existing literature by examining the growth of banking services and also identifying the important determinants of the expansion of banking services using the most recent available data.

In case of telecommunication services, studies such as Das and Srinivasan (1999), Narayana (2011), Biancini (2011), Ghosh and Prasad (2012) and Ghosh (2016) documented the expansion of telecommunications services in India. However, the existing literature has not given sufficient attention in examining the expansion of telecommunication services across states in India. Furthermore, there is a dearth of study that examines the diffusion of telecommunications services in rural and urban areas. Therefore, the present study also tries to fill this gap by examining the trend, pattern and determinants of telecommunications services across states in India along with in rural and urban areas.

1.3 Objectives and Scope of the Study

The present study is taken up with the primary objective of examining the trend, pattern and determinants of services sector in Indian economy. However, as mentioned above, the services sector comprises of several services sub-sectors and their segments. Therefore, besides investigating the trend, pattern and determinants of various services sub-sector and their segments, the present study has taken up two services segments namely the banking services and telecommunication services to examine their trend, pattern and determinants in growth individually.

The broad objectives of the present study are as follows.

(a) To study the pattern of growth in services sector, its sub-sectors along with their various segments.

The trend and pattern of growth are also separately examined for banking and telecommunications services segments.

(b) To identify the important determinants of services sector, its sub-sectors along with their various segments.

This is also done separately for the two segments namely the banking and the telecommunications services.

1.4 Research Questions

The underline research questions for the study are as follows.

(a) What are the trend and pattern in the growth of services sector, its sub-sectors and their segments?

(b) What are the important factors that explain the growth of various services segments?

1.5 Data and Methodology

1.5.1 Data

The present study is based entirely on secondary data. The required data for the present study are obtained from different Ministries and Departments under the Government of India. Data available at international institutions such as World Bank are also accessed for the purpose of the present study. Moreover, the study also utilises data available at www.indiastat.com whenever found relevant for the study.

Various data sources under the Government of India that are used to obtain data for the present study are as follows: Central Statistical Office, Ministry of Statistics and Programme Implementation, Government of India; Handbook of Statistics on the Indian Economy, Reserve Bank of India; Statistical Tables Relating to Banks in India, Reserve Bank of India; Department of Telecommunication, Ministry of Communication, Government of India; Ministry of Human Resource Development, Government of India, Office of the Registrar General and Census Commissioner India, Government of India; Publications Division, Ministry of Information and Broadcasting, Government of India.

1.5.2 Methodology

Simple statistical tools such as ratio, percentage and growth rates are used to trace the trend and pattern of growth in overall services sector, its sub-sectors and segments. In

addition, according to the requirement of the specific objectives, different parametric as well as non-parametric tools are applied to obtain answer for the objectives laid out above.

In order to address the objectives specific to the overall services sector, the following analytical tools are applied.

- The output (Gross Value Addition) growth rate of overall services sector, its sub-sectors and its various segments are analysed using simple statistical tools such as ratio, percentage and compound annual growth rate.
- The Semi-log quadratic equation is applied to see the pattern of acceleration or deceleration in the growth rates in overall services sector along with its sub-sectors and their various segments.
- Johansen cointegration procedure is applied to check if long run relationship exists among gross value addition (GVA) in services segments, per capita income and export value of the country.
- In order to examine the causality of PCI and export towards various services segments causality analysis is carried out.
- Finally, a regression analysis under panel data framework is employed to see the effect of splintering on the expansion of services sector.

To examine the pattern of growth and determinants of banking services, following tools are used.

- Simple statistical tools such as ratio, percentage and compound annual growth rate are used to asses the extent of banking services in India.
- Total factor productivity growth of commercial banks is estimated by using input oriented Data Envelopment Analysis.
- Regression analyses under panel data framework are used to identify the determinants of productivity growth of banking services.

The analytical techniques used to examine the telecommunication services are as follows.

- Simple statistical tools such as ratio, percentage and growth rate are used to asses the extent of telecommunication services in India.

- Parametric tools such as panel unit root tests in addition to non-parametric techniques such as kernel density plot, transition probability matrix are used to examine the pattern of teledensity across states in India.

- Panel data regression techniques are applied to identify determinants of teledensity across states in India.

Detailed discussion about the methodologies applied are presented in the respective chapters.

1.6 Layout of the Thesis

The dissertation is comprised of six chapters including the introduction. The second chapter of the dissertation presents review of available literature on various conceptual, theoretical and empirical aspects of services sector growth.

The core of the thesis begins with the third chapter. In this chapter, a brief description of the structure of overall services sector, its magnitude and importance in Indian economy is presented followed by an analysis of the trend in overall services sector in India. Moreover, an attempt is made to explain some of the probable drivers of services sector in the Indian economy.

The fourth chapter examines the trend and pattern of growth in the banking services. The expansion of banking services in Indian economy are examined with the help of the basic banking parameters such as expansion in the bank branches, growth in deposit, credit etc. In addition, this chapter examines the pattern in the productivity growth of the banking services in an attempt to measure the overall performance of the banking services. Furthermore, this chapter also makes an attempt to identify important determinants in driving the productivity growth of banking services in Indian economy.

In the fifth chapter, the trend, pattern and important determinants of telecommunication services is examined. The pattern in the growth of telecommunication services is examined in terms of its contribution to the GDP of the country. In addition, number of telephone subscribers and teledensity is also utilised to trace the growth pattern of telecommunication services in India. Apart from the growth pattern for the overall country, this chapter also examines the penetration of telecommunication services and disparity in penetration across different states in India. Moreover, this chapter makes an attempt to identify important

determinants of telecommunication services in rural as well as in urban areas of India, in addition to the entire country as a whole.

In the sixth chapter, broad conclusions and findings derived from the study are summarised. The chapter also outlines some of the limitations of the study and future scope of research in this field.

2

Review of Literature

In the process of development, each economy experiences transformation in its structure of production. As a result of the transformation in the economy, at the first instance agriculture sector loses its primacy in the economy giving way the opportunity to industrial sector to grow faster in the second phase of development. In the third phase, the services sector becomes the leading sector in the economy in terms of contribution to the Gross Domestic Product (GDP). These two consecutive phases are called as industrialisation and post-industrialisation (Soubbotina, 2004). A good number studies have examined and found such structural transformation in the development process of an economy. One of the most influential American economic historians W.W. Rostow propounded that the transition from underdevelopment to development can be described in terms of a series stages through which all countries must proceed (Todaro and Smith, 2011).

Owing to the fact that, structural transformation is a vital phenomenon in the process of economic development, it would be worthwhile to understand the process, its pattern and implication in an economy. Moreover, it is also necessary to asses the extent of structural change and concomitant growth in different sectors in the economy. Therefore, in order to understand the process and pattern of structural shift, In this chapter an attempt is made to summarise the relevant literature that explains the changes in the structures of an economy and overall growth in the economy of a country with special reference to the Indian economy. This chapter is grouped and discussed under following sections.

In the first section, structural transformation in an economy and its associated economic development is discussed. The second section presents the concepts and issues related to services sector. The third section of the present chapter summarises various issues in the

services sector. The last section presents a summary of the chapter.

2.1 Linkage between Structural Change and Economic Development

According to Ray (2012), the basic characteristics of structural change in the process of development of a country are demographic, occupational and pattern of production, rural-urban composition and international trade. Ray elaborates these characteristics and points out that there is a general tendency of the population growth rate to decline with increase in per capita income. As an economy develops its per capita income rises. This leads to improvement in medical services, education and other living facilities, which initially reduces mortality rate and then brings down fertility, and finally reduces overall population growth. In occupational and production structure, it is the agriculture sector which dominates the sectors in developing countries. The share of labour force engaged in agriculture remains substantially high in developing countries. The third structural characteristic of a developing country is the rapid rural urban migration. The large scale migration from rural to urban is an outcome of both the push from agriculture and pull of the urban sector which provides comparatively high wage and other working facilities. Theoretical explanations of such labour movement can be found in a number of pioneering economic literatures. Some of such prominent literatures are Lewis, unlimited supply of labour, 1954; Ranis and Fei's theory of economic development, 1963 etc. (Ray, 2012). Lewis' idea of dual economy explains the coexistence of traditional and modern sector in an economy. In Lewis framework of development, modern sector accumulates capital and employs surplus labour from traditional sector, thus becoming the engine of development. The fourth characteristic is the differences between developing and developed countries in the composition of trade. The export basket of developing countries mainly comprises of primary goods, which include raw materials, cash crops, textiles and light manufactured items. In contrast to that, developed countries mainly export manufactured goods, consumer goods etc. The structural characteristics of an economy at different stages of development of a country changes and this is an established phenomenon in development literature. The conceptual foundation of structural characteristics can be found in Tableau economique propounded by Francosis Quesnay of Physiocratic school of thought that had emerged during the late seventeenth century. The Tableau economique is an economic model that shows the process of production, circulation of money and commodities and distribution

of income. The Physioctrats classified the economic activities into three classes, the productive class (cultivators), the sterile class (manufacturing) and idle class (landlords) (Hunt and Lautzenheiser, 2011). In Tableau economique, a simple structural representation and interdependence among economic sectors was explained. Adam Smith in his book "An Inquiry into the Nature and Causes of the Wealth of Nations", discusses the association among various sectors and changing composition among the sectors at different stages of development in an economy. according to Adam Smith, the division of labour brought the stimulus to structural change. Specialisation of labour raises labour productivity and dexterity among workers. David Ricardo, a noted classical economist, forwarded the theory of rent, where he explains how the inclusion of less fertile land in the production process generates rent for the other fertile land that are already in the production process. The process increases the use of land and eventually brings land with substandard quality into the production process as the fertile land becomes scarce. Since land cannot be created, the steady process of development and population growth requires a changing composition of productive system or inclusion of manufacturing of commodities in the production process.

Schumpeter, one of the most influential economists of the twentieth century viewed the structural change of an economy in terms of innovation. The continuous process of shift in an economy is brought through technological change. The process of innovation by one farm brings the prospect to earn profit for that firm. In the process, some other firm imitates the production process or product (innovation) and reduces profit for the particular innovation in the market, compelling the other competing firms in the market to make more innovation to sustain their level of profit. This process of diffusion, imitation and new technology of production continues further leading to structural changes in the economy in terms of production. In Schumpeterian vision, entrepreneur is an innovator and it (the entrepreneur) transforms the existing structure of the economy to a new structure (Nissan et al., 2011).

Silva and Teixeira (2008) outline traditional distinction of the structure of an economy and explain the differences between horizontal and vertical economic structure. The horizontal structure represents the economic system as a circular structure. The economic activities remain clustered into mutually dependent classes. On the other hand the vertical structure represents the structure of the economy stressing unidirectional relationships

and asymmetric dependence in the clustering process. Leontief in his input-output model explains the interdependence among all industries in an economy. Output from one industry enters as an intermediate input in other industries (Chiang, 1984). The explanation of Leontief can be described as the horizontal flow of structure in the economy as it explains parallel interaction among different sectors in an economy. Pasineeti (1933) viewed the structural change as permanent changes in the absolute levels of basic macroeconomic parameters such as gross national product, total consumption, total investment, overall employment etc. and changes in their composition in the structure of the economy.

In words of Pasineeti (1933):

> "The evolution of modern economic systems, especially since the inception of the industrial revolution, shows that, as time goes by, the permanent changes in the absolute levels of basic macro-economic magnitudes such as gross national product, total consumption, total investment, overall employment etc. invariably associated with changes in their composition, that is, with the dynamics of their structure" (p. 1).

Syrquin (2010) defines structural change in the development process as the changes in relative importance of different sectors in the economy; changes in the process of economic activity and other associated transformation in the economy. Further, the author pointed out that the process of development in an economy can be seen as a gradual replacement of traditional economic activity by modern sectors and with new production techniques. Therefore, the dynamics of structural change is essential to sustain economic growth in a country.

Quoting Pasinetti and Scazzieri (1987), Silva and Teixeira (2008) pointed out that the major source of structural change in the economy is individual and social learning. The process of learning (acquiring knowledge) influences the dynamics of economic changes in two ways, the first one is through technological changes, which builds new production techniques and products leading to increase in productivity. The other (second) one is change in demand. The increase in per capita income and associated increase in demand can be described by Engel's law. This law describes rise in per capita income and its influence in consumer demand. Engel's law specifically focuses on spending patterns of food consumption. In such way advancement in technology and changes in the pattern of demand can be seen as prime determinants in the dynamics of an economy.

The structural change in national income of an economy is historically associated with the process of development of that economy. In some leading works about structural change and economic development a set of stylized facts from empirical evidences have been postulated. In a pioneering article A.G.B. Fisher narrates the process of economic growth of an economy and distinguishes three broad sectors, i.e. primary, secondary and tertiary in the economy (Katouzian, 1970). In the first stage of economic development, the effort of production remains mainly concentrated in primary activities, in the second stage, the manufacturing and other activities associated with it starts occupying predominance in the production process of the economy. The tertiary sector starts dominating the other sectors in more advanced countries with relatively high income. In this stage, it becomes possible to divert an increasing proportion of human time and effort, and capital equipment into the production of goods and services. The tertiary sector includes activities such as facilities for travel, amusements of various kinds, personal and intangible services, flowers, music, art, literature, science, philosophy etc. (Fisher, 1933). Colin Clark re-states the same division of economic activities as Fisher. Clark's division of national income can be classified as primary industry-agriculture, forestry and fishing; secondary industry-manufacturing, industry, mining and building; and tertiary industry-commerce, transport and services (Rothbarth, 1941).

Simon Kuznets analysed the process of structural change and observed that structural change is an integral part of modern economic growth (Syrquin, 2010). A tri-partied decomposition i.e., agriculture, industry and services can be found in literature of Simon Kuznets' also (Silva and Teixeira, 2008). Ansari (1995) sums up a vast body of theoretical literature on structural change and observed about four broad explanations of structural change,

a) Cambridge view: this attributes deindustrialization to a growing inability of the export sector to pay for rising imports. In order to explain Cambridge view Ansari (1995) quotes Thirlwal (1978)Thirlwal (1982),

> "In the long run, no country can grow faster than at that rate consistent with balance of payment equilibrium on current account, and if the real terms of trade do not change much this rate is determined by the rate of growth of export volume divided by the income elasticity of demand for import. Attempts to grow faster than this rate mean that exports can't pay for imports, and the

economy comes up against a balance of payment constraint on demand, which affects the industrial sector's ability to grow as fast as labour productivity" (p. 33).

b) The Dutch-disease: this explains structural change in terms of the resource movement and spending effects. A boom in one sector causes the marginal product of labour to rise, this leads to a movement of resources from other sectors.

c) The Bacon-Eltis: this view explains the structural change as a result of increasing expansion of government sector. The author pointed out that, since government expenditure tends to be biased in favour of services, there occur shifts of resources from goods and industrial sector to the services sector.

d) Secular view: according to this view structural change is a result of society's attempt to reallocate available resources in response to changing taste and income. With the rise in income level, the proportion of income spent on primary goods fall and rises for secondary and tertiary goods.

In some of the leading empirical studies in this field, Kuznets found association between rise in per capita income and structural change in economy because of two factors i.e., per capita product and productivity; and shifts in structure of production in the economy. He explains the rise in per capita income as combined influence of change in consumer demand, change in comparative advantage and change in technology.

Kuznets (1957) points out the association of structural change in economy and successive economic growth. In the study it, was reported that the share of services sector in the national product drops significantly as growth rate declines. As the level of per capita drops, the share of agriculture in national product rises. The study confirms the well-known negative correlation between level of income and share of agriculture, and positive correlation between level of income and share of non-agricultural commodity production. In some empirical studies, carried out by Syrquin and Chenery (1989, 1989a) comprising more than hundred countries and covering a period of three decades, a transition has been noticed from low income agriculture dependent economy to an industrialised urban economy with substantially higher income. According to them in the process of structural transformation, technological change and other exogenous factors influence the patterns at micro level in the economy. Further, they pointed out some other factors such as accumulation of physical and human capital; shifts in the composition of demand; trade;

output and use of factor as input; urbanization; demographic transition and changes in income distribution in explaining the structural transformation. Rowthorn and Wells (1987) describe the patterns of structural change in terms of changes in pattern of employment in advanced economies. They notes that the employment in agriculture declines with the economic development of a country. In contrast, employment in most other services activities such as health and education, modern welfare starts to expand with the development process. Structural change involves strengthening of economic linkage among different sectors within the economy through integrating domestic economy and improving the productivity in all major sectors in the economy United Nations (2006). Landesmann and Scazzieri (1996) describe an association between high growth rate of national income and production, changes in qualitative composition and characteristics in production of national income.

2.2 Services: Concepts and Definition

The structural shift in an economy in development process brings some inherent changes in the economy. The most vivid structural change is the dominance of services in the advanced stage of economic development. Therefore, it is important to study the concepts and definition of services sector to understand the structural shift of an economy.

There is unanimity among the researchers over the heterogeneous nature of services activity. The heterogeneous natures of services makes it difficult to define the services output. As such, it is very difficult to find single, precise, conclusive and unanimously accepted definition for the services sector (Joshi, 2004). Services are not physical objects and this feature makes services not easily observable and hence not quantifiable (Nayyar, 2012). Carrying out a comprehensive literature review about the definition and classification of services sector, Nayyar defines services sector under the following characteristics, simultaneity of production and consumption; non-storability and of perishable nature; intangibility; the role of labour; international trade and contractual nature of the market transaction. Classical economist Adam Smith distinguished between productive and unproductive labour and included agriculture, manufacturing, commerce and transportation of goods under productive category, and government personal, personal and domestic services as unproductive (Joshi, 2008). The tangibility nature can also be found in Marxist literature, Marx emphasised tangible inputs as determinants of economic development,

and classified employment in services sector as unproductive (Eschenbach and Hoekman, 2006).

Hill (1977) classified services on the basis of their characteristics. The author defined services as those activities which brought about some changes of some persons or some goods and these changes are the results of the activity of some other economic units. According to Hill (1977),

> "A service may be defined as a change in the condition of a person, or of a good belonging to some economic unit, which is brought about as the result of activity of some other economic unit, with the prior agreement of the former person or economic unit" (p. 318).

The author draws two basic distinctions among the services, services that affect person and services that affect goods. Services affecting person comprises economic activities that changes consumer's mental and physical condition. The changes in the consumers' mental and physical condition are brought at the request of the consumer as a direct consequence of some producer's activity. Examples of such services are transportation, hairdressing, medical treatment, education etc. Here, services such as transportation, hairdressing brings about some physical change of the consumer, while education brings some mental changes to the consumer. He further adds that some of the services are temporary physical transformation that can be easily reversible, e.g. transport; whereas medical surgery is permanent and irreversible kind of service in nature. Another characteristic of services is that the consumption and production of service must have to take place simultaneously. Hill further argues that services must be consumed simultaneously with their production; as such service cannot be detached from the producer in the way that goods can be done. Bhagwati (1984) categorises services sector on the basis of necessity and non-necessity of physical presence of consumer and producer, these are mobile provider and immobile user (construction worker), mobile user and immobile provider (hospital services, theatre services), and mobile user and mobile provider (lectures, haircuts etc.). Importantly, physical proximity between consumer and producer is not necessary in some of the services such as banking and insurance. The reason for this is the rapid technological progress in the production and consumption of these services. A distinction between different activities based on labour productivity has been put forward by W. J. Baumol. He pointed out that the basic source of differentiation among economic activities resides in the role played by labour in

those activities. Referring to Baumol (1967), Nayyar (2012) mentions that labour played an incidental requisite for the attainment of some manufacturing final product; whereas, labour is an important end in itself for a number of services. From an operational approach Griliches (1992) states that services can be defined from the point of view of their non-tangible and non-commodity notion. The author mentions that everything except agriculture, mining, construction and manufacturing can be defined as services. He includes activities like transportation, communication, public utilities, wholesale and retail trade, finance, insurance and real estate (FIRE), repair, personal, business, health, legal, and other services and activities of the federal and local governments in services. Katouzian (1970) discusses the heterogeneous nature of services sector in consumption and production and classifies the services sector into three broad categories. The first category, named as new services includes education, consumption and modern clinical and medical service, entertainment services such as cinema, night club etc. The second category named as complimentary category, includes banking; finance; transport and wholesale; and retail trade. The third category termed as old services consist of those services which grew before industrialisation and whose importance and contribution has continuously declined over time. Domestic service is an example of this category service. According to him, historically the demand for first category services is highly sensitive to the growth of per capita incomes, and it is also an increasing function of the amount of per capita leisure time and state of scientific knowledge etc. The second category services are complementary to the process of industrialisation and expands in response to a rise in demand of industrial sector. A relatively straightforward definition of services has been put forwarded by Chand (1983). The author opines that goods are visible and tangible objects, whereas services are invisible and hence intangible objects. However, Chand points out that classification of economic activities suffers from conceptual problems and there is no concord in the definition for classification. Hirsch (1989) distinguishes services output according to user's point of view. His classification includes, first, instant consumption which satisfies immediate consumption needs, e.g. transport entertainment, haircuts. The second group enhances the user's consumption capacity by reducing cost-benefit ratio of per unit consumption, e.g. health, education, finance and insurance services. In the third group he includes those services that enhance user's productive capacity by reducing the cost-benefit ratio per unit of output, e.g. maintenance, training and services included in the second group.

Ghani (2010) divides services into two broad categories, modern impersonal services and traditional personal services. Examples of modern impersonal services are such as communication, banking, insurance and business related services. The traditional personal services include trade, hotel, restaurant, beauty shops, barber, education and health. At the international level the standardised industrial classification was brought by International Labour organization in the year 1923 and economic activities were classified under following three broad categories, primary production, which includes agriculture and mining; secondary production, comprising manufacturing and construction, and services, comprising transport; commerce; administration etc. (Central Statistical Organization, 2008). The Statistical Commission of United Nations recommended an International Standard Industrial Classification (ISIC) of all economic activities. The ISIC is based on internationally agreed concepts, definition, principles and consistent classification rules. The economic activities under ISIC are divided into a four level structure, named as sections and these are alphabetically coded. The sections are subdivided into broad groups such as agriculture, forestry and fishing; manufacturing; and information and communication. Further classification of these sectors becomes more detailed successively and these are numerically coded as two digit; three digit; and at the greatest disaggregated level a four digit class (United Nations, 2008). In the National Accounts Statistics of India, the services sector includes, i) trade; ii) hotel and restaurants; iii) railways; iv) other transport including tourist assistance activities as well as activities of travel agencies and tour operators; v) storage; vi) communication; vii) banking and insurance; viii) real estate and ownership of dwellings; ix) business service including accounting, software development, data processing services, business and management consultancy, architectural, engineering and other technical consultancy, and advertising and other business services; x) public administration and defence; xi) other services including education medical and health, religious and other community services, legal services, recreation and entertainment services; and, xii) personal services and activities (Sharma et al., 2007).

2.3 Issues in Services Sector

The discussion of the previous section reveals that structural transformation in the economy is associated with the rise of services sector as the leading sector of the economy. It is evident from economies across the world. As a result, in recent times services sector

has emerged as the leading sector in the world economy. According to the Economic Survey report that, out of total US$70.2 trillion world GDP, services sector contributes 67.5 percent (Government of India, 2013). In the total world economy, the services sector surpassed the other sectors in terms of contribution to GDP in the year 1970. The services sector contribution was 52 percent to the world production in the year 1970, the respective share of agriculture and industry were 10 percent and 38 percent respectively (UNIDO, 2009).

Considering the importance of services sector, it would be worthwhile to understand growth in services sector in an economy and the issues related to its growth. Therefore, in this section an attempt has been made to summarise the available literature that explains the growth in services sector as result of structural changes an economy and its implication on the growth in the overall economy of a country. The discussion in this section is presented under the following heads-dominance of services sector and its linkages in the economy and what explains services sector growth; and transition of Indian economy and important determinants of services sector growth in Indian economy.

2.3.1 Dominance of Services Sector and its linkage in the Economy

The three basic sectors of an economy (primary, secondary and tertiary) are interdependent to each other for their demand and supply of input and output. Each sector influences other sectors in several ways. Therefore, examination of structural relationship among the sectors helps to understand the evolution of the relationship among different sectors in an economy. This also makes us understand inter sectoral adjustment of different sectors over a period of time (Kaur et al., 2009).

In an economy, structural relationship can be examined in three ways. The first technique is Input-Output tables, the second is purely statistical and involves causality analysis among the various sectors, and the third approach is based on econometric modelling among various sectors of the economy (Sastry et al., 2003; Kaur et al., 2009). Kaur et al. (2009) pointed out that, all key sectors (primary, secondary and tertiary) in an economy displays a strong equilibrium relationship amongst each other in an economy. Based on the production function approach they argued that Indian manufacturing production depends on the services sector to a considerable extent as one of its inputs. Sastry et al. (2003) describes the interdependence among the sectors through production linkage and demand

linkage. Production linkage among the sectors arises from the interdependence for meeting the needs of production inputs. The demand linkage implies the generation of demand in one sector for the commodities/product in the other sector. The rise or fall of income in one sector is supposed to affect the demand in other sectors. Quoting Hirschman (1958), Dhawan and Saxena (1992) pointed out that investment projects may have two types of linkages-backward linkage and forward linkage. The backward linkage provides stimulus to activities in earlier stages of production and forward linkage boosts activities in subsequent stages of production. Rangarajan (1982) examines linkage between agriculture and industry in India for a period from 1961-1972 and put forward the view that agriculture influences industry by generating demand for industrial goods used in farming such as fertilizer, tools and machinery etc. In reverse, agriculture provides raw materials to industry. He noticed a strong influence of agriculture sector to industrial sector and showed that a one percent growth in agriculture can generate a 0.5 percent growth in industrial sector in Indian economy. In a study covering the period of 1970 to 1990, Sastry et al. (2003) have noticed a transformation of Indian economy from primary agro based economy to a services dominant economy. They pointed out that the agricultural sector was paying a continuing role in determining the overall growth rate of the economy through the linkages to other sector. Hansda (2001) used Input-Output framework to examine the interdependencies among the sectors in Indian economy. He found more interdependencies between services and industry than services and agriculture sectors. However, he notes overall dominance of services sector at aggregate level in the economy. The interdependence between services sector and manufacturing sector was also discussed by Banga and Goldar (2007). They examined the contribution of services output growth and productivity in Indian manufacturing by using capital, labour, energy, material and services production function. Their examination result an increased importance of services as an input to production in the manufacturing and a considerable acceleration in the importance during 1990s. In his study, Singh (2010b) examined the relationship between services sector and GDP, and between services and non-services sector in India. The author found unidirectional Granger-causality from services sector to GDP and bidirectional Granger-causality between services sector and GDP, as well as, between services and non-services sector by the impulse response and variance decomposition analyses.

The growing dependence of other sectors of the economy to services sector has been

reported in some other literature also. Falk and Peng (2013) based on their empirical study in eighteen European Union (EU) countries for the period of 1995-2008 found that EU's manufacturing sector relied increasingly on external and internal services, particularly business services and skilled services.

Thus, dominance of services sector is observed with the development of an economy, as use of services is increasing as intermediate input in the production of other sectors. A similar conclusion was put forward by Francois and Woerz (2008) in their study for OECD countries. They found significant and strong positive effects of business services on industries like machinery, motor vehicles, chemicals and electric equipments etc. World Development Indicator 2013 reports that in many East Asian and Pacific economies, service sector constitutes nearly half of the GDP and contributes 3.5 percentage points to an average growth rate of 8.5 percentage in recent years. This rise in economic growth reflects strong domestic demand for services in that region and the growth in services is consistent with long term trend of rising income in other region (World Bank, 2013). Ansari (1995) mentioned about the relative growth of services sector as one of the most important features of the growth patterns around the world. The author carried out an empirical study for three important South-Asian countries, i.e. India, Pakistan and Sri Lanka for the period 1973 to 1991. The study explains that both rising per capita income and rapid increase in government expenditure appeared to be significant determinants of the services sector in all the three countries. The author used the term "secular trend" to classify the specific way of structural transformation in these countries. In the South-Asian region, services sector grew from less than 40 percent of GDP in 1980 to more than half of the GDP in 2005 (Ghani and Kharas, 2010). Vries et al. (2012) pointed out that the pattern of structural shift in an economy leads to the shift of labour and capital from production of primary goods to manufacturing and later to services sector.

In course of economic development in most of the countries the services sector has been found to grow rapidly relative to the other sectors in the overall economy in terms of growth rate and share to the GDP.

The demand for most of the goods and services increases when income of a nation rises. Fuchs (1965) pointed out that other things remaining equal, a rapid rise in real output for the services sector compared with the goods sector would imply a more elastic demand for services. Fuchs attributes to the growth of intermediate demand for services

like banking, insurance, transport, accounting and consultancy services etc. and growth of final demand from consumer for services as part of explanation for the growth of services sector. In a study of OECD countries, Francois and Reinert (1996) observe positive association between income level and share of intermediate services; level of development and share of income originated in services; intermediate demand of services in manufacturing and overall income level; and, services export and level of development.

Quoting Schoell and Ivy (1981), Joshi (2008) suggests the following reasons for the growth of demand for services industries; i) increasing affluence; ii) more leisure; iii) high percentage of women work force; iv) greater life expectancy; v) use of complex production (requires maintenance services); vi) complexity of life; vii) greater concern for ecology and resource scarcity; and viii) increasing number of new products. There are several other factors which affect the growth and share of services sector in the economy. Those factors are urbanisation, technological advancement, educational standards, pattern of income distribution, average age of population etc. (Joshi, 2008). Growth of efficient manufacturing industry also pushes up the consumption of services and can generate new employment opportunities in the services sector in developing economies (Galenson, 1963). In a study exploring the determinants of services sector in Indian economy Banga (2005) categorised the factors as demand side factors and supply side factors. Under demand side factors she included high income elasticity of demand for final product; slower productivity growth in services, leading to higher employment potential and structural changes within the manufacturing sector making the contracting out of services more efficient. The supply side factors included by the author are increased trade; higher foreign direct investment in services and improved technology. In an analysis of factors which is driving the performance of services industries in OECD countries Wolfl (2005); Organization of Economic Cooperation and Development (2005) identifies the following factors. a) Physical capital, which increases capital deepening and leads to productivity growth. Deepening of capital embodies capital stock with new technology. b) Innovation, i.e. better R&D or knowledge intensity is an important driver of firm performances. Innovation increases efficiency in performance and in contrast to physical capital, innovation or R&D gives non decreasing returns for a certain period of time. In the OECD countries the R&D intensity as measured by R&D expenditure in value added in services sector was found low in services as compared to manufacturing. c) The skill distribution in services industries is also an important

factor in determining services growth, as measured by educational and occupational skills. d) The entry and exit possibility of services firm also has a good impact on services productivity. It has been found empirically that the size of services firm is skewed towards small firm, which reflects that market for services is relatively open to entry and exit on the one hand, and the high potentiality of entry and exit of firms may emerge as a likely factor to reduce the growth in productive potentiality and employment growth in services sector on the other hand. One of the possibilities here is that market of some of the services is not big enough to expand to reap the benefit of economies of scale. e) The labour market characteristics also provide a great extent of flexibility in production of services output. f) Regulation is another important factor in expanding the services sector. Besides other factor such as specialization of production, urbanization, rising income, Engel's law etc., increasing participation of women in the workforce also has an impact on services growth as it leads to increase in demand for services (Wu, 2007). More women in workforce could increase the demand for services such as babysitting, beauty treatment and personal services like cooking and other household service, which are usually or traditionally looked after by women. Mahadevan (2000) carried out an empirical study in the economy of Singapore and studied the growth of Total Factor Productivity (TFP) for a period covering 1986 to 1994. She observed a decline in TFP growth in the services sector and pointed out the deterioration in technical efficiency as the main cause of falling TFP over time in the economy of Singapore. However, she noticed input growth as a main contributor of output growth in the economy. Ghani (2010) pointed out emerging growth of services sector in South Asian region and mentioned that technology, transportability and tradability in services sector are the main driving factors in raising the productivity significantly in services sector. In a study of services sector growth in Asian countries, Noland et al. (2012) pointed out that traditional services comprising wholesale and retail trade, hotels and restaurants, real estate, transport, personal services, and public administration, continue to dominate the overall economy. Modern services i.e. information and communication, finance and professional business services, comprises only around 10 percent in developing countries whereas in advanced countries it comprises around 20 percent. They also found low labour productivity in most of the Asian countries as compared to some developed countries. One positive note they argued that there is enough scope for productivity growth in services in Asian countries. Van Ark et al. (1999) in their study on comprising Canada, France, Ger-

many, the Netherlands and the US found considerable productivity differences not only at country level but also across industries within the main services sectors. They pointed out the importance of studies that take into account at aggregate level within the services sector. The three basic sectors of an economy (primary, secondary and tertiary) are interdependent to each other for their demand for and supply of input and output. Each sector influences the other sectors in many ways. Therefore, examination of structural relationship among the sectors helps to understand the evolution of the relationship among different sectors in an economy.

2.3.2 Structural Shift of Indian Economy

Indian economy has also experienced significant structural changes in the post-independence period. At the time of independence the economy was dominated by agriculture sector. At that time agriculture accounted for more than 55 percent of GDP and the sector was shelter for more than 75 percent of the total workforce. After independence the Government of India initiated development programmes with the launch of the first Five Year Plan in 1951. During the initial years, the growth performance of the economy was very poor in the all three key sectors (primary, secondary and tertiary) in the economy. In the first three decades since independence, the economy grew at an annual rate of around 3 percent. The "Hindu Rate of Growth", a popular term was used to reflect this meagre growth rate, initially used by late Professor Raj Krishna (Acharya, 2002c). The economy recorded an upward shift in its growth rate after 1980s and grew at a rate of 4.8 percent per annum during 1980-81 to 1987-88. During 1980s the economy witnessed another upward shift and the annual growth rate reached 6.3 percent per annum during 1988-89 to 2005-06 (Panagariya, 2008). However, the growth acceleration in GDP in the country during the decade of 1980s has been accompanied by rising fiscal deficit, widening current account deficit and greater dependence on external borrowing. The rapid increase in oil prices as a result of Gulf War during 1990s culminated in considerable imbalance in the economy (Acharya, 2002a). To restore the economy back to its growth path as it has experienced in the late nineties, Government of India launched a set of economic reforms such as New Industrial Policy, Liberalisation, Privatisation and Globalisation of the economy etc. After the reforms, the economy started picking up momentum and revived its growth rate to a higher level. However, there is a debate among the researchers and academia regarding the time

series break in which the acceleration of growth in Indian economy took place. Rodrik and Subramanian (2005); Wallack (2003) and Balakrishnan and Parameswaran (2007) led the view that the acceleration in the growth rate of the economy started in the 1980s. In contrast to this view, Srinivasan (2005) argued that the acceleration in the Indian economy mainly occurred during 1990s, after the economic reforms of 1991. Rodrik and Subramanian (2005) pointed out attitudinal change on the part of government in 1980s; limited pro-business rather than pro-competition policy change; large productivity response because of the policy change and key role played by manufacturing as possible explanations of increase in growth rate in 1980s. Wallack (2003) explained that the increased growth was due to changing composition of GDP, because of movement of resources from slow growing sectors to fast growing sectors in the economy. Pointing out the possible explanations in the economic growth in India, Balakrishnan and Parameswaran (2007) argues that the acceleration of growth in the primary sector, occurring in the mid-1960s provided the original stimulus through the supply and demand linkage. Then, the growth in primary sector enters into the growth of the tertiary sectors which in turn enters into the growth of the secondary sector. However, the secondary sector does not enter in any other sector. The tertiary sector also found not to be entered into the growth of the primary sector. Arguing the difficulty to dispute such debate whether the economy experienced the growth surge in 1980s or in 1990s, Basu and Maertens (2007) opined that the growth process of Indian economy that started in 1980s further accelerated after the economic reform of 1991.

The overall performance of Indian economy is not satisfactory except the last decade in terms of growth rate. As mentioned above the economy started picking up in its growth rate during 1980s and more rapidly in 1990s. In sector wise, the performance of agriculture and allied activities were very meagre. In most of the time Compound Annual Growth Rate (CAGR) for the sector remain below 3 percent except in 1980s (1980-81 to 1989-90) and 2000s (2000-01 to 2011-12), in these two periods growth rates were 3.34 percent and 3.03 percent respectively. The growth rate in industrial sector remains constant around 5 to 6 percent per annum except in 1970s and 2000s. In 1970s (1970-71 to 1979-80) and 2000s the CAGR of industrial sector were 3.37 percent and 7.34 respectively. On the other hand, services sector outgrew the other two sectors from the decade of 1970/71 to 1979/80 till date. The sector grew at an impressive growth rate of 8.27 percent during the last decade (2000/01 to 2011/12).

In an analysis of Indian economy, Bosworth et al. (2007) critically analysed the pattern of growth and pointed out that the increase in growth rate before 1980 was mainly because of increase in use of factors, while the rise in growth in the post 1980 can be attributed more to increase in Total Factor Productivity than to increase in factors.

Similar conclusion was drawn by Rodrik and Subramanian (2004). They pointed out that the acceleration of the growth can be explained by rise in Total Factor Productivity (TFP) in the economy. According to them, India was producing below its production possibility frontier before the growth surge started in 1991. Acharya (2002) suggests factors such as productivity gains in trade, finance to industry and some other services; surge in export growth, investment boom of 1993-96; improvement in terms of trade for agriculture for the remarkable growth surge in the post 1991 period. The growth in Indian economy has also been attributed to steady increase in domestic savings (Mohan, 2008; Acharya, 2002a). Mohan (2008) further adds the increased efficiency of resources in explaining the growth in the economy. Basu and Maertens (2007) pointed out that the nationalization of bank in 1969 had played a crucial role in improving saving rate in the economy. The formation of state-owned Unit Trust of India in 1964 may have given an extra fillip in growth of savings by making saving easier and safe (Shetty, 2007). Nagaraj (2013) termed the recent growth as private corporate run debt-led growth and pointed out that, despite sharp rise in domestic savings the growth was financed by bank credit to private corporate sector. He asserts that the growth has been financed by bank credit to the private corporate sector, and boosted by surge in foreign capital such as Foreign Direct Investment (FDI), Foreign Portfolio Investment (FPI) and Foreign Currency Convertible Bonds (FCCBS). Nagaraj reported that, in Indian economy FDI increases from 0.6 percent of GDP in 2003-04 to 2.8 percent of GDP in 2007-8; and, the total capital inflow (sum of FDI, FPI and ECCBs) reached 10 percent of GDP just before the financial crisis struck in 2008. Further, the economy registered a relatively more rapid growth rate during the first few years of the 21st century till the financial crisis began in the US. The rise in GDP of the economy at factor cost over the period has been associated with the shift in sectoral contribution to GDP. However one noticeable factor in the growth pattern of the country is the emergence of services sector as the main contributor to the national income. The contribution of agriculture to the GDP has declined over time; share of manufacturing to the GDP remained stagnant and contrary to that services sector gained importance in the economy in terms of

contribution. This kind of growth pattern leads to a major puzzle as mentioned by (Panagariya, 2008). He questions, why the growth pattern has not been accompanied by much faster industrial growth?

It can be summarised from the above literature that the growth in services sector shows a clear sign of acceleration compared to the other two sectors, and the growth rate in services became more rapid after the economic reforms in 1991. Thus, there are sufficient empirical evidences such as Gordon and Gupta (2004), Joshi (2004), Joshi (2008), Joshi (2010) that, the service sector in Indian economy is growing rapidly and is dominating the other sectors in the economy. Thus the services sector emerged as major sector in the economy both in terms of growth rate as well as in terms of contribution to the GDP.

2.3.3 Explanation of Services Sector Growth in India

In the above section the transition of Indian economy from an agriculture based economy to a services economy leapfrogging the manufacturing sector has been discussed. The dominance of services sector in Indian economy can be found in a good number of literatures. Babu (2005) noticed structural change as the central point in modern economic growth in India and emphasised the role of services sector in propelling the overall growth rate in the country after 1990s. He pointed out that the declining share of primary sector in GDP in the process of structural transformation in an economy is driven by rapid economic growth. This brings a services led growth pattern in the economy. Balakrishnan and Parameswaran (2007) term the services sector as the engine of India's economic growth and put forward the view that the acceleration in the growth rate during the period of 1970s and 1980s has been borne in and propelled by services sector. There is strong evidence of relatively faster services sector growth compared to commodity sector growth in India and the disparity between the growth rates has increased in the eighties compared to seventies (Bhattacharya and Mitra, 1990) . However, Bhattacharya and Mitra (1990) pointed out following peculiarity of the pattern of services dominance in Indian economy, first, the services sector has become predominant before rapid growth in industrial section in the economy which is against cross country experiences, and second, the share of services in national income is much larger than the corresponding share in total employment.

In the context of rapid growth of services sector in Indian economy, it would be relevant to explore the factors that have contributed in the growth of services sector. Therefore, in

this section, at attempt has been made to understand the factors which explain the growth of the services sector in Indian economy.

2.3.3.1 Factors Affecting Demand for Services Sector

Higher demand for services final product implies that quantity absorbed rises in services as real income or per capita income rises. Gordon and Gupta (2004) identified factors such as high income elasticity of demand for services sector as a factor in elevating services sector growth. They pointed out that the rate of growth of final consumption of services in 1980s was slow, whereas in 1990s, it grew at a rate similar to services output growth. The hypothesis that services sector output witnessed higher income elasticity has been proved by other authors also (Kravis et al., 1982). Eichengreen and Gupta (2010) explain that services sector growth can be explained by private final demand and exports, which played a significant role in accelerating growth rate in the services sector. A sharp rise has been recorded in private final consumption expenditure in the country from 8 percent in 1950-51 to 11 percent in 1960-61; 14 percent in 1970-71; 17 percent in 1980-81; 21 percent in 1990-91 to 31 percent in 2000-01 at 1999-2000 prices (Jain and Ninan, 2004). Eichengreen and Gupta (2010) notice that growth of private final demand accounts for about half of the growth of services sector output in 1991. However, they pointed out the difficulty in precise splitting of private consumption data based on National Account Statistics. They also argued that the broad aggregation of services confirms two distinct waves of services sector growth, the first occurring in traditional services sectors such as personal services early in the development process at relatively low levels of income. The second occurring later in the development process at higher incomes in activities such as communication, computer technical and business services that are more intensive in the use of information technology. Nagaraj (2009) raises the issue of overestimation of services sector output in India stating the difficulty of computing value added and finding price deflator in services sector. The higher wage paid to the public sector employees by government has also been pointed out as an important factor in the rapid growth of services sector (Acharya, 2002c) and Srinivasan (2005). Acharya (2002c) pointed out specifically that the payment of inflated wages to the public sector employees in fifth pay commission has significant contribution to the services sector growth in India. In authors view a part of the services growth was spurious in the sense that the higher pay scale was simply

reflected in value added in some of the services sub-sectors such as public administration and defence services.

Similarly, Rakshit (2007) attributed sixth pay commission as a key factor behind the growth of the services sector. As a result of pay hikes a sharp rise in public consumption and compensation of government employees in the second half of 1990s has been observed. However, Nayyar (2012) rejects increasing public expenditure as possible cause for rapid services growth in Indian economy. He notices steep rise in private final consumption expenditure during 1950-51 to 2008-09 in contrary to decreased government final consumption expenditure in the second half of 1990s (1994-95). He observes that during 2000-01 to 2008-09 the growth of government final consumption expenditure has declined. The author also rejects inflated price as a reason behind the swelling growth rate in the services sector. He carried out an empirical survey of relative price rise for the period 1993-94 to 2009-10 among the key sectors taking 1993-94 as base year. The author found 3.01 percent price rise in agriculture and 2.57 percent each for Industry and Services. This suggests that relative price rise is not an important explanation in explaining increased share of the services sector in GDP of the country. There are some other factors affecting services sector output which have appeared significantly in literature. Bhagwati (1984) discussed the determinants of services growth in India and pointed out that splintering (the externalisation of some activities) played a significant role in the growth process of services sector. Gordon and Gupta (2004) argue that change in production technique makes a service firm to splinter and this splintering activity is reflected in an increased usage of services output as intermediate inputs in other activities such as manufacturing. The authors tried to estimate the impact of splintering activities in the services sector growth by looking at the input-output coefficients in agriculture and industry and found 0.5 percentage point contribution to annual growth in services sector during 1980s by splintering. They also reported reduced splintering impact for 1989-90 to 1993-94 in services growth at 0.25 percentage point. Nayyar (2012) extends the time series from 1979-80 to 2006-07 and estimated splintering impact during the twenty seven year period and found about 0.17 percentage point effect of splintering in determining annual services growth. This means that over the year use of services activity in other sector has declined. During the same period at more disaggregate level, Nayyar (2012) shows that usage of storage; communications; hotels and restaurants; public administration and defence; and, education and health

services in production of other two sectors as input has remained more or less constant. Use of transport services as an input has reduced, whereas an increment has observed for wholesale and retail trade, financial services and other services as intermediate input. The author draws the conclusion that increase in splintering cannot explain the recent surge in services sector growth.

2.3.3.2 Economic Reforms in Indian Economy

Economic reforms, growth in foreign direct investment in services sector and services exports are also important factor in determining services sector growth in the country. Liberalisation of services improves competition among the firms and attracts foreign factors such as technology and capital stock. Increased in such foreign factors (technology, capital etc.) and increased competition brings large scale activity and greater scope for special growth enhancing effects in the production Banga (2005). The inception of market based liberalisation policies was pointed out as an important source of services sector growth in India, as such policies improves total factor productivity in services sector (Verma, 2008). Nagaraj (2008) discussed the consistent growth in services sector of the country and found that some of the subsector of services, such as communication witnessed the largest increase in the growth rate, which according to him is driven by domestic demand. According to him, economic reforms initiated in the year 1991 made it possible to utilize India's abundant engineering skills into software service to increase its production. However, the author raises concerns over the rapid expansion of services growth saying that the methodological base of services sector estimation is weak and there is a deterioration of industrial statistics. Gordon and Gupta (2004) mentioned that services activity can also be stimulated by liberalisation, privatisation, opening up to foreign direct investment along with technological advancement. They found reform measure and growth in the industrial sector significantly related to services growth in their empirical study in Indian economy.

In the context of output expansion of the services sector, Nagaraj (2013) pointed out that a sharp upturn in world trade since 2002 and technological change in communications combined with growing outsourcing business by the US gave a boost to India's services sector. Srivastava (2006) studied the impact of FDI inflows on service exports, i.e. the causal relationship between FDI inflows and service exports in the Indian economy during the post liberalization period since 1991. The author found positive unidirectional granger

causality from FDI to services exports indicating that FDI has positively influenced the growth of services exports in Indian economy, particularly in the short-run, after economic reforms were introduced in 1991. Joshi (2010) in a similar fashion concludes that opening up of services sector to world economy and FDI inflow in services have positive impact on GDP and have emerged as significant determinants of GDP over the period 1995-2005. Contrary to this finding, Chakraborty and Nunnenkamp (2008) investigated industry specific Granger causality between FDI and output in Indian economy. Their investigation showed a robust bidirectional causal links in the long run relationship between FDI stock and output in manufacturing sector. However, there has not been any strong evidence between FDI stock and output growth in tertiary sector despite the fact that the bulk of additional inflow of FDI to post reform India is attracted by the tertiary sector. India's services exports grew nearly six times faster than world exports of services. Software services registered a growth rate of over 50 percent. Thus, it is clearly evident that India's competitiveness in services is growing relative to commodity sector. It has also been reported that majority of FDI inflow to the country is concentrated in services sector, particularly in modern services (Ghani, 2010). Further, adding the role of globalization in expanding the services trade Ghani (2010) mentions that globalization of services has enabled developing countries to expand and grasp services as a source of growth. Globalization in the economy has facilitated trade in services to grow more rapidly, especially in modern services compared to traditional services. However, Alfaro (2003) in a cross country empirical study could not find any specific effect (ambiguous at negative and positive) of FDI on services sector, whereas FDI exerts negative and positive impact for primary and secondary sector respectively. Chakravarty (2006) carried out a study on inter sectoral analysis of state domestic product for all Indian states with the help of an econometric analysis, the author found that after liberalization most of the states witnessed a surge in growth rate of services sector except the state of Assam. The study shows industrial activities of a state as the most important factor in determining the service sector growth. Agriculture has also been found as a good determinant of services growth. The growth in the rest of the economy (output produced in commodity producing sector in rest of the economy except the state considered) is also found significant in determining services sector performance in some specific states depending upon inter regional disparities in labour cost, infrastructure facilities etc. India's services exports grew significantly and exceeded the merchandise

exports. The export basket of services commodity in India has also undergone significant change from traditional services such as transport and travel towards miscellaneous services such as business services (Chanda, 2009). According to a World Bank estimates, the Revealed Compared Advantage (RCA) for services in India increased by 74 percent during the period of 1996 and 2000 while that for goods declined by 15 percent. The shift of composition within the services export basket from traditional services to emerging services such as software and other services has also been reported. Chanda (2010) pointed out that the rapid growth in information technology and business process outsourcing has placed India among the major suppliers of services in the world trade.

2.3.3.3 Issues Related to Productivity

It has been argued that the growth in labour productivity is slower in services sector as compared to manufacturing sector. It is difficult to improve productivity in services sector through capital accumulation, innovation, or economies of large scale operation because of the nature of activity involved in services Baumol (1967). Banga (2005) mentions that technological changes are more prominent in reduction of cost in commodity sector than in service sector. Therefore, productivity of services sector may vary inversely with income level of a country. The author put forward two arguments for lower productivity in services output, i) investment in new technology in services sector may take time to lead productivity enhancement; and, ii) low productivity can be because of flawed-measurement of output in services sector because of unavailability of market price for public service; difficulty in output determination in some services output; difficulty in determining quantity of services output; heterogeneous nature of services output; poor data quality of service output etc. Bosworth and Collins (2008) in a study compared growth pattern in India and China and remarks that India has achieved gains in services sector with a very modest growth in capital per worker. The rapid and impressive growth in services is largely reflected in improvement of total factor productivity. Bosworth et al. (2007) attributes service producing industries as the source to recent growth surge in India, and pointed out that services sector consistently outperformed industry and manufacturing sector. They highlighted that the gains in output per worker in services sector is dominated by rapid improvement in total factor productivity (TFP). They argue that under-estimation of price rise may leads to overestimation of services output growth. The authors raise their apprehension over the

measurement error in TFP growth in services and state that rapid rise in TFP is a puzzling phenomenon in the economy. In similar conclusion on productivity growth in services sector in Indian economy, Verma (2008) estimated the respective contribution of capital, labour and TFP at 23, 25 and 42 percent in the pre liberalisation period (1980-1990); the corresponding contributions were at 30, 21, and 48 percent respectively in the post liberalisation period (1990-2003) in Indian economy. Significant productivity growth has been noticed in rapidly growing sectors in Indian economy leading to a decline in their relative prices (Gordon and Gupta, 2004). On the productivity of services sector, TFP growth in India was found to be the highest in the services sector during 1980 to 2008 (Mukherjee, 2013). However, the author pointed out the problem of lack of disaggregated data in the services sector and its difficulty in calculation of TFP. Goldar and Mitra (2008) found a marked increase in the growth rate of TFP in the services sector in India. They found a significant change in the composition of the tertiary sector particularly after deregulation and liberalization programmes. The correlation coefficient between the growth rate in TFP in services and the growth rate in aggregate GDP have been found to be 0.51. However, Srinivasan (2005) and Ghani (2010) advocate higher wages in public sector as one of the possible factors in raising the TFP in services industry.

Estimating the contribution of services output growth and productivity in Indian manufacturing, Banga and Goldar (2007) noted the importance of services as an input to production in the industrial sector. Increased use of services output as input in industrial sector contributes not only in output growth in industry but also improves productivity in industrial sector. Drawing similar conclusion, Chanda (2010) noted that increasing use of services output as intermediate input raises the productivity in other sectors. The author noticed that the growth in services is not accompanied by concomitant rise in employment in services sector. This is an indication of growth in total factor productivity in the services sector in Indian economy. Bosworth and Maertens (2010) reported the highest total factor productivity of services sector compared to the other two sectors in their study covering all the South Asian countries.

2.3.3.4 Other Issues Related to Services Sector

Gordon and Gupta (2004) observe differences in growth rate in services sectors and its sub-sectors in India during the period of 1980s and 1990s. Some sectors such as business

services, communication services, banking sector and community services and hotels and restaurant showed rapid growth rate, while some other sectors such as distribution services, public administration and defence and personal services witnessed moderate growth rate. Aggarwal (2012) reports concentration of recent growth in services in communications, business service, finance service etc. The IT enabled industry including call centres; software also contributes significantly in the recent growth in services sector. Referring to the National Association of Software and Services Companies (NASSCOM) which is a trade association of Indian Information Technology and Business Process Outsourcing industry, Aggarwal mentioned that IT business, outsourcing sector contributed 6.4 percent of India's GDP, 14 percent of India's export and 10 percent of services sector revenues in 2010-11. However, the services sector in India is not able to generate enough employment corresponding to its growth rate. It implies that though services sector is growing rapidly and its productivity is high in Indian economy, the sector is not able to generate enough jobs. Some possible impediments are regulatory hurdles and access to funding and infrastructure etc. (Government of India, 2013) . Pointing out the fact that services sector in India is not creating enough jobs, Chanda (2010) mentioned that employment intensive services such as trade and distribution or railways have either not grown that much rapidly or have decelerated. On the other hand, services such as communication and business services which are more technology intensive and have experienced productivity witness rapid growth. Joshi (2004) put forward the view that services sector failed to generate enough employment opportunities as compared to its growth rate. However, she observed an interesting pattern in generation of employment in the economy. She mentioned that during the pre-reform period the primary sector was the main source of additional employment but in the post-reform period the tertiary sector accounted for 73.2 per cent of additional employment generation followed by secondary sector during the study period of 1980 to 2000. Noting the mismatch of GDP growth and generation of employment in services sector Aggarwal (2012) pointed out that in the urban areas services sector employment is mostly in informal sector. The author explains productivity growth in services as a reason for slow employment growth in services. Rangarajan et al. (2007) observes a sharp decline in employment elasticity in Indian economy (sensitivity of employment growth to GDP growth) in the all sectors during 1999-00 compared to during 1993-94. However, they report an improvement in employment elasticity during the period 2004-05 compared

to 1999-00. All the services sub-sector exhibits improvement in elasticity growth except transport, storage and communication during the period of 2004-05.

2.4 Summing Up

The above discussion tries to document the theoretical baseline of structural transformation of an economy in the process of its development. Review of the available literature reveals that Indian economy has gone through a transformation over the years and services sector has emerged as the most dominant sector in the economy. However, very few studies have examine the pattern of the India's growth story of services sector econometrically. Some of which are Gordon and Gupta (2004); Eichengreen and Gupta (2011) and Nayyar (2012).

In this background of rising importance of services sector in all aspects of the economy including gross value addition, trade and growth; this study aims to explore the pattern of growth in gross value addition and the determinants of services sector in India. Another important direction of the present study is that it tries to explore the relative importance of different sub-sectors in the services sector along with its components. Furthermore, the study also explores determinants or factors affecting the services segments within the broad group of services sector. For this purpose, the present study attempts to explore the growth pattern of different services sub-sectors and their segments. Moreover, this study has chosen the banking and the telecommunications segments out of the several services segments for detailed investigation of the growth pattern of these two segments. The selection of these two segments are justified considering the magnitude of contribution of banking sector in the GDP of the country while the telecommunication segments is selected on the ground of its rapid growth rate.

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3

Trend, Composition and Determinants of Services Sector

3.1 Introduction

Over the years, Indian economy has undergone a significant structural transformation in various dimensions. One way to look at these transformations in the economy is in terms of changing pattern of relative contribution of different sectors i.e. agriculture, industry and services or their relative importance in the economy.[2] Rising magnitude of services sector in the Indian economy which was perennially an agriculture dominated economy, perhaps can be considered as one of the key structural changes in the last two and half decades. Services sector is now the dominating contributor to the GDP of the country. In the year 1950-51, contribution of services sector was merely one third of the GDP of the country. However, over the years, a continuous growth in the share of the services sector is observed. Subsequently, in the year 1991-92, services sector became the dominating sector in the economy contributing more than half of the GDP whereas the combined contribution of agriculture and industry shrank to about 45 percent. According to the data for 2013-14, services sector contributed more than two third of the GDP while contribution of agricultural sector which was the dominant sector during 1950s declined to about 14 percent. The changing structure of Indian economy can also be seen in terms of rapid growth rate of services sector during the last two decades. Annual average growth rate of services sector remained well above the overall growth rate of the economy for a considerably long time period since 1997-98. It can be noticed that the acceleration in the growth of services sector started from 1980-81. The phase of rapid annual growth continues; and the sector registered annual average growth rates around or even more than 10 percent per annum in a

few instances during the period of 2004-05 to 2012-13, while the aggregate economy grew at an average rate of about 8 percent. This changing structure led the economy to a different path dominated by the services sector. Many authors pointed out the acceleration in the services sector as the prime driver of the overall economy in India. Babu (2005) explains the changing growth path of Indian economy in terms of magnitude of sectoral composition and mentioned structural change as the central point in modern economic growth in India. The author emphasised the role of services sector in propelling the overall growth rate in the country after 1990s. Terming services sector as the engine of India's economic growth, Balakrishnan and Parameswaran (2007) argued that the acceleration in the growth rate in the economy during the period of 1970s and 1980s is borne in and propelled by services sector. Explanation on significant annual growth and expanding dominance of services sector can be found in a number of studies. Some of the major studies in the area are Gordon and Gupta (2004); Joshi (2004); Joshi (2008); Eichengreen and Gupta (2010) and Nayyar (2012).

With such increasing dominance and importance of services sector in Indian economy, it is crucial to understand the pattern of growth in services and its various segments individually. Therefore, the present chapter attempts to construct a background of services sector in Indian economy. This chapter focuses on the trend and composition of output in the services sector its sub-sectors along with their various segments. Attempts are also made to capture acceleration or deceleration in the growth trend of services and its different sub-sectors. Furthermore, the chapter also tries to examine the effect of per capita income, export and use of services as input in other sectors in the expansion of various segments of the services sector. The time period taken for the present analysis is 1980-81 to 2012-13.[3] The selection of 1980-81 as the starting point of our study is guided by the argument that the phase of rapid growth of Indian economy started in 1980s and further accelerated in 1990s (Basu and Maertens, 2007). In this chapter, simple arithmetic tools such as percentage, ratios and growth rates are used to analyse the pattern of growth in the services sector over the period. The effect of per capita income, export and use of services as input in other sectors in the expansion of various segments of the services sectors and segments are examined using econometric techniques. Detailed discussion on the methodology is presented in the respective sections.

The main source of data for the present analysis is the National Accounts Statistics,

compiled by Central Statistical Office (CSO) under the Ministry of Statistics and Programme Implementation.[4] All data accessed from CSO are at 2004-05 constant price. Data available at World Bank Database are also accessed and utilised whenever found relevant for the present study.

The chapter consists of six sections including the introduction. Second section of this chapter discusses about magnitude of services and its different sub-sectors in terms of share to the GDP and growth. Direction (acceleration/deceleration) in the growth over the years is discussed in the third section. The fourth section discusses the important determinants of growth of services sector. Section five presents the findings of the empirical analysis where the importance per capita income, export and use of services as input in other sectors in the expansion of services sectors and its different segments is examined. The last section concludes the chapter.

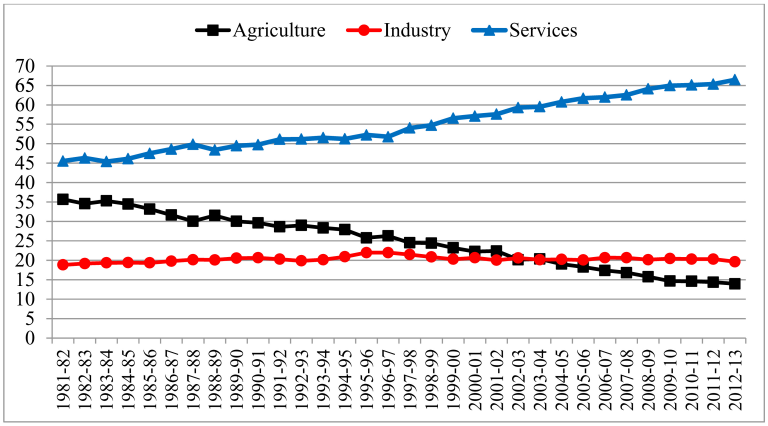
3.2 Magnitude of Services Sector

3.2.1 Trend in the Share in GDP

The magnitude of services sector in the Indian economy can be viewed in terms of its rising share to the GDP and the growth rate of gross value addition over the last few years. It is observed that there is a consistent rise in the share of services sector to the GDP of the country since 1970 (Government of India, 2013). The continuous rise in the contribution of services sector to the GDP and increasing dominance can be ascertained by examining its relative share in the GDP. In Table 3.1, share of three main sectors in the GDP i.e. agriculture, industry and services are compared for the year 1980-81, 1990-91, 2000-01 and 2012-13. The selection of these years for comparison is purposive.

The classification of the three broad sectors is based on the Handbook of Statistics on the Indian Economy published by the Reserve Bank of India, the central bank of India. According to Handbook of Statistics on the Indian Economy, agriculture includes agriculture, forestry and logging and fishing whereas mining and quarrying, manufacturing, electricity, gas and water supply are parts of industry. The services sector comprises of five sub-sectors namely (i) construction; (ii) trade, hotel and restaurant; (iii) transport, storage and communication; (iv) financing, insurance, real estate and business services; and (v) community, social and personal services.

Figure 3.1: Percentage Share of Major Sectors to the GDP



Source: Central Statistical Office

These five sub-sectors under the broad headings of services sector are again subdivided into two or more segments except under construction. The table shows that the share of services sector in the GDP was about 46 percent during the year 1980-81; which rose to about half of the total GDP in the following decade. The share of services sector further increased to about 57 percent in the year 2000-01. In the financial year 2012-13, services sector generated around 66 percent of the GDP while the combined contribution of the other two sectors was less than 35 percent during the same period. The rising share of services sector in the GDP of the country clearly reveals dominance of services sector in the Indian economy. Figure 3.1 shows the continuous trend in the share of the three main sectors to the GDP for the period 1980-81 to 2012-13. It is clear from the figure that there has been steady and continuous rise in the share of services sector in the GDP.

Table 3.1: Percentage Share of Major Sectors to GDP

Year	Agriculture	Industry	Services
1980-81	36.06	18.23	45.71
1990-91	29.62	20.63	49.76
2000-01	22.26	20.64	57.10
2012-13	13.95	19.61	66.44

Source: Central Statistical Office, Government of India. Note: Services data are presented including construction

This clearly shows the overwhelming dominance of the services sector in Indian economy in recent years. In contrast to the continuous rise in the share of services sector, the share of agriculture in the GDP of the Indian economy declined continuously and shrank to less than 14 percent in 2012-13; contributing the least to the country's GDP among the three major sectors. Similarly, the share of industrial sector has improved marginally during the entire period of the present study. Its share in 1980-81 was much lower at 18.23 percent which increased slightly to reach 20.63 percent in 1990-91. However, by the end of the first decade in 2000s, the share of the sector has gone down below 20 percent in 2012-13. Thus, it can be argued that the entire decline in the share of agriculture sector during the period is gained by the services sector.

However, as mentioned above, services sector consist of five different sub-sectors and their segments. Therefore, it is important to examine the trends of different sub-sectors along with their segments in order to understand the services sector at disaggregated level. In Table 3.2, the contribution of different sub-sectors within the broad services sectors and their segments to the GDP is presented while Table 3.3 shows contribution of different sub-sectors and their segments to overall services sector.

In terms of contribution to GDP, financing, insurance, real estate and business services (FIRE) with a share of more than 19 percent in 2012-13 is the largest contributor to GDP of the country among all other services sub-sectors (refer Table 3.2). The share of FIRE increased by more than two times during the period 1980-81 to 2012-13. The magnitude of FIRE can also be traced with its sizeable share in the overall services sector as FIRE alone contributes more than one fourth to the services sector (refer Table 3.3).

In 2012-13, the second largest contributor to the economy was trade, hotel and restaurant with a contribution of more than 16 percent. However, the share of this sub-sector increased in a moderate rate (about four percentage points) during the study period i.e. 1980-81 to 2012-13. The corresponding contribution of trade, hotels and restaurant to the overall services sector was found to be around 25 per cent in 2012-13. With a share of about 13 percent, community social and personal service is found to be the third largest sub-sector in terms of contribution to the GDP in the year 2012-13. It is clear from the data that the contribution of this sector in the GDP has not recorded any significant change during the study period and has remained close to 12 to14 percent. Transport, storage and communication, which contributed about 11 percent to the GDP is the fourth largest ser-

Table 3.2: Percentage Share of Sub-sectors and Segments of Services Sector to GDP

Sl.no.	Sub-Sectors/Segments/Year	1980-81	1990-91	2000-01	2010-11	2012-13
1.	Construction	7.61	7.08	6.62	7.62	7.66
2.	Trade, Hotels & Restaurant	11.95	12.51	14.64	17.00	16.48
2.1.	Trade	10.96	11.56	13.30	15.53	14.76
2.2.	Hotel & Restaurant	0.87	0.94	1.34	1.47	1.46
3.	Transport Storage & Communication	4.99	5.19	7.01	10.32	10.81
3.1.	Railways	1.34	1.22	0.97	0.96	0.99
3.2.	Transport by other Means	3.89	4.30	5.03	5.46	5.68
3.3.	Storage	0.13	0.11	0.08	0.07	0.06
3.4.	Communication	0.35	0.37	0.90	3.83	4.07
4.	FIRE & Business Services	8.23	11.55	14.42	17.27	19.13
4.1.	Banking & Insurance	2.40	3.88	5.47	8.27	9.37
4.2.	Real Estate & Ownership of Dwellings	5.98	7.78	8.95	9.00	9.46
5.	Community Social & Personal Services	12.86	13.44	14.42	12.89	12.94
5.1.	Public Administration & Defence	5.65	6.31	6.53	5.70	5.68
5.2.	Other Services	7.16	7.16	7.89	7.20	7.27

Source: Central Statistical Office

Table 3.3: Percentage Share of Sub-sectors and Segments of Services Sector to the Total Services Sector

Sl.no.	Sub-Sectors/Segments/Year	1980-81	1990-91	2000-01	2010-11	2012-13
1.	Construction	16.81	14.24	11.58	11.7	11.52
2.	Trade, Hotels & Restaurant	26.14	25.13	25.63	26.12	24.69
2.1.	Trade	24.22	23.22	23.29	23.86	22.05
2.2.	Hotel & Restaurant	1.9	1.9	2.34	2.26	2.18
3.	Transport Storage & Communication	10.92	10.42	12.47	15.85	16.20
3.1.	Railways	2.94	2.44	1.69	1.48	1.48
3.2.	Transport by other Means	8.51	8.63	8.80	8.39	8.51
3.3.	Storage	0.28	0.21	0.13	0.1	0.10
3.4.	Communication	0.77	0.74	1.64	5.88	6.10
4.	FIRE & Business Services	18	23.21	25.25	26.52	28.79
4.1.	Banking & Insurance	5.26	7.8	9.58	12.7	13.39
4.2.	Real Estate & Ownership of Dwellings	13.08	15.64	15.68	13.82	14.18
5.	Community Social & Personal Services	28.13	27	25.26	19.8	19.40
5.1.	Public Administration & Defence	12.35	12.69	11.44	8.75	8.52
5.2.	Other Services	15.66	14.39	13.82	11.05	10.88

Source: Central Statistical Office

vices sub-sector. This sub-sector has registered significant improvement in its share over the years. Its share to the GDP has increased from about 5 percent in 1980-81 to around 11 percent in 2012-13. Share of construction, which was earlier considered as a part of industrial sector, also remained around 7 to 7.5 per cent during the entire period considered in the present study.

In Table 3.3, the contribution of various segments within different sub-sectors to the GDP of the country is also presented. It is clear from the table that among different segments of services sector, the maximum contribution in the year 2012-13 come from trade which contributed around 15 percent to the GDP. Interestingly, this is higher than the contribution of agriculture sector during the same year. Real estate and ownership of dwellings which is one of the segments in FIRE, is the second largest segment in terms of its share to GDP. Banking and insurance is another segment in FIRE which contributed around 9 percent to the GDP of the country in 2012-13. It is worth mentioning that among the various segments within the sub-sectors discussed above, contribution of banking and insurance has increased very rapidly over the years. The contribution of this segment to the country's GDP during the study period (of 33 years) has gone up by around seven percentage points from 2.40 percent in 1980-81 to 9.37 percent in 2012-13. It is also important to note that the increase in the share of this sector was more rapid during the last two decades of the period under consideration (i.e. 1990-91 to 2012-13) compared to the first decade of the study period (i.e. 1980-81 to 1990-91). Communication which is a segment within transport, storage and communication, also registered significant rise in its contribution to GDP. The share of communication increased from 0.35 percent in 1980- 81 to 4 percent in 2012-13. As against this, the contribution of hotel and restaurant, railways and storage to the GDP of the country is found to be negligible as their respective shares to the GDP were 1.46 percent, 0.99 percent and 0.06 percent in 2012-13. However, moderate increase in the contribution of hotel and restaurant is observed during the period from 1980-81 to 2012-13. It is interesting to note that, the contribution of railways and storage to the country's GDP has declined over the years. This indicates that the importance of these two segments in the national income of the country has declined. The above discussion reveals that in terms of contribution to GDP, trade, banking and insurance, construction, real estate and ownership of dwellings are the major segments within services sector while sectors such as hotel and restaurant, storage and railways have contributed relatively less to the GDP of

the country.

3.2.2 Trend in Growth Rate

The discussion in the last section reveals that share of some sub-sectors and segments grew faster than that of others. This indicates variation in growth across segments. Moreover, it is also observed that some segments grew faster in the later part of the sample period than in the first part. In order to understand the pattern of growth in different services segments, it is important to examine the output growth rate of different segments. Therefore, in order to understand the pattern of growth, Compound Annual Growth Rates (CAGR) of gross value addition (GVA) of each of the sub-sectors and their segments are estimated.

For this purpose, the entire period of 33 years (i.e. 1980-81 to 2012-13) have been sub-divided into three sub-periods. These sub-periods are 1980-81 to 1989-1990, 1990-1991 to 1999-2000 and 2000-2001 to 2012-2013. Such division of time period in different sub-periods may enable us to understand the growth pattern of different sub-sectors and their segments during different phases of time. It also allows to correlate the growth pattern of output in services sector with changes in policies in various economic aspects along with the changes of national and international economy. The first sub-period i.e. 1980-81 to 1989-90 is characterised by initiation of reform process in Indian economy while the second period under consideration was marked with more extended liberalisation and reform process in Indian economy. With a series of reform measures initiated in 1991, more sectors of the economy were opened for reform in the third sub-period. The third sub-period i.e. 2001-02 to 2012-13 is important for many other reasons. More operational flexibility was allowed in some sectors like communication and insurance sector during this period. For example, the New Telecom Policy 1999 allowed private participation in National Long Distance network (Government of India, 1999 (NPT 1999)). Foreign Direct Investment (FDI) mostly comprising equity capital also increased considerably since 2000. The coverage of FDI expanded since 2000-01 and includes equity capital, reinvestment earnings and other capital (Reserve Bank of India, 2012).

To estimate the annual compound growth rate in the GVA of the different sub-sectors and segments, the following semi log linear trend equation is used.

$$lnY_t = \beta_0 + \beta_1 T + \mu_t \tag{3.1}$$

where, lnY is the log value of GVA of the entire services sector, their different sub- sectors and segments within these sub-sectors. β_0 and β_1 are the constant and coefficients term to be estimated. μ_t is the random error and T is trend variable. Ordinary Least Square estimation technique was used to determine the value of the respective coefficients. Using coefficient β_1, Compound Annual Growth Rate (CAGR) can be estimated as follows,

$$CAGR = (e^{\beta_1} - 1) \times 100 \tag{3.2}$$

The estimated CAGR is reported in Table 3.4. The table shows that overall services sector registered growth rate of 7.6 percent during the entire study period. In can be observed that the growth rates of the overall services sector has increased in the successive sub periods. In the first sub-period i.e. during 1980-81 to 1989-90, the overall services sector grew at an average annual rate of 6.35 percent while the growth rate was 7.42 percent and 9.22 percent during 1990-91to 1999-00 and 2000-01to 2012-13 respectively. It can be seen from the table that the overall services sector grew more rapidly during the last sub-period under consideration (i.e. 2000-01 to 2012-13) compared to the previous periods. Change in growth rate of overall services sector during the 2000s over 1990s is also higher than that of 1990s over 1980s.

In line with the overall services sector, all sub-sectors and their segments also registered rapid growth during the study period. Among the sub-sectors, transport, storage and communication services has recorded the highest compound annual growth rate of 9.03 percent during the study period. It grew at a rate of about 6 percent in the decade of 1980s. However, the sub-sector has experienced considerable increase in its compound annual growth rate during the decade of 2000-01 to 2012-13. Among the segments within transport, storage and communication, compound annual growth rate of railways declined during 1990s as compared to 1980s while its growth rate has improved in the subsequent decade. CAGR of transport by other means shows moderate improvement over the period. It is to be mentioned that communication attained a growth rate of more than 15 percent for the entire period which is the highest among all other segments. During the first sub-period i.e. 1980-81 to 1989-90, the compound annual growth rate of communication was 5.50 which significantly increased to 22.87 percent in 2000-01 to 2012-13.

The second important sub-sector in the economy in terms of growth is the financing, insurance, real estate and business services (FIRE) which grew by 8.73 percent during the study period. In the first sub period, FIRE grew at a rate of 9.26 percent. During

Table 3.4: Compound Annual Growth Rate of Services, Sub-sectors and their Segments

Sl.no	Sub-Sectors/Segments	1980-81to 2012-13	1980-81 to 1989-90	1990-91 to 1999-00	2000-01 to 2012-13
1	Construction	6.65	3.73	4.84	9.45
2	Trade, Hotel & Restaurant	7.60	5.89	8.51	8.68
2.1	Trade	7.50	5.88	8.32	8.71
2.2	Hotels & Restaurant	8.70	5.97	10.73	8.35
3	Transport, Storage & Communication	9.03	5.99	8.45	11.93
3.1	Railways	4.85	4.58	2.89	7.65
3.2	Transport by other means	7.63	6.74	7.77	8.68
3.3	Storage	3.37	3.45	1.63	7.55
3.4	Communication	15.68	5.50	15.22	22.87
4	Fire, Insurance and Real Estate	8.73	9.26	8.15	10.33
4.1	Banking & Insurance	10.45	11.19	10.47	12.96
4.2	Real estate & ownership of dwellings	7.59	8.25	6.58	8.37
5	Community, Social & Personal Services	6.30	6.23	6.52	6.68
5.1	Public Services	6.05	7.59	6.23	6.66
5.2	Other Services	6.52	5.26	6.73	6.70
	Total Services	7.60	6.35	7.42	9.22

Source: Central Statistical Office

the subsequent decade, it registered a decline in its growth rate as compared to 1980s. However, the CAGR is found to have increased considerably during the decade of 2000 and registered more than 10 percent growth rate. It can be seen that CAGR for both segments under FIRE has declined during the decade of 1990s as compared to the previous decade. However, CAGR of both the segments has improved in the decade of 2000s.

It has been found that trade, hotel and restaurant grew at 5.89 per cent during 1980-81 to 1989-90. The growth rate increased to about 8.5 percent during 1990s. However, growth rate for the sub-sector remained static at around 8.5 percent during 2000s. CAGR of both the segments of trade, hotel and restaurant have experienced improvement in 1990s as compared to 1980s. However, for the subsequent decade, moderate rise in the CAGR continued for trade but hotel and restaurant experienced decline in their CAGR during this period.

CAGR for community, social and personal services remained at around 6 to 7 percent during the entire period of the present study. Out of the two segments, of community, social and personal services, public administration and defence experienced decline in the CAGR while other services experienced increase in its CAGR during 1990s than that of 1980s. During the following decade, CAGR of public administration and defence services has registered moderate improvement while CAGR of other services remained more or less static as compared to the previous decade.

During the entire study period, construction grew at a rate of 6.65 percent. This sub-sector has also registered considerable growth during 2000-01 to 2012-13 as evident from a relatively high growth rate of 9.45 percent as compared to a relatively low growth rate of 3.73 percent during 1980-81 to 1989-90.

The above discussion shows that the services sector in India has been growing consistently for the last three decades. The examination of CAGR reveals that in most of the services sub-sectors and their segments, the growth rate is more rapid during the decade of 2000s than in the decades of 1980s and 1990s. In the decade of 1990s which is known as the period of liberalisation, trade, hotel and restaurant, and transport, storage and communication showed improvement in their growth over the previous decade. The increase in growth rate in the GVA of transport, storage and communication continued in the next decade as well with a growth rate of about 12 percent in the 2000s.

3.3 Acceleration/Deceleration in GVA of Services Sector/Sub-Sectors/Segments

Mere examination of growth rate does not allow one to conclude accurately about the direction of growth. In order to check the direction of growth in the economy, the present chapter examines whether there is acceleration or deceleration in the growth rate of different sub-sectors and segments within the services sector. Semi log trend equation used to estimate compound annual growth rate can be further utilised for testing for any acceleration/deceleration in the growth rate. Extending the log linear trend equation used in the estimation of CAGR, the following semi-log quadratic equation is used for this purpose.

$$lnY = \beta_0 + \beta_1 T + \beta_2 T^2 + \mu_t \tag{3.3}$$

where, T^2 is the square of the trend variable. The remaining specifications are same as used in equation 3.1. Differentiating the equation with respect to time we obtain the following model,

$$\frac{\delta lnY}{\delta T} = \beta_1 + 2\beta_2 T + \mu_t \tag{3.4}$$

A positive and significant coefficient of β_2 indicates acceleration, whereas negative sign of significant β_2 means deceleration in the growth rate. Insignificant value of β_2 implies neither acceleration nor deceleration in the growth rate. The results of the above exercise are presented in Table 3.5. The Table reveals significant acceleration in the growth of overall services sector GVA during the period 1980-81 to 2012-13 as β_2 is found to be positive and significant. Among the sub-sectors, the coefficient β_2 for all the services sub-sectors except FIRE are found to be positive and significant. This indicates that all sub-sectors within the services sector except FIRE registered acceleration in their growth during the period of the present study. It can be seen that most of the services segments also exhibit acceleration in their GVA. However, in contrast to most of the segments, banking and insurance, real estate and ownership of dwellings and public administration and defence registered neither acceleration nor deceleration in their growth. Thus, it can be concluded that growth rates of most of the services sub-sectors and their segments have accelerated during the study period. However, no such evidence is noticed for FIRE among the sub-sectors and banking and insurance, real estate, ownership of dwellings and public administration and defence among the segments.

Table 3.5: Accleration/Deceleration in GVA of Services Sector/Sub-Sector and Segments (1980-81 to 2012-13)

	Sector/Sub-sector	Constant	Coefficient of β_1	Coefficient of β_2	R^2
1.	Construction	10.97	0.0233(5.98)	0.00120***(10.84)	0.99
2.	Trade, Hotel & Restaurant	11.41	0.0510(18.33)	0.00065***(-8.21)	0.99
2.1.	Trade	11.34	0.0497 (-19.26)	0.00066***(-9.03)	0.99
2.2.	Hotels & Restaurant	8.7	0.0667(-10.66)	0.00049***(-2.79)	0.99
3.	Transport, Storage & Communication	10.59	0.0357(14.11)	0.00148***(-20.59)	0.99
3.1.	Railways	9.35	0.0160(3.80)	0.00092***(7.68)	0.98
3.2.	Transport by other means	10.28	0.0586(32.59)	0.00043***(8.52)	0.99
3.3.	Storage	7.98	0.014(2.16)	0.0038***(20.24)	0.99
3.4.	Communication	7.07	-0.0026(-0.41)	0.0010***(-5.67)	0.93
4.	Fire, Insurance and Real Estate	11.03	0.0764(-23.21)	0.00021(-2.28)	0.99
4.1.	Banking & Insurance	9.79	0.0901(-16.98)	0.00027(-1.79)	0.99
4.2.	Real estate & ownership of dwellings	10.73	0.0705(-29.69)	0.000076(1.13)	0.99
5.	Community, Social & Personal Services	11.47	0.0529(-22.79)	0.00024***(-3.65)	0.99
5.1.	Public Administration & Defence	10.68	0.0554(-11.79)	0.0001(-0.78)	0.98
5.2.	Other Services	10.85	0.0521(-31.11)	0.00032***(-6.74)	0.99
	Total Services	12.75	0.0502(-35.05)	0.00067***(-16.53)	0.99

Source: Central Statistical Office. ***, ** and * indicate significance at 1%, 5% and 10% respectively. Figures in parentheses represent 't' values for the respective coefficients

3.4 Determinants of Services Sector/Sub-Sectors

In view of the rapid growth of overall services sector, its sub-sectors and their segments, it is imperative to examine the factors affecting their growth. A number of studies such as Gordon and Gupta (2004); Banga (2005); Joshi (2008); Ghani (2010); Eichengreen and Gupta (2011); Nayyar (2012) etc. have dealt with the issues related to growth in services sector. These literature have mainly focussed on three channels in the explanation of rapid growth of services sector in India. These include domestic demand or high income elasticity of services product in the country; expanding international trade in services and contracting out of services components in other economic activities. Theoretical arguments and discussion of each of these channels in driving services growth are discussed in the following subsections.

3.4.1 High Income Elasticity

High income elasticity of services output implies a relatively larger increase in quantity demanded as a result of rise in real income of the consumers. Proportionately higher expenditure on services output as a result of increase in income indicates larger share of consumption expenditure. In an empirical study in the United States, Fuchs (1965) found demand for services more elastic as compared to the other sectors in the Unites States. This broadly suggests that the rising income might have played important role in the determination of services growth in India as well. In the context of India, Gordon and Gupta (2004) pointed out that the share of private final consumption expenditure increased by almost three times during the period from 1951 to 2000. The authors noted sharp rise in private final consumption in services sector particularly since 1990. Adding to the above findings, Rakshit (2007) pointed out that consumption of services grew at an average annual growth rate of 8.64 percent during 1995-2005 whereas aggregate GDP grew by 5.87 per cent. The author attributed such high income elasticity primarily to increasing inequality of income. Nayyar (2012) in a study compared the growth rate of private final consumption of services and value addition in services sector for 1980s, 1990s and 2000s. The study found similar pattern of growth for both private final consumption expenditure and value addition in services sector in all the years. Table 3.6 presents percentage of private consumption expenditure in services to the total final consumption expenditure.

Table 3.6: Private Final Consumption Expenditure in Services in India (in Percentage)

Year	Percentage of PFCE in Services to TFCE
1980-1981	2.32
1984-1985	3.30
1989-1990	5.08
1994-1995	8.87
1999-2000	21.58
2004-2005	32.98
2009-2010	46.79
2012-2013	61.09

Source: Central Statistical Office; PFCE and TPFC are Private Final Consumption and Total Final Consumption expenditure respectively

The table shows rapid increase in the share of private final consumption expenditure on services to the total private final consumption expenditure. It can be observed from the table that in 1980-81, only about 2 per cent of the total private final consumption expenditure was spent on services while the share of private final consumption expenditure in services to the total private final consumption expenditure increased to about 61 per cent in 2012-13.

3.4.2 International Trade

International trade is considered as another important driving force in explaining rapid services growth in India. Gordon and Gupta (2004) argued that trade in services increased manifold around the world as a result of the expansion in information and technology. In Indian context, the authors found rapid growth in services export during 1990s as compared to 1980s. According to Nagaraj (2013) technological changes in communication coupled with booming outsourcing industry has led India's service export. Pointing out to significant growth of services export, Chanda (2009) mentioned that the export basket of services commodity in India has also undergone significant changes from traditional

services such as transport and travel towards miscellaneous services such as business services. According to a World Bank estimate, the Revealed Compared Advantage (RCA) for services in India increased by 74 per cent during the period from 1996 to 2000 while the same for goods declined by 15 per cent. The shift of composition within the services export basket from traditional services to emerging services such as software and other services has also been reported. Chanda (2010) mentions that the rapid growth in information technology and business process outsourcing placed India among the major suppliers of services in the world trade.

Nayyar (2012) considers the expansion of export of information and technology enabled services as the most noticeable feature of services export in India. The author attributed the rise in services export from India to economic liberalisation, human capital, growing international demand for services, etc. Srivastava (2006) stated that higher flow of FDI particularly in the post liberalization period since 1991 positively influenced the growth of services exports in Indian economy. The author argued that relaxation in FDI and trade policies during the post liberalization period widened export opportunities in India. Further, greater export opportunities induced foreign investment in India's services sector which was enjoying comparative advantage in services export.

In Table 3.7 the CAGR of India's services export is presented. The table depicts that services export grew at a compound annual growth rate of 4.78 percent during the decade of 1980s. Compared to the slow growth during 1980s, the CAGR of services export during 1990s was much higher at 15.62 percent. Services export grew even more rapidly during 2000s with a rate more than 21 percent. However, during the last three years of our sample period, growth in services export declined considerably.

Table 3.7: Growth of Services Export (1980-2013)

Year	CAGR of Services Export
1980-81 to 1989-90	4.78
1990-91 to 1999-00	15.62
2000-01 to 2009-10	21.14
2010-11 to 2012-13	3.56

Source: World Bank online Database. Note: Price at current US dollar

3.4.3 Splintering

Discussing determinants of rapid growth in services sector, Bhagwati (1984) pointed out that splintering (the externalisation of some activities) played a significant role in the growth of services sector. Splintering in simple words refers to the outsourcing of various types of services by agricultural and industrial sector. Splintering or outsourcing arises because with the expansion of production in a sector it becomes economical for the sector to contract out some of its activities to other efficient or specialized sector (Rakshit, 2007). According to Gordon and Gupta (2004) changes in production technique make it economical for the producer to outsource some of its activities such as business operations which were done internally by individual firm. Such contracting out enhances services intermediation leading to increase in services output. Using input-output coefficients, Gordon and Gupta (2004) show that services sector input in industry increased by about 40 per cent during 1979-80 to 1993-94. Another way to measure the splintering effect is to estimate the change in input-output coefficients of services input in other sector. Applying this approach, the authors estimated that splintering in services had contributed 0.5 per cent point to the annual growth of services during the 1980s whereas contribution of splintering in the annual growth declined to 0.25 per cent during 1990s. Using similar method, Nayyar (2012) estimated effect of splintering in services sector for the period 1979-80 to 2006-07 and found about 0.17 percentage point effect of splintering in determining annual growth in services sector. According to the author, the contribution of splintering in the growth of services is negligible and has declined over time. In addition, the author noted that usage of storage, communications, hotels and restaurants, public administration and defence, and, education and health services in production of other two sectors as input remained more or less constant during the period 1993-94 to 2006-07 whereas moderate increase was recorded in wholesale and retail trade, financial services, real estate and business services and personal services. Central Statistical Office, under the Government of India compiles input-output table which gives information on the input flow from one sector to other sectors for Indian economy. In Table 3.8, proportion of output of variour services segments used as input in other sectors is presented for the years for which input-output tables are available. It is clear from the table that the inter-industry usage of services declined in railways, transport by other means, storage, communication, banking and insurance and other services during 1993-94 to 2007-08. In contrast to the decline of splintering in most

services segments, splintering increased in trade and hotel and restaurant.

In the discussion of determinants of services sector, three channels are analysed i.e. high elastic demand, international trade and splintering. In order to assess the importance of these factors in determining output in services sector, the present study attempts to extend the investigation with the help of econometric techniques. Gordon and Gupta (2004) examined important determinants of services growth in India. They utilised two approaches to identify significant determinants of services sector growth in Indian economy.

In the first approach, they estimated separate regression using time series data to explain growth rates in different services activity such as business, communication, financial, hotels and restaurants, distribution, transport, public administration and defence and community and personal services for the period 1952-2000. In the regression analysis, they considered annual growth rates of each of the services sector output as dependent variable

Table 3.8: Percentage of Inter-Industry use to Total output of Various Services Segment

Sector	1993-94	1998-99	2003-04	2006-07	2007-08	Changes over 1993-94 to 2007-08
Trade	44.80	44.72	51.05	51.58	54.66	9.86
Hotel and Restaurant	16.20	17.02	21.58	18.86	45.07	28.88
Railways	68.90	70.51	60.24	70.69	56.67	-12.23
Transport by Other Means	50.10	72.91	43.49	45.82	47.32	-2.78
Storage	99.08	98.96	98.27	98.94	98.70	-0.39
Communication	65.45	51.17	69.63	75.49	57.78	-7.67
Banking and Insurance	80.52	68.67	75.65	80.79	71.88	-8.64
Other Service	45.55	62.53	30.97	35.66	38.51	-7.04

Source: Input-Output Table compiled by Central Statistical Office (Various Year); Last column presents changes over 1993-94 to 2007-08.

whereas growth rates of commodity producing sector, external trade of goods, service exports, and two dummy variables for 1990 and 1980 were used as explanatory variables in their model. The dummy variables were used to capture the impact of economic reforms related to liberalisation. In the second approach, they used a panel data model for different services activities including trade, hotels, railways, transport by other means, storage, communications, insurance, banking, dwellings business and personal services. They utilised five-year average data ranging 1970-2000 for the estimation of the panel regression. The dependent variable in that model was annual growth rates in services a activity. The independent variables were average growth rates in industry and agriculture; the volume of external trade in goods; the value of exports in services and a dummy variable to capture whether reforms were carried out in each services sub-sector. Results in the first approach show that for components like business, communication, financial, hotels and restaurants and community services the dummy variable for 1990 is positive and highly significant. The dummy for 1980 is also found significant for business, financial and community services. Thus they concluded that the sectors which were opened up experienced faster growth. Furthermore, the growth of external trade in goods is found to have important impact on transport services. They found domestic demand as well as foreign demand less important in determining the growth of most of the services segments. Growth in services export has been found significant for business services only. In the second approach, dummy variable for reforms is found to be significant implying that sectors opened for external factors such as FDI, trade or private ownership experienced faster growth. Among other variables, output growth in the industrial sector is found to be significantly correlated with services sector output growth.

Eichengreen and Gupta (2010) also examined important determinants of services sector growth in India. They used growth in value addition of different services as the dependent variable in their model. The explanatory variables were per capita income, the square of per capita income, the tradability of the service in question, index for liberalisation, skilled-labour intensity, and whether the activity is correlated with industrial growth. Another explanatory variable they included is the difference between the share of a services category say i to the GDP in India and the share of the i^{th} services category in other countries. According to the authors, this variable captures catch-up; the extent to which an activity with initial small shares is likely to grow. Their study reveals that per capita

income and per capita income squared are not individually significant but they found these two variables jointly significant. Tradable services exhibit significant growth rate. The explanatory variable, 'liberalisation' also exhibits positive and significant impact on services sector growth. The study found that those services category with a very small share in the initial period registered higher growth rate.

In a more recent study ranging the period from 1990-91 to 2008-09, Nayyar (2012) examines the determinants of the services sector in India considering eleven services sub-sectors i.e. trade, hotels and restaurant, transport, storage, communication, financial services, real estate and renting services, business services, public administration and defence, social and community services and personal, cultural and recreational services. Using two different models, the author tried to identify the potential determinants of services sector growth in India. In the first approach, Nayyar (2012) regressed share of services sub-sector in GDP on sum of the value of exports and imports by services sub-sector, index for liberalisation, total enrolment of students in higher education, coefficient to measure the intensity of the use of different services in producing industrial output and price of a service sub-sector output relative to industrial output. Lagged values of the explanatory variables were used in the regression model. In the second model, the author used the following set of explanatory variables; private final consumption expenditure on services, government final consumption expenditure and export by services sub-sector. The dependent variable was the same as in the first model. The results of the first model depict that the levels of GDP, services trade and liberalisation have a statistically significant and positive impact on the share of services in GDP whereas in the second model, liberalisation and private final consumption expenditure on services and services export are found to be statistically significant.

With this brief review of literature, the present study tries to examine the effect of various factors in the growth of services sector in India.

The present exercise examines the effect of three factors i.e. per capita income, size of export and effect of splintering on the expansion of services sector in India. Thus, the present approach does not differ much and largely remain similar to the existing studies in selecting the explanatory factors of the services sector growth in India. However, the present study differs from the earlier ones on several counts. First, the present study differs from the existing ones in terms of its sample period. The sample period taken for

the present study is 1980-81 to 2012-13, whereas the most recent available study (Nayyar, 2012) covers the period 1990-91 to 2008-09. Moreover, this data period allows us to take into account two major economic events i.e. the economic liberation of Indian economy in 1991 and the other is the global financial crisis of 2007-08 that took place during this period. Second, the present study departs from the existing literature in terms of its choice of dependent variable. While the earlier studies have taken growth rate of services sector or share of services sector to the GDP as their dependent variable, the present study considers gross value addition (GVA) in the services as the dependent variable. It is assumed that the GVA is a better option for dependent variable as it is independent and not relative to any factor. In contrast, growth rate is relative to the previous period and share of services sector to the GDP is relative to the share of other sectors in the economy. Third, the present study uses VAR modelling in explaining the effect of income and export in GVA of services. Additionally, in order to examine the role of splintering in services, an econometric approach in the form of a panel model has been used while most of the studies discussed above have made use of mathematical approach for the purpose. The details of the time series analysis and analysis under panel data framework are discussed separately in the following section.

3.5 The Econometric Approach

This section analyses the effect of per capita income, export and splintering in the expansion of services sector in India. The present exercise is carried out under two heads-the time series approach and the panel data approach. Detailed discussion on each of these approaches are presented in the following sub-sections.

3.5.1 Time Series Approach

In this approach, time series econometric techniques such as co-integration and causality analysis are used in order to examine relationship among gross value addition in various services segments, per capita income and export of the economy. Per capita income is included to trace the importance of income in the overall value addition in services sector of the economy. The inclusion of export as a variable enables us to assess the importance of international trade in determining services sector in the context of Indian economy. This exercise is carried out separately for trade, hotel and restaurant, railways, transport by other means, storage, communication, banking and insurance, and real estate and business

services. However, effect of splintering on the services segments could not be assessed in this approach as continuous time series data on intermediary usage of services output in other sectors are not available for the entire study period.

The test of stationary property is the prerequisite for any econometric study involving time series data. Augmented Dicky-Fuller (ADF) test is one of the most widely used tests for the stationary property of time series data. However, ADF test is criticised for its assumption of independently and identically distributed error term (Gujarati and Sangeetha, 2007). In addition, if the time series in consideration is suspected to have structural change or break; the Dickey-Fuller test statistics are biased toward the non-rejection of a unit root (Enders, 2014). In a study of 14 economic and financial aggregates, Nelson and Plosser (1989) show evidence in favour of the unit root in 13 out of the 14 variables, while using same set of data and allowing structural breaks in the time series Perron (1989) rejected the null hypotheis of a unit root hypothesis for most of the variables. Perron modified the Dickey-Fuller (DF) unit root tests by including dummy variables for the known structural break. The approach by Perron (1989) is also questioned as it assumed prior knowledge of structural break. In response, Zivot and Andrews (1992) proposed a unit root test by endogenizing structural breaks for all possible break dates in the time series. The Zivot and Andrews (1992) test is a sequential test which uses entire sample points and examines each possible break in the time series by including dummy variable for all the possible break dates. Subsequently, a break date will be chosen where the evidence is least favourable for the unit root null (Glynn et al., 2007).

As the data set in the present study may include structural break in 1991 (the year of economic liberalisation in Indian economy), the present study adopted Zivot Andrews unit root test to check the stationary property of variables of interest. The results of the unit root test are reported in Table 3.9. The results indicate the presence of unit root in all variables except for storage as the null hypothesis that the series is non-stationary at level is rejected for storage at 10 percent level of significance but not for the remaining variables. All other remaining variables except railways and communication are found to be stationary at their first difference as the test statistics for each of the remaining segments suggest to reject the null hypothesis at least at 10 percent level of significance.

Thus all the variables except railways, storage and communication are integrated of order one, $I(1)$. In case of railways and communication the null hypothesis could be rejected

at its second difference, therefore they are integrated of order two, i.e. $I(2)$ whereas storage is found to be stationary at level i.e. $I(0)$. In the next logical step of time series econometrics, Johansen cointegration procedure is applied to check whether the GVA of various services segments, per capita income and export value of the country are cointegrated or they move together in the long run. However, railways, storage and communication are excluded from this exercise as their order of integration is not same with PCI and export. Results of the Johansen cointegration test presented in Table 3.10 provide evidence of cointegrated relation between hotel and restaurant, transport by other means, public administration and defence; and other services with per capita income and export of the economy.

For hotel and restaurant, and transport by other means, null hypothesis of no cointegration $(r = 0)$ and at most one cointegrating equation $(r \geqslant 1)$ are rejected at least at 5 percent level of significance. Therefore, it can be concluded that there are at least two cointegrating equations for these two services segments with per capita income and export. In case of public administration and defence; and other services null hypothesis of no coin-

Table 3.9: Results of Zivot-Andrews Unit Root Test

	Levels	1st Difference	2nd Difference
Trade	-2.64	-7.37***	
Hotel & Restaurant	-2.72	-5.48**	
Transport by Other Means	2.21	-5.07*	
Railways	-3.46	-3.96	-7.14***
Storage	-4.88*		
Communication	-2.94	-2.05	-9.12***
Banking & Insurance	-3.21	-7.04***	
Real estate	-0.53	-4.84*	
Public Administration and Defence	-3.59	-4.96*	
Other Services	0.56	-6.41***	
PCI	-3.11	-4.87*	
Export	-3.71	7.16***	

Note: ***, ** and * indicate significant at 1 percent, 5 percent and 10 percent level respectively. The test is carried out allowing break in both intercept and trend.

tegration $(r = 0)$ is rejected against the alternative hypothesis of at most one cointegrating equation $(r \geqslant 1)$ indicating at least one cointegrating equation with per capita income and export. In all the remaining segments i.e. trade, banking and insurance, real estate and business services, hypothesis of no cointegrating equation $(r = 0)$ could not be rejected against the general alternative hypothesis of one or more $(r \geqslant 1)$ cointegrating equations. Existence of cointegrating equation confirms that long run equilibrium relationship exists among PCI, export and hotel and restaurant, transport by other means, public administration and defence; and other services. In other words, in the long run these variables move together. However, no evidence of long run relation among PCI, export and trade, banking and insurance and real estate and business services could be found.

The analysis of cointegration indicates the existence of causality between two or more

Table 3.10: Results of Johansen Cointegration Test

Sector	Rank	Trace Statistic	Lags
Trade	None	19.76	3
	At most one	-	
Hotel and Restaurant	None	21.33**	3
	At most one	15.42***	
	At most Two	1.51	
Transport By others means	None	22.17**	3
	At most one	20.83***	
	At most Two	0.35	
Banking and Insurance	None	18.30	1
	At most one	-	
Real estate & business services	None	20.76	1
	At most one	-	
Public Administration & Defence	None	25.40***	2
	At most one	8.68	
Other services	None	25.43***	3
	At most one	20.058	

*** and ** indicate significant at 1 and 5 percent level respectively. Note: Maximum lag is selected on the basis of AIC criteria.

variables, but do not reveal anything on the direction of causality (Soytas and Sarib, 2003; Jamil and Ahmed, 2010). Therefore, in order to examine the direction of causality among PCI, export and various services segments, we conducted causality analysis applying Toda and Yamamoto (1995) procedure. Toda and Yamamoto (1995) proposes a VAR modelling at levels of the variables even if the series are integrated or cointegrated of an arbitrary order. In conventional empirical practice, testing long run relationship among different variables requires all variables to be integrated of order one, conversely if the variables are integrated of different orders no test for a long run relationship can be conducted (Rufael, 2005). However, Toda-Yamamoto method ignores possible non-stationary or cointegration between series for the causality investigation. The Toda-Yamamoto approach estimates a standard VAR model in the levels of the variables with augmented lag order say $k+d_{max}$, where k is the lag length fixed for the VAR modelling and $dmax$ is the maximum order of integration among the series considered in the VAR model. Finally, linear restrictions are tested on coefficients of the first k lags, ignoring the augmented lags i.e. d_{max} (Toda and Yamamoto, 1995; Rufael, 2005).

The present study however, only focuses in examining the causality from per capita income and export to the output of various services segments. In order to conduct Toda-Yamamoto test, the following VAR model is used.

$$Y_t = \gamma + \sum_{i=1}^{k} \eta Y_{t-i} + \sum_{j=k+1}^{d_{max}} \lambda Y_{t-j} \sum_{i=1}^{k} \alpha PCI_{t-i} + \sum_{j=k+1}^{d_{max}} \phi PCI_{t-j} + \sum_{i=1}^{k} \beta Export_{t-i} + \sum_{j=1}^{d_{max}} \psi Export_{t-j} + \mu_t \tag{3.5}$$

In the equation Y denotes the output in segment i. The joint significance of the coefficients of lagged per capita income and export represented respectively by α and β. These two coefficients describe the causality from per capita income and export to GVA of the i^{th} services segments. The estimated results of the Toda-Yamamoto causality test are presented in Table 3.11. The results indicate significant causality of export to trade as the chi-square statistic is found to be significant at one percent level. Gross value addition of hotel and restaurant is also significantly caused by export value of the country. Similar results are found for communication and real estate, business services, public administration and defence and other services as the respective chi-square statistic are found to be significant at least at 10 percent level. This implies that expansion of export in Indian economy has

significant contribution in improving gross value addition of these services segments. On the other hand, per capita income is found to have significant impact in determining gross value addition of transport by other means, railways, banking and insurance, real estate and public administration and defence. The chi-square statistics for transport by other means, railways and public administration and defence are statistically significant at one percent while chi-square statistic for banking and insurance and real estates are found to be significant at 10 percent level of significance. Therefore, it can be concluded that generation in output of transport by other means, railways, banking and insurance and real estate segments are directly associated with overall development of the economy as measured by per capita income. It is worth mentioning that among these segments only real estate and public administration and defence are found to be significantly affected by both per capita income and export. The individual causality analysis for the segments reveals that significant factor(s) of one segment may not affect other segments. Therefore, it is evident from the study that significance of determinants i.e. per capita income and export in the value addition of services sector cannot be generalised across the segments. Rather, different factors/sets of factors are found to affect various segments differently.

Table 3.11: Results of Toda-Yamamoto Causality test

	Chi Square Statistic		Total Lags (Lag+dmax)	
Variable	PCI	Export	Lag	dmax
Trade	1.26	7.86**	3	1
Hotel & Restaurant	4.68	14.81***	3	1
Transport by other means	13.44***	1.99	3	1
Railways	9.36***	0.69	1	2
Storage	0.8	2.32	3	1
Communication	3.27	34.92***	3	2
Banking & Insurance	3.37*	1.05	1	1
Real estate	4.92*	13.34**	1	1
Public Administration & Defence	11.37***	15.15***	2	1
Other Services	4.23	7.38*	3	1

***, ** and * indicate rejection at the 1, 5 and 10 percent level respectively. Note: Maximum lag is selected on the basis of AIC criteria. d_{max} is the maximum order of integration ($I(n)$).

3.5.2 Panel Data Approach

In the second approach, a panel data regression is conducted to examine the effect of growth of splintering on the growth of various segments within the services sector in Indian economy. Eight out of the ten services segments used in the time series approach are considered as cross section units in this panel approach and hence for the present exercise number of cross section unit is eight $(N = 8)$.[5] The effect of growth in splintering is measured as the changes in the ratio of inter industry use of a particular segment to its total output. Data related to input output for the services segments are obtained from Central Statistical Office, Government of India. However, as mentioned above, year wise continuous data on input and output of the services segments are not available. Data on input and output of the services segments could only be collected for the following five years i.e. 1993-94, 1998-99, 2003-04, 2006-07 and 2007-08. However, in order to obtain the change or growth in a year over its available previous year, the first data point gets eliminated and hence only four data points $(T = 4)$ could be used for the panel regression. In order to trace the effect of splintering, the following panel model is utilised.

$$\Delta Y_{it} = \alpha_i + \phi \Delta IOratio_{it} + \beta \Delta PCI_{it} + \gamma \Delta Export_{it} + \mu_{it} \tag{3.6}$$

In the equation, IO ratio indicates the ratio of inter industry input of ith sector to the other industries in the economy at time period t. Values of per capita income and export are included in the equation as control variables. Total sample size for the present exercise is 32 $(N \times T)$. The estimates of the above panel equation have been obtained using the fixed-effects and the random-effects models. The results obtained from both fixed effects and random effects are quite similar to each other. Results of Hausman test indicates the appropriateness of random effect model over fixed effect model. The results of random effect panel regression are presented in Table 3.12.

In the table, coefficients of ratio of inter industry input to total output indicated by ΔIO ratio is found to be statistically insignificant which implies that splintering does not have any significant impact on the rapid expansion of services sector at least during the time period considered in the present study. Out of the two control variables, per capita income is found to be highly statistically significant while export is statistically insignificant.

Table 3.12: Effects of Splintering on Services Sector

Independent Variables	Coefficient	t-statistics
ΔIO ratio	-0.03(0.03)	-0.62
ΔPCI	1.36***(0.51)	2.63
ΔExport	0.21(0.17)	1.33
Overall R^2	0.07	

*** indicates significant at 1 percent level. Figures in the parentheses represent robust standard errors. Sample size 32.

3.6 Summing Up

It is evident from the foregoing analysis and discussion that present growth of Indian economy is the services sector led growth where the share of the services sector has increased rapidly and the sector now dominates Indian economy in terms of contribution to the GDP of the country. Among the five sub-sectors within the overall services sector, contribution of FIRE is found to be the highest in 2012-13. The share of transport, storage and communication to the GDP has also increased significantly. In terms of growth rate, overall services sector has grown at compound annual growth rate of 7.6 per cent during 1980-1981 to 2012-2013. At sub-sector level, transport, storage and communication grew more rapidly compared to others registering an average annual growth rate of 9.03 per cent. Within transport, storage and communication, communication segment has exhibited the most rapid growth rate. Except storage and railways, all the services sub-sectors and segments registered compound annual growth rates of more than 6 per cent. This implies that services, its sub-sectors and different segments within these sub-sectors have recorded healthy growth rate during the period of the present study. It has also been found that the first decade of 2000s is more supportive to most of the services sectors compared to the previous decades under consideration.

The time series approach which was employed to examine the effect of per capita income and export in various segments of services sector has revealed that per capita income drives services segments like transport by other means, railways, banking and insurance, real estate and business services and public administration and defence. However, the study could not find any such effect of per capita income for segments like trade, hotel and

restaurant, storage and communication. Similarly, export is found to be one of the significant determinants for growth in trade, hotel and restaurant, communication, real estate and business services, public administration and defence and other services while the impact of export on segments such as transport by other means, railways, storage and banking and insurance is found to be statistically insignificant.

Results of the panel data regression analysis indicate insignificant effect of splintering in the expansion of services sector in India. However, the results show significant coefficient of per capita income indicating per capita income as the main driving force of services sector in Indian economy.

The discussion in the present chapter shows that financing insurance real estate and business services is the largest contributing sub-sector to the GDP of the country in recent years while transport storage and communication is the fastest growing sub-sector during 1980-81 to 2012-13. Considering the importance in terms of their shares to the GDP and rate of growth, these two sub-sectors are taken up for further investigation in terms of their pattern of growth and determinants in the following two chapters. However, it has already been mentioned that each of these sub-sectors consist of two or more heterogeneous segments. Therefore, further disaggregating these two sub-sectors, attempts are made to examine the trends, patterns and determinants of the banking services within FIRE in fourth chapter and basic telecommunication services within the transport, storage and communication in the fifth chapter of this dissertation.

4

Pattern of Growth and Determinants of Banking Services

4.1 Introduction

In has been found in the previous chapter that, Financing, Insurance, Real estate and Business Services (FIRE) is the largest contributing sub-sector to the GDP of the country. It is also found that within FIRE, banking and insurance is the largest contributor and it has registered a very high compound annual growth rate over the period considered in the study. The broad group of banking and insurance services can further be separated into two different segments, i.e. banking and insurance. Although both banking and insurance provide financial services, they are distinctly different in terms of their output and operational modes.[6] While banks operate in an interconnected system under a central bank, insurance providers do not operate under such system. In addition, the risk profiles, strategies to manage risk and regulatory regimes are also different in banking vis-a-vis insurance (Bipartisan Policy Centre, 2015). Therefore, in order to conduct any systematic study, these two segments must be considered separately. In the present study, attempts are being made to undertake a case study of the banking services only. The selection of banking service is guided by its significant importance in the development of an economy. In addition, data related to banking service is systematically available and easily accessible than insurance sector. Availability of systematic data makes empirical study on banking segments comparatively more feasible than insurance segment.

The basic aim of this chapter is to capture the trend in growth of banking services within the sub-sector of FIRE and to identify important determinants that influence overall performance of banking services. Performance of banking service can be traced with

the help of a number of banking parameters such as deposit, credit, advance, profit, population per branch, number of branch etc. It is difficult to combine such large number of parameters into one index which makes it convenient to measure overall performance of banking service. Colwell and Davis (1992) point out that economists have experienced considerable difficulties in defining what bank produce. Kumbhakar and Sarkar (2003) mention about multi input-output nature of banks and suggest that, productivity growth can be one alternative to trace overall performance of banking services. In the absence of other representative measure or index, the present study has also utilised productivity growth of banking services to examine the overall performance of banking sector in India.

The broad objective of the chapter is to assess the productivity growth of banking services in India. This chapter tries to address the objective by examining the productivity growth of scheduled commercial banks in India.[7] Regional rural banks (RRB) which comes under scheduled commercial banks are excluded from the analysis because of its very small share in total deposit (3 percent) and credit (2.6 percent) of the entire commercial banking sector.[8] Moreover, the study also makes an attempt to identify some important determinants of productivity growth in the context of banking services in India. In particular, this chapter tries to address the following research questions.

i. What is the trend in growth of commercial banking services in India in terms of different banking parameters such as branch expansion, deposit, credit etc.?

ii. What is the trend in productivity growth of commercial banks in India?

iii. What are the important determinants of productivity growth of commercial banking sector in India?

The chapter is organized into six sections including the introduction. The second section presents a brief description of the banking services in India. The third and fourth section discusses the conceptual and measurement issues in productivity and the methodology of the present study respectively. The findings of the study are presented in the fifth section. The last section presents a summary of the discussion in the chapter.

4.2 Banking Service in India: A Brief Background

Indian banking sector, prior to its nationalisation was criticised for its neglect to agriculture and other small sectors like small scale industries in providing bank credit despite some progress in terms of geographical coverage (Kumbhakar and Sarkar, 2003). Nationalisation of bank in 1969 and subsequently in 1980 brought some major structural changes into Indian banking system. These structural transformations are in terms of regulatory measures adopted by the Reserve Bank of India. These measures include changes in the sectoral composition of credit, stipulated lending targets to priority sectors, opening up of bank branches in rural and semi-urban areas etc.[9] According to Kumbhakar and Sarkar (2003), public sector banks became unprofitable during the period due to their excessive focus on quantitative achievements. Similarly, some banks were considered undercapitalised according to international standards while some other had low capital adequacy ratio and high non-performing assets.[10] Following these, the Government of India initiated banking sector reforms in 1991 aiming to create an efficient, profitable and sound banking system in the country. Banking sector reforms in 1991 include deregulation of control of interest rates, introduction of international norms like capital adequacy requirements and other prudential norms to strengthen Indian banking system. The reform also aimed at improving competitiveness in the banking services, diversification of ownership to private investors to certain limit and reduction in cash requirements and statutory requirement of the banks. These financial reforms were expected to increase efficiency in mobilisation of resources and its allocation in the real economy which in turn are regarded crucial for macro economic stability and are expected to generate higher economic growth (Ahluwalia, 2000). According to Mohan (2005b), the main objective of economic reforms in 1991 was to accelerate growth of the entire economy. The author mentioned about three channels which can affect economic growth of an economy. These are- improving productivity of capital, investment in human capital and raising total factor productivity. He further argued that the quality of financial sector has the capacity to affect the functioning of all other sectors in the economy. The quality of financial intermediation improves the efficiency of resource allocation and thus promotes productivity in other sectors as well. Zhao et al. (2010) divided the banking sector reforms in India into two stages. The first stage is related to deregulation aiming at promoting competition. This stage was

characterised by deregulation of interest rate on deposit and lending. Private sector was also allowed to operate. These deregulations have led the banking service in India to a greater operational flexibility. The second stage focused on financial stability in terms of prudential norms of classification of assets, loans and capital requirement of the banking system. Mohan (2005a) argues that deregulation is supposed to boost competitive forces in the banking system in India. These competitive forces are expected to enable the banks to alter their input-output mix. Changing structures of input combinations endowed with technological developments improve output of banks that raises overall bank productivity and efficiency. Again, new private and foreign banks equipped with superior management and technology are supposed to have better efficiency. Panagariya (2008) pointed out that the entry of foreign and new private banks as a result of the reforms in 1991, has positive influence on productivity of Indian banks. Pointing out the better performance of banking system in India, he mentions the significant improvement in profit per employee from ₹ 10 thousand in 1995-96 to ₹ 130 thousand at 2004-05 constant prices. Similarly, the increase in business per employee from ₹ 6 million to 17.3 million and rise in deposit per branch during the same period is another indication of significant increase in productivity of banks in India. However, these ratios only give an idea of partial productivity since output (in terms of value) has been compared with number of employee or branch. Hence, these parameters fail to capture the overall performance of the banking services. In the absence of representative measure or index to capture overall performance of banking services, many studies relied upon the productivity growth of banking services to examine the overall performance of banking sector in India. Some of these studies are briefly discussed below.

In a study of banks in India, Bhattacharyya et al. (1997a) pointed out that nationalisation has brought not only changes in ownership but also changes in the development and planning. They pointed out that these changes initially thwarted productivity of all banks in India. According to the authors, during 1970 to1992, the productivity growth of banks in India was around 2 percent. However, they noted substantial rise in productivity growth during the last few years of their sample period which was the phase of economic liberalization and banking deregulation. Bhattacharyya et al. (1997b) examined productive efficiency of 70 Indian commercial banks using data envelopment analysis for the period of 1986 to 1991. They found public sector owned banks more efficient than private sector

banks with marginal improvement in the performance of overall banking services in India during the sample period of their study. Their findings also suggest that foreign banks were least efficient at the beginning of their sample period, however, they have noticed a rise in the efficiency of those bank over the period of their study. Keshari and Paul (1994) also found that foreign banks were less efficient as compared to the domestic banks in the context of Indian economy. However, they concluded that the differences in efficiency between foreign and domestic banks were not significant in terms of their efficiency. Mohan and Ray (2004) compared productivity growth of public, private and foreign banks in India for the period 1992 to 2000. Their results reveal that the difference in productivity growth of private and public sector banks are insignificant which led them to reject the general belief that deregulation resulted in huge gap in productivity of privately and publicly owned banks. Shanmugam and Das (2004) in their study of technical efficiency of Indian banks during the period 1992 to 1999 found that Indian banks performed inefficiently which according to the authors is due to technical inefficiencies of the banks. Ataullah et al. (2004) suggested that overall technical efficiency of banks in India improved after 1995-96 following the reform in Indian banking. They argued that the rise in efficiency is due to improvement in both technical efficiency and scale efficiency.[11] De (2004) carried out a study on efficiency of Indian banking comprising a panel data of public, private and foreign banks for the period of 1985 to 1995-96. Their study reveals that there is no improvement in the banking industry in India after the liberalisation in 1991-92. They argued that banking industry is technically inefficient and due to this inefficiency, banking industry was losing output during the period. In contrast to most of the studies, De (2004) found foreign owned banks to be the most efficient as compared to other banks. In an article, Mohan (2005b) argued that productive efficiency of Indian banks has improved in the post reform period as operating cost per unit of earning assets declined since 1992. Das and Ghosh (2006) in a study of banking service in India for the period 1992-2002, reported high degree of inefficiency of some banks during the period of liberalisation. They have also reported variation in the efficiency level in different categories of bank, according to ownership. Their study found public sector banks relatively more efficient compared to private banks. In a more recent study, Kumar and Gulati (2014) has estimated productivity growth of Indian commercial banks for the period of 1993-94 to 2007-08. Their study reveals that public sector banks are more productive than privately owned and foreign banks.

Moreover their study found that Indian commercial banks registered higher productivity growth during 2000-01 to 2000-08 compared to 1993-94 to 1998-99.

The review of available literature presented in this section shows that banking services in India have recorded overall productivity growth during the liberalisation period. Most of the studies have reported that publicly owned banks are comparatively more productive then foreign and private sector banks.

4.3 Conceptual and Measurement issues in the Estimation of Productivity

The estimation of productivity involves several conceptual and empirical issues, particularly in services like banking which produces multiple outputs using multiple inputs. Therefore, it is necessary to understand the conceptual issues associated with the measurement of productivity in banking services. In the following section, a brief review of the various conceptual issues associated with productivity and its measurement in the context of banking services is made.

The term 'productivity' is a measure of efficiency. It measures how efficiently input(s) are converted into output(s) in a production process by an economic unit or firm. Although productivity and efficiency are often used interchangeably, they have different meanings. The efficiency of a firm is associated with its production possibility frontier. A firm is considered efficient if the firm operates at its production possibility frontier while any firm operating below its production frontier is considered inefficient. There are mainly four methods to estimate efficiency of a firm (Bauer et al., 1998). These methods are (i) Linear programming approach, often referred to as data envelopment analysis (DEA), (ii) Stochastic frontier approach, (iii) Thick frontier approach, and (iv) Distribution free approach. Out of these methods, Data Envelopment Analysis (DEA) introduced by Farrell (1957) is a non parametric method. According to Cooper et al. (2011) DEA is a data oriented method to evaluate performance or efficiency of a set of peer entities. The peer entities are also called as Decision Making Unit (DMU) which converts multiple inputs into multiple outputs. The remaining three methods are parametric in nature and are based on different distributional and functional assumption in estimation of efficiency.

In contrast to the term efficiency, the term productivity indicates the ratio of output or

outputs of a firm to its input or inputs. Pritchard (1995) defines productivity as the ratio of output over inputs. Similar definition is also put forward by Organization for Economic Co-operation and Development (2001) which defines productivity as ratio of a volume measure of output to a volume measure of input in a production process. There are broadly two measures of productivity, namely single or partial factor productivity and multiple or total factor productivity (henceforth TFP). The single or partial factor productivity measures productivity relative to a single input e.g. labour productivity which measures output per unit of labour or capital productivity which measures output per unit of capital. In contrast to the notion of partial productivity, total factor productivity is the increase in output growth which is not caused by the factor accumulation. According to Comin (2006), TFP can be defined as the portion of output which cannot be explained by inputs. The efficiency of input utilisation to convert into output in turn determines TFP. Felipe (2006) interpreted TFP as an index of those factors other than labour and capital which have contributed in the generation of output but are not explicitly accounted for in the production. In other words, it describes the increase in output caused by factors other than the inputs used in the production process. For example, a simple production function can be specified as follows.[12]

$$Y = F(K, L, T) \tag{4.1}$$

where, Y indicates output, K, L and T represent capital, labour and some measure of know how or knowledge in the economy respectively. Assuming no change in the knowledge represented by T, aggregate growth in output can be expressed in terms of the growth of factors employed as follows.

$$\frac{\Delta Y(t)}{Y(t)} = \sigma_k(t)\frac{\Delta K(t)}{K(t)} + \sigma_l(t)\frac{\Delta L(t)}{L(t)} \tag{4.2}$$

where $\sigma_i(t)$ indicates the income share of i^{th} factor while $\Delta Y(t)$, $\Delta K(t)$ and $\Delta L(t)$ represent the change in output capital and labour respectively over periods t and $t+1$. In equation 4.2, equality between the right hand side and left hand side holds the assumption of no increment in T is true. However, if the assumption does not hold true, the right hand side of the equation does not add up to the left hand side of the equation. The difference between the two sides is often referred as growth in total factor productivity. Including

total factor productivity growth, equation 4.2 can be presented as follows.

$$\frac{\Delta Y(t)}{Y(t)} = \sigma_k(t)\frac{\Delta K(t)}{K(t)} + \sigma_l(t)\frac{\Delta L(t)}{L(t)} + TFPG(t) \tag{4.3}$$

where $TFPG(t)$ represents the total factor productivity growth over periods t and $t+1$. Higher total factor productivity growth implies that lower amount of input can be converted into higher levels of output.

Existing literature has discussed various methods to measure TFP. These methods can broadly be grouped into two heads i.e. the parametric and non-parametric approaches (Colwell and Davis, 1992). Under parametric approach, there are two alternative methods, namely econometric function models and stochastic frontier model while total factor productivity indices and data envelopment analysis have been clubbed under non parametric approaches (Coelli et al., 1998). In the parametric approach, measurement of TFP involves estimation of parameters of specified economic function such as cost, revenue or profit functions (Mawson et al., 2003). The econometric approach, however, has been criticised on many grounds. One major criticism is the proper specification of functional form. According to Bauer et al. (1998) parametric approaches impose structural restriction on functional form. Under non parametric head, there are broadly three alternative methods, i.e. Fisher, Tornqvist and Malmquist productivity index. In these methods, productivity is estimated as ratio of output and input quantity index (Mawson et al., 2003). Explaining these methods, Ray (2004) pointed out that Tornqvist and Fisher index combines information of quantity and price to construct indices of output and input. Taking ratio of output and input index, the desired productivity index can be estimated. Both Tornqvist and Fisher indices can be constructed without any prior knowledge of the production technology of the firm. In contrast to these two methods, the Malmquist productivity index is defined as ratio of two output distance function which corresponds to the different sets of input output combinations and state of technology. Malmquist index can evaluate productivity change between two time periods. Cooper et al. (2007) defined Malmquist index as the product of "catch up effect" and "frontier shift effect". Out of these two effects, the former relates to the degree of changes in efficiency of a DMU while the latter relates to the changes in efficiency between two time periods. Malmquist index can be constructed using DEA technique.

4.4 Methods used in the Present Study

In the context of studies related to efficiency and productivity of banking service, researchers have been using both parametric as well as non-parametric methods. For example, application of stochastic method that comes under parametric group can be found in studies such as De (2004); Shanmugam and Das (2004); Zhao et al. (2010); Keshari and Paul (1994) and Kumbhakar and Sarkar (2003) while many studies including Bhattacharyya et al. (1997b); Ataullah et al. (2004); Sathye (2003); Das and Ghosh (2006) and Rezvanian et al. (2008) employed non-parametric DEA methods in the estimation of productivity in their respective studies.

Although, both parametric and non-parametric techniques are used in the estimation of productivity of banking services, there has been a debate regarding the appropriate method in the estimation of productivity in banking services. For example, in a detailed analysis of DEA method, Seiford (1990) argued that mathematical programming approach as applied by DEA method is more robust for efficiency frontier estimation. The author mentions that in estimation of frontier efficiency, DEA can provide additional information which is not found in conventional econometric technique. Another crucial advantage of DEA method is that it is developed for measuring technological efficiency in sectors where prices are not available or reliable (Bauer et al., 1998). According to Coelli and Rao (2005) a major advantage of DEA in productivity analysis is that it does not require price data. Bhattacharyya et al. (1997b) pointed out that DEA method is eminently suitable for examining performance of Indian banks. Banks provide various financial services. This multi-output nature of banking services makes application of stochastic frontier approach difficult in measurement of efficiency. They further argued that regulation and other market imperfection distorts prices in banking services in India, which complicates the use of Stochastic Frontier Approach. Comparing parametric and non-parametric DEA approach, Das and Ghosh (2006) pointed out that in the DEA, it is not necessary to specify a functional form which is a prerequisite in the stochastic frontier approach. Therefore, the DEA is free from misspecification of functional form. Another advantage of DEA method is its suitability in application for multi-input multi-output industry. Since banking is a multi input-output service, therefore application of DEA method in estimation of efficiency is appropriate. Pointing out the disagreement among the researchers in the selection of ap-

propriate method in the estimation of productivity, Ataullah et al. (2004) mentioned that parametric study, which uses econometric estimation is based on pre-specified functional form. Efficiency measure in parametric method is influenced by the pre- specified functional form. In the non-parametric method, for example DEA does not require to specify functional form apriori. However, DEA assumes the measurement error or statistical noise in the estimation as constant which according to Ataullah et al. (2004) is a major disadvantage of DEA method. They also argued that compilation of input and output prices is difficult or such prices may be distorted because of long regime of regulation in banking industry. Other market imperfections may also distort price mechanism in banking industry in developing countries. According to Sanyal and Shankar (2011), one of the major drawbacks of DEA is that it does not correct for the endogeneity of inputs and ignores possible heterogeneity across banks.

Following the above discussion which has highlighted advantages and disadvantages of various methods, non-parametric DEA method has been regarded as more appropriate in measuring productivity in banking industry. Therefore, in the present study attempt has been made to estimate TFP growth of the banking industry using input oriented DEA based Malmquist Productivity Index (MPI). The selection of Malmquist Productivity Index is based on the argument that it does not require price data and allows for the use of multiple inputs and outputs in the estimation (Kumar and Gulati, 2014). An MPI higher than 1 implies growth in the productivity whereas an MPI below 1 indicates a decline in the total factor productivity. Statistical package 'R' is used in the estimation of MPI.

For the second part of our analysis i.e. to identify important determinants of productivity growth of banking services in India, the present study carries out a regression analysis under panel data framework. Detail discussion about the regression analysis has been presented in the respective section.

4.4.1 Defining Input and Output in Banking Services

In a multi input-output service like banking, it is also difficult to specifically define input and output. Precise definition of input and output of banks is difficult because banks are typically a multi-input and multi-output firm (Mohan, 2005b). Discussing issues related to banking theory, Frexias and Rochet (1997) highlighted three main approaches of measurement of different activities of banks. These are production approach, intermediation

approach, and modern approach. According to the author, the first two approaches are based on classical microeconomic theory while the third one modifies the classical theory and incorporated risk management into the measurement of activities in banking services. Production approach considers banks as producers of deposits and loans using capital, labour and other material factors as inputs. In the production approach, output is measured in terms of number of accounts and outstanding loans. Total cost of banks in this approach is measured as sum of all operating costs (Ferrier and Lovell, 1990).

Intermediation approach defines financial institutions as intermediating funds between savers and investors (Das and Ghosh, 2006). In this approach, banks collect funds and intermediate these funds to loans and other assets. In intermediation approach, output is measured in terms of dollar value of deposit accounts and loans. Input cost in intermediation approach is measured in terms of operating cost and interest cost. Mohan (2005b) mentions three variants of intermediation approach, these are asset approach, user cost approach and value added approach. The asset approach focuses exclusively on the role of banks as financial intermediaries, depositors and final uses of bank asset. Deposits and other liabilities along with labour and physical capital are termed as inputs. Loans and investments constitute banks' output in asset approach. The user cost approach determines bank's inputs and output on the basis of their contribution to bank revenue. If financial returns on an asset exceeds opportunity costs they are considered as output and otherwise taken as inputs. Value added approach identifies those categories as output that contributes into the value addition of bank. This approach considers deposits and loans as outputs as they form a significant portion of value added.

Finally, the modern approach measures output integrating risk, agency costs and quality of bank services (Mohan, 2005b). This approach also incorporates quality of bank assets and the probability of bank failure in the measurement of costs.

Considering differences in defining the input and output in banking services, it is very crucial to select input and output carefully. In a review of estimation methodology of banking intermediation services, Barman and Samanta (2007) have pointed out that major part of revenue in the banking sector comes from the financial intermediation services rendered by banks to their customers. System of National Accounts 1993 (SNA 1993) used the term Financial Intermediary Services Indirectly Measured (FISIM) instead of Banking Services as in SNA 1968. The FISIM is measured as difference between property income

received and interest paid. The authors focus on measurement of output and prices of intermediation service. In most of the previous studies deposit and loan or investments has been used as one of outputs in banking services, which falls under intermediation approach (Rezvanian et al., 2008; Ataullah et al., 2004; Keshari and Paul, 1994; Bhattacharyya et al., 1997a). Following the notion that banking is an intermediation services, the present study considers input and output combination according to intermediation approach. Hence, the present study has considered advances and investments as outputs of bank while demand deposits, saving deposits, fixed deposits, capital related operating expenses and employee expenses are regarded as inputs of bank.[13]

Required data for the productivity analysis are obtained from various issues of Statistical Tables Relating to Banks in India (STRB) published annually by Reserve Bank of India.[14] The present study is carried out for the period of 1990-91 to 2014-15. Selection of 1990-91 as the beginning of our sample period is based on the intuition that prior to 1990-91, the banking sector was less competitive as there was restriction on entry of new banks. According to Reserve Bank of India (2008), the restriction on the entry of new banks resulted in lack of competitiveness in the entire banking sector in India which resulted in poor performance of the Indian banking sector. Moreover, restrictive policies such as stringent regulation on interest rate also had adverse impact on the competitive environment. Since 1991, many new banks have started operation in India while many others have ceased their operation. Due to this entry and exit of banks, number of banks operating in India differs year to year. In addition, merger of some banks with other banks also have affected the number of operating banks in different years. Therefore, the present dataset is inconsistent in number of banks (panels) over the years which is not suitable for estimation of Malmquist Productivity Index over the year continuously. In order to overcome the problem, this study computes Malmquist productivity index comparing data for two years at a time starting from 1990-91 to 1991-92. Furthermore, such breakups made it possible to include or exclude any new entry or exit of bank. Table 4.1 presents the year wise break up of sample banks by category of ownership.

4.5 Results and Discussion

In this section, results obtained in the empirical exercise are presented. The discussion in this section is categorised under three subsections. Firstly, various descriptive statistics

related to banks in India are discussed in the first subsection which is based on simple arithmetic analysis. In the second subsection, discussion on productivity growth of banks is presented while the third subsection examines the probable determinants of productivity growth in banking services in India.

Table 4.1: Year Wise Number of Banks by Category of Ownership

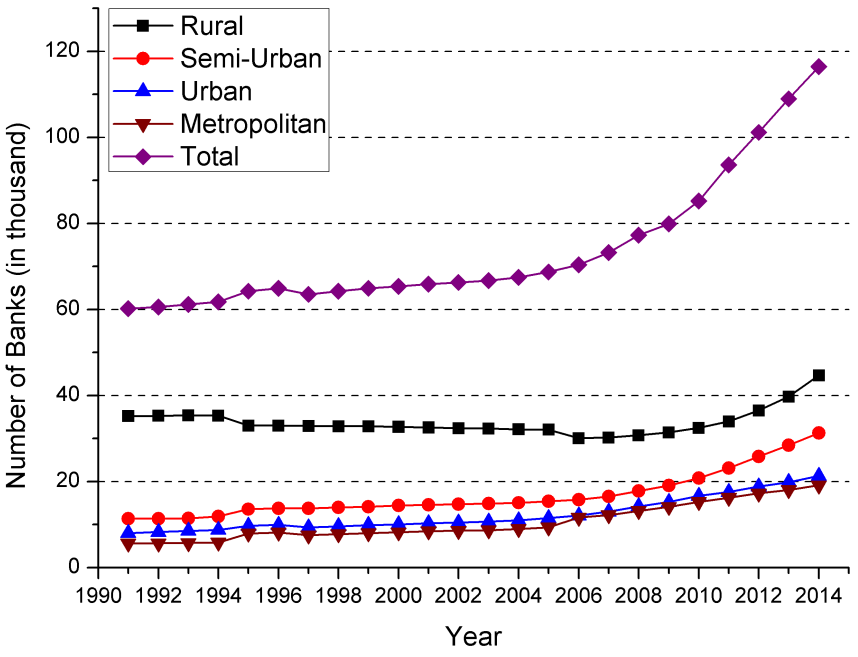
Year	Public sector banks	Private sector banks	Foreign banks	Total banks
1991-92	28	24	22	74
1992-93	28	24	24	76
1993-94	27	24	23	74
1994-95	27	24	23	74
1995-96	27	30	25	82
1996-97	27	32	28	87
1997-98	28	33	36	97
1998-99	28	32	33	93
1999-00	28	31	33	92
2000-01	28	30	35	93
2001-02	28	29	29	86
2002-03	28	27	29	84
2003-04	28	28	31	87
2004-05	28	28	28	84
2005-06	28	26	27	81
2006-07	28	25	28	81
2007-08	28	23	26	77
2008-09	27	22	26	75
2009-10	27	22	26	75
2010-11	26	21	27	74
2011-12	26	20	29	75
2012-13	26	20	30	76
2013-14	26	20	31	77
2014-15	27	20	35	82

Source: Statistical Table Relating to Banks in India (Various Issues)

4.5.1 *Banking services in India: Growth over the Years*

Table 4.2 portrays some of the basic parameters related to banking sector during the period from 1990-91 to 2013-14. It can be seen from the table that number of bank offices increased rapidly during the sample period of the present study. Figure 4.1 depicts that during the period 1991-92 to 2007-08, number of bank offices expanded very slowly whereas during the next six years of our sample period, the expansion was comparatively rapid. Expansion of banking services in terms of number of branch or bank offices can be examined under two different categories-according to the nature of ownership and size of population. According to the ownership categories, the banks can be categorised into three groups namely public sector bank, private sector bank and foreign bank. The second categorisation is based on population size, which includes rural, semi-urban, urban and metropolitan areas. If the size of population of an area is less than 10 thousand then the area is considered as rural area while if the size of population ranges between ten thousand to one lakh, it is considered as semi urban. Similarly, an area is regarded as urban if its population size is between one lakh to ten lakh whereas the corresponding size of population for metropolitan area is above ten lakh.[15]

Figure 4.1: Number of Bank Branches in Rural, Semi-Urban, Urban and Metropolitan areas



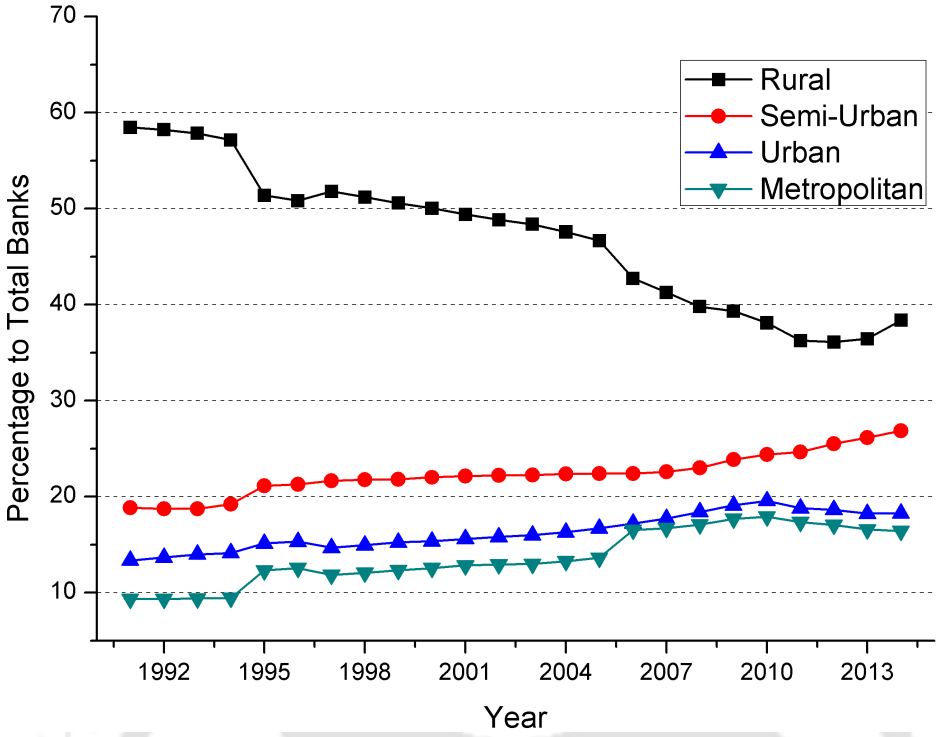
Source: Statistical Tables Relating to Banks in India (Various Issues)

Table 4.2: Basic Indicators of Banking Service in India

Year	1992	1995	2000	2005	2010	2014
Number of offices (in thousands)	60.22	62.37	67.86	68.36	85.39	117.28
Rural Branch (as Percentage of Total)	58.46	52.92	50.04	46.93	38.10	38.32
Semi-Urban Branch(as Percentage of Total)	18.84	21.39	22.03	22.53	24.41	26.88
Urban Branch (as Percentage of Total)	13.36	14.22	15.37	16.82	19.57	18.29
Metropolitan Branch (as Percentage of Total)	9.34	11.47	12.56	13.71	17.92	16.44
Population per office (thousands)	14.00	15.00	15.00	16.00	13.80	10.80
Deposits (in lakh crore)	2.01	3.87	8.52	17.22	44.93	79.13
Credit (in lakh crore)	1.22	2.12	4.54	11.24	32.45	61.39
Deposits as Percentage of National Income (at current prices)	48.10	46.40	53.50	68.50	86.60	86.30
Share of Priority Sector in Total Credit	37.70	33.70	35.40	36.70	35.10	35.10
Credit Deposit Ratio	60.60	54.70	53.30	64.90	72.20	77.60

Note: Data about number of bank branch and corresponding percentages are taken from Handbook of Statistics on the Indian Economy 2013-14; RBI. The remaining informations are collected from Basic Statistical Returns of Scheduled Commercial Banks in India; RBI.

Figure 4.2: Share of Bank Branches in Rural, Semi-Urban, Urban and Metropolitan Areas



Sources: Statistical Tables Relating to Banks in India (Various Issues)

One notable point from Table 4.2 is that during 1991-92 majority of bank offices were in rural areas as compared to the semi-urban, urban and metropolitan areas. However, share of rural offices to the total number of bank offices declined sharply over the years. Figure 4.2 shows a steady decline in the share of rural branches since 1993, however, a sign of improvement in the share of rural branches can be observed by the end of our study period. It is worth mentioning here that this decline in share does not mean that there is a decline in absolute number of bank offices in rural areas. In semi urban areas, share of bank offices has improved over the period. Similar gain in the share of bank offices has been observed in urban and metropolitan areas as well. Rise in share of bank offices in semi-urban, urban and metropolitan areas indicates comparatively high rates of expansion of bank offices in these areas which are relatively developed. In other words, the decline in share of bank offices in rural area may be a reflection of relative neglect in expanding bank offices in rural areas.

Although number of bank branch has expanded over the years, population per branch did not show any declining trend till 2007-08.[16] During 1990-91, population per branch

was 14 thousand which has further deteriorated and increased to 16 thousand in 2004-05. Thereafter, a continuous decline has been observed in population per branch in the subsequent years and at the end of 2013-14, the number of population per bank office declined to around 11 thousand. This reflects the expansion of banking services in absolute term taking the growth of population into account.

Comparison of branch expansion according to bank group portrays more disaggregated picture. Tables 4.3 to 4.6 presents the break up data for branch expansion for different groups of bank according to their ownership. It is observed that, majority of the bank branches in rural, semi-urban, urban and metropolitan areas are owned by public sector. However, a declining trend can be seen in the share of public sector banks in all four categories over the period of our study. In rural areas, almost 95 percent bank offices were under public sector in 1994-95 which has declined to 91 percent in 2012-13. Share of private sector banks was merely 5.55 percent in 1994-95 which has improved its presence and its share in total bank offices in rural areas increased to 8.91 percent. Number of foreign bank offices in rural areas are found to be negligible and only 8 foreign bank offices were operating in 2012-13. In semi-urban areas, presence of private sector bank has increased significantly as an increase of 8.8 percentage points is noticed in its share during 1995 to 2013. During the same period, public sector bank lost about 9 percentage points in its share while private sector banks gained nearly same in the same magnitude. It can be seen from the table that presence of foreign bank offices in semi-urban areas is very small. A similar declining trend in the share of public sector bank offices and rising private sector bank offices have been observed in urban and metropolitan areas as well. In the metropolitan areas, the share of public sector banks has declined by 11.5 percentage points while share of private sector bank offices has registered an increment about 12 percentage point. Over the years, there is a decline in the share of foreign banks in metropolitan areas. With 250 bank branches in 2013, the presence of foreign bank in metropolitan areas is not very impressive.

The above discussion shows that in terms of share of bank offices or branches, private sector bank has expanded considerably in all areas according to population group while share of public sector bank has declined over the sample period of the present study. In order to assess relative growth of bank offices according to different ownership and population group, we estimated CAGR of number of offices over the period of 1994-95 to

Table 4.3: Trend in Expansion of Bank Office in Rural Areas (in Numbers)

Year	1995	2000	2005	2010	2013
Public Sector Bank	19389	19393	18209	19618	24147
	(94.45)	(94.46)	(94.64)	(94.33)	(91.06)
Private Sector Bank	1140	1137	1031	1175	2363
	(5.55)	(5.54)	(5.36)	(5.65)	(8.91)
Foreign Bank	0	0	0	5	8
	(0.00)	(0.00)	(0.00)	(.02)	(.03)
Total Banks	20529	20530	19240	20798	26518

Note: Figures in parentheses represent percentage of total. Bank office including administrative offices. Source: Statistical Tables Relating to Banks in India (Various Volumes); Reserve Bank of India

2012-13. The estimated CAGR is presented in Table 4.7 and shown graphically in figure 4.3. It is clear from the figure that the growth rate of bank offices is much rapid in metropolitan areas as compared to other three population categories. Overall, number of bank offices or branches has grown by 5.22 percent in metropolitan areas while the growth rates of rural, semi-urban and urban areas are 1.43 percent, 4.36 percent and 4.50 percent respectively. It has been observed that CAGR of branch expansion among the private banks

Table 4.4: Trend in Expansion of Bank Office in Semi-Urban Areas (in numbers)

Year	1995	2000	2005	2010	2013
Public Sector Bank	10215	10894	11078	14892	19794
	(87.18)	(86.40)	(86.52)	(82.60)	(78.29)
Private Sector Bank	1498	1712	1725	3129	5477
	(12.78)	(13.57)	(13.47)	(17.35)	(21.66)
Foreign Bank	3	2	0	6	10
	(0.02)	(0.01)	(0.00)	(0.03)	(0.03)
Total Banks	11716	12608	12803	18027	25281

Note: Figures in parentheses represent percentage of total, Bank office including administrative offices. Source: Statistical Tables Relating to Banks in India (Various Volumes); Reserve Bank of India

Table 4.5: Trend in Expansion of Bank Office in Urban Areas (in numbers)

Year	1995	2000	2005	2010	2013
Public Sector Bank	8305	9274	10074	14115	16507
	(89.03)	(87.96)	(83.98)	(81.34)	(80.06)
Private Sector Bank	1008	1255	1893	3175	4044
	(10.80)	(11.90)	(15.78)	(18.29)	(19.61)
Foreign Bank	15	14	28	61	66
	(0.16)	(0.13)	(0.23)	(0.35)	(0.32)
Total Banks	9328	10543	11995	17351	20617

Note: Figures in parentheses represent percentage of total, Bank office including administrative offices. Source: Statistical Tables Relating to Banks in India (Various Volumes); Reserve Bank of India

Table 4.6: Trend in Expansion of Bank Office in Metropolitan Areas (in numbers)

Year	1995	2000	2005	2010	2013
Public Sector Bank	7076	7886	9768	13028	153028
	(89.37)	(86.03)	(82.89)	(80.22)	(77.87)
Private Sector Bank	693	1103	1799	2973	4124
	(8.76)	(12.03)	(15.26)	(18.30)	(20.86)
Foreign Bank	147	177	217	238	250
	(1.85)	(1.93)	(1.84)	(1.46)	(1.26)
Total Banks	7907	9166	11784	16239	19769

Note: Figures in parentheses represent percentage of total, Bank office including administrative offices. Source: Statistical Tables Relating to Banks in India (Various Volumes); Reserve Bank of India

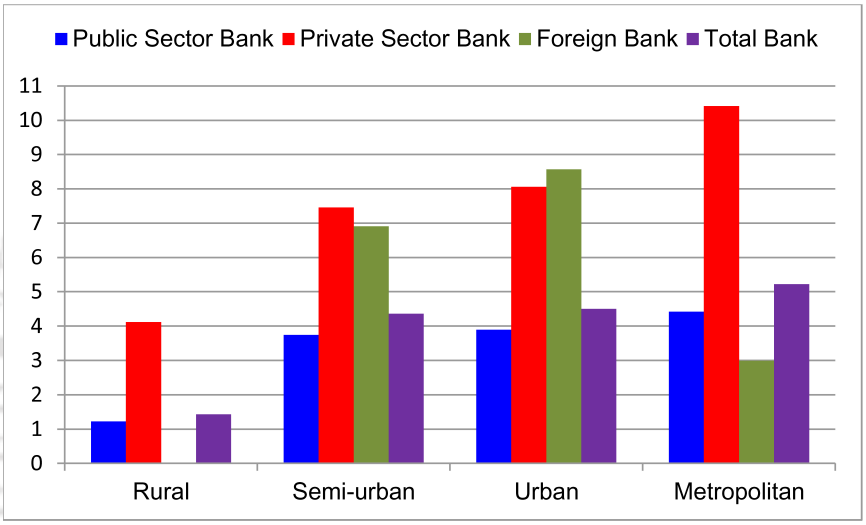
is the highest in metropolitan and rural areas where it grows over 10 percent and 4 percent respectively. In urban areas foreign bank has grown at much faster rate (8.57 percent) than private and public banks. It is worth mentioning that rate of expansion of public sector bank branches was somewhat lower as compared to the overall growth of bank branches in all four categories according the size of population. In rural areas, public sector bank branches expanded at a meagre rate of 1.22 percent during the period 1994-95 to 2012-13 while the overall rate of expansion was 1.43 percent.

Table 4.7: Compound Annual Growth Rates of Bank Branches (1994-95 to 2012-13)

Banks/Area	Rural	Semi-Urban	Urban	Metropolitan
Public Sector Banks	1.22	3.74	3.89	4.42
Private Sector Banks	4.12	7.46	8.03	10.41
Foreign Banks	-	6.91	8.57	2.99
Total Banks	1.43	4.36	4.50	5.22

Note: Data of foreign banks is not available for the year 1994-95 for rural areas.

Figure 4.3: Compound Annual Growth Rates of Bank Branches



Similarly, the rate of expansion of public sector banks were 3.74 percent, 3.89 percent and 4.42 percent respectively for semi-urban, urban and metropolitan areas, whereas the corresponding overall growth rates were 4.36, 4.50 and 5.22 percent. Higher rates of CAGR in urban and metropolitan areas reveal that expansion of banking services in penetrating at a faster rate in relatively developed areas compared to rural and semi-urban areas. Furthermore, higher growth rate of private banks indicates the emerging space for private sector and increasing competition in the baking services in India.

In addition to the considerable expansion in number of offices, the commercial banking sector in India has shown a rapid growth in the accumulation of deposit and corresponding credit. Aggregate deposit has increased from ₹ 2.01 lakh crore in 1991 to ₹ 79.13 lakh crore in 2014, corresponding figures for credit was ₹ 1.22 and ₹ 61.39 lakh crore in 1991 and 2014 respectively (Refer Table 4.2). Credit deposit ratio which indicates the capacity of banks in transforming its liability into asset has also improved from 60.60 percent in 1991

to 77.60 percent in 2014 i.e. an improvement of about 17 percentage point. Deposits as a proportion of Net National Income has also gone up from about 48 percent in 1991 to 86.30 percent in 2014. It can be seen that the deposit as share of national income was well below 50 percent up to 1999 for most of the years. However, a steady and continuous progress has been observed since 2002 and finally deposit as percentage of national income increased to 86.3 percent in 2014. Priority sector lending which has been capped at minimum of 40 percent of aggregate advances has remained around 35 percent during our study period.

The discussion in this section reveals that overall banking services in India has made considerable progress in terms of parameters such as number of bank branches, deposit, credit, credit-deposit ratio and other parameters such as deposit as proportion of national income etc. The various banking indicators discussed above reflect that the performance of banks in India has somewhat improved over the years. However, the availability of several indicators makes it difficult to trace the overall performance of the banking services. Therefore, in order to capture the overall performance of banking services in India, TFP growth has been estimated of the banking services. In the following sub-section, discussion in the pattern of TPFG in banking services is presented.

4.5.2 Total Factor Productivity Growth of Banking Services in India

In this subsection trends in productivity growth of commercial banks have been discussed. Growth in TFP across different ownership group and for overall banking service in India has been presented in Table 4.8. Estimated productivity growth indicates fluctuation in total factor productivity which makes it difficult to compare the pattern of annual growth over the years. In order to make annual productivity growth comparable, geometric mean for the entire period has been estimated which reveals that over the entire sample period, overall productivity of banking sector in India has increased moderately. On an average the banking sector in India has shown a one percent growth in productivity during the period 1991-92 to 2014-2015. Considering banks according to their ownership, it is found that TFP of public sector has grown by 2.1 percent during the period. Foreign banks has also shown a growth of on an average of 1.1 percent in its productivity. In contrast to public sector and foreign banks, a decline in productivity growth is recorded among private sector banks. It is clear form the table that in terms of productivity, performance of pubic sector bank is better than the other two categories of banks during the entire sample period.

However, a slightly different picture has been observed when overall productivity growth is estimated under two different sub-period i.e. 1991-92 to 2005-06 and 2006-07 to 2014-15.[17] Overall productivity of banking sector in the first sub period has registered moderate growth of 0.5 percent while in the subsequent period i.e. 2006-07 to 2014-15, productivity of banking service has grown at much faster rate (2.4 percent). In terms of bank ownership, during the first sub-period, public sector bank attained productivity growth of about 2 percent while private sector registered decline in their productivity. During the period, moderate growth in productivity can be observed among foreign banks. In contrast to the first period, in the second sub-period, all categories of bank exhibit growth in their productivity. During the second period, productivity of public sector bank grew by about 2.5 percent while the rate of productivity growth for private sector bank and foreign banks were 1.6 percent and 2.1 percent respectively. The analysis reveals that, productivity of banking sector in India has improved over the sample period considered in the study. It has also been observed that public sector bank outperformed its private and foreign counterparts in terms of productivity growth at least in the time period considered in the present study.

In the discussion of TFP growth across categories of bank over the years, it has been found that banking services in India have registered moderate productivity growth during our sample period. Furthermore, the present study observes variation in the growth of TFP across the groups of bank such as public sector banks, private sector banks and foreign banks. In order to analyse the differences in growth of TFP or what drives the growth of TFP across banks', the following section makes an attempt to examine possible determinants of productivity growth with the help of a regression analysis.

4.5.3 Determinants of Productivity Growth:

In the discussion of the growth of TFP across banks in India, it is observed that the growth differs across categories of banks in terms of their ownership. Considering the differences, the present study attempts to identify probable determinants of TFP growth across banks' with the help of a panel data regression analysis. In the regression analysis, TFPG index obtained in the previous section is considered as the dependent variable. The explanatory variables employed in the regression analysis are based on the available literature.

Theoretically, performance of a bank depends on two broad sources, the bank specific

Table 4.8: Growth in TFP by Category of Ownership of Banks

Year	All Banks	Public Sector banks	Private banks	Foreign banks
1991-92	1.055	1.048	1.038	1.083
1992-93	0.996	0.961	0.952	1.083
1993-94	1.105	1.083	1.067	1.173
1994-95	1.105	1.083	1.066	1.173
1995-96	0.927	0.974	0.862	0.961
1996-97	0.944	1.045	1.012	0.786
1997-98	0.935	1.049	1.013	0.795
1998-99	0.999	1.017	1.035	0.950
1999-00	1.087	1.046	1.071	1.139
2000-01	1.043	1.029	1.013	1.096
2001-02	1.047	1.019	0.982	1.126
2002-03	0.990	1.030	0.961	0.986
2003-04	1.002	1.022	1.006	0.974
2004-05	1.013	0.996	0.907	1.152
2005-06	0.879	0.901	0.905	0.832
2006-07	0.961	1.017	0.966	0.904
2007-08	1.026	1.041	1.011	1.023
2008-09	1.089	1.065	1.072	1.129
2009-10	1.049	1.027	1.004	1.111
2010-11	1.041	1.050	1.013	1.056
2011-12	1.082	1.111	1.102	1.044
2012-13	1.010	1.044	1.033	0.968
2013-14	0.953	0.960	0.959	0.945
2014-15	0.993	0.923	0.998	1.048
Geometric mean by sub-period				
1991/92-2014/15	1.010	1.021	0.999	1.011
1991/92-2005/06	1.005	1.018	0.991	1.005
2006/07-2014/15	1.024	1.025	1.016	1.021

Note: 1990-91 has been considered as base year.

micro factors and overall macro environment in the economy (Clair, 2004). The first set is the bank specific micro factors which include various bank related factors such as risk exposure, operating strategies, and the degree of management expertise. The second set consists of the overall macro economic variables in the economy including GDP, exchange rate, inflation etc. Gonzalez et al. (1997) took evidence from their study on 1994 Mexican financial crisis and suggested that soundness and failure of a bank depends on bank specific factors and macro economic conditions. Bank specific micro factors are defined by different operational framework which are applicable to banks whereas the state of the economy where the banks operate is defined by the macroeconomic environment of the economy. Singh and Sharma (2016) mentioned the influence of macro factors on the liquidity of banks and explains that macro factors are external in nature as the bank management does not have any control over it. In the present context, these two sets of independent variables are regressed on total factor productivity growth, estimated in the previous section. In the regression framework, the first set of variables are bank specific micro variables which directly affect a particular bank in its output and input decision. The other set of variables are the macro economic variables which determines the overall economic activities in an economy.

Explanation of the explanatory variables and their expected relation with the dependent variable are briefly discussed in the following two subsections.

4.5.3.1 Bank Specific Variables

Ratio of non interest income to total asset: Ratio of non interest income to total asset indicates bank's income other than interest income. In other words non interest income reflects income from non traditional activities. It is taken as an explanatory variable in the model as a proxy for bank's earnings from non traditional activities such as commission, exchange and brokerage, sales of investment, sale of other asset etc. Reddy and Nirmala (2013) have mentioned that non traditional activities which can be offered using existing resources or infrastructure along with traditional banking services can improve efficiency of a bank. According to Ariff and Can (2008), ratio of non-interest income to total asset shows the extent of fee-based services of a bank. They also noted that an efficient bank earn more in the category of non interest income.

Ratio of intermediation cost to total asset: Intermediation cost to total asset can also be

defined as operating expenses to total asset. Operating expenses include expenses other than interest related expenses. Operating expenses include payment and provision to employees, rent, taxes and lighting, printing and stationery, law charges, insurance etc. This ratio is used as proxy of management quality as explained in Sufian (2009). In a study of bad loans and cost efficiency of commercial banks, Berger and DeYoung (1997) pointed out that "bad management" which is reflected through poor management practice in day to day operation of bank reduces cost efficiency of banks. Sub-par manager fails to sufficiently monitor operating expenses of a bank which in turn adversely affect cost efficiency.

Total asset: Considering total asset of a bank as its size, Hauner (2005) pointed out two channels through which size of a bank may positively affect its cost efficiency. First, the author argued that if size is positively related to market power then larger banks are likely to pay less for their inputs. Secondly, increasing size of a firm may reduce input per unit of output thus operating in increasing returns to scale allowing the firm to work more efficiently. According to Reddy and Nirmala (2013), on the one hand larger size of bank asset provides an opportunity to exploit economies of scale, better opportunity in risk diversification and better efficiency to deal with unforeseen shocks, but on the other hand it increases cost to the bank. Therefore, they argued that the expected relation of the size of asset is unpredictable.

Total deposit: Total deposit of the bank has been used as proxy of market share of the bank. Larger share of market indicated by large deposit improves banks' ability to invest its resources in traditional banking along with other non traditional banking activities. However, large deposit is also associated with increasing interest and other management costs. Following Sufian (2009), this study also does not make any prior expectation about the probable relation of total deposit.

Capital Adequacy Ratio: The present study has also included capital adequacy ratio (CAR) as one of the independent variables. CAR is the ratio of capital to risk weighted asset. CAR is obtained by dividing the capital of the bank with aggregated risk weighted assets for credit risk, market risk and operational risk. Higher CAR indicates better capitalization of a bank (Reserve Bank of India, 2015). Bernauer and Koubi (2002) pointed out that well capitalized banks are less likely to fail as sound capital base helps these banks to attract funds at lower cost. Contrary to this, an insufficiently capitalized banks is less likely to withstand adverse development of balance sheet of a bank and hence prone to

fail. Das and Ghosh (2006) pointed out that banks with higher CAR or well capitalized banks face comparatively lesser risk in contrast to those banks with poor capitalization. Comparatively lesser risk enables well capitalized banks to reduce their cost of borrowing and thus improve their efficiency.

4.5.3.2 Macro Economic Variables

Gross Domestic Product (GDP): The present study has included Gross Domestic Product as one of the determinants of bank efficiency in India. Growth of GDP may influence cost efficiency of a bank through changes in macro economic affects on cost structures of bank (Hauner, 2005). Sufian (2009) included log value of GDP as proxy of overall economic condition to measure association between bank efficiency and economic condition. However, the author mentioned that it is difficult to make any priory expectation of the direction of the relation. Reddy and Nirmala (2013) also mentioned that the expected direction of influence of annual growth rate of GDP to profit efficiency is unpredictable. They put forward the argument that a growing economy generates greater cash flow of banks and other banking activity which in turn may positively influence banks' profit margins. However, in contrast to that higher demand for banking services led by higher economic growth also raise banks' expenses which result in low profits.

Inflation: Inflation can be considered as an important macro economic factor in determining bank productivity. Inflation affects costs as well as revenues of banks (Reddy and Nirmala, 2013). As a result, inflation has important influence on productivity growth of a bank. Revell (1979), pioneer in the discussion of inflation and its relation to financial institutions noted that the effects of inflation on the profits of bank depends on the bank's adjustment of wages and other operating expenses with the inflation. In the present study, wholesale price index (WPI) for all commodities has been used as proxy for the inflation in the economy. The selection of WPI for all commodities as a measure of inflation is guided by the unavailability of one representative measure of consumer price inflation or wholesale price inflation in India. In the present context, no prior expectation could be made on the sign of the coefficient of this variable.

Fiscal Deficit: Fiscal deficit (FD) has been incorporated in the present study in order to capture the likely affect of fiscal policy in the economy. Similar to GDP, prior expectation about the relationship from FD to bank productivity is difficult. In macroeconomics, fiscal

policy is termed as expansionary if public expenditure exceed public revenue whereas it (a fiscal policy) would be said to be contractionary when public expenditure falls short of public revenue. Zagler and Durnecker (2003) notes that public expenditure can be divided into two categories i.e. productive and non-productive expenditure. If public expenditure are productive, then deficit borne out of that productive government expenditures exhibits indirect effect on long-run economic growth. The effect on long run economic growth can also be expected to affect other micro economic activities including banking services. Rakshit (2009) in the context of India, argues that higher fiscal deficit indicates higher borrowing by the government for its expenditure which raises the interest rate and as a result private investment tend to fall. However, if the fiscal deficit is financed through the net RBI credit, there is an increase in reserve money. The increased reserve money then augments supply of bank and non-bank credit which further boosted through the money multiplier mechanism.

Prime Lending Rate: Prime lending rate (PLR) has been selected to capture the monetary policy signal of the economy. PLR is the rate at which banks lend to its credit worthy borrowers. Higher rate of PLR results in lower borrowings which may reduce banks profitability and vice-versa. In a detailed analysis of different instruments of the central bank to control monetary fluctuations in India, Bhaumik et al. (2011) points out that there are several instruments such as bank rate, CRR, repo rate and reverse repo rate. The availability of various instruments makes it difficult to select a single monetary policy instrument which reflects the monetary signals in India. However, in their study, the authors found Prime Lending Rates (PLR) to be the most appropriate to use as monetary policy instruments as it closely replicates other policy rates such as the bank rate and also the repo and reverse repo rates. Following Bhaumik et al. (2011) Prime Lending Rate reported by RBI has been used in the present study to capture the impact of monetary policy in the economy on the bank's total factor productivity.

Exchange Rate: Exchange rate is another macroeconomic channel which affects quality of assets in banks. In this context, Klein (2013) notes that exchange rate depreciation might have a negative impact on asset quality in countries with a large amount of lending in foreign currency to un-hedged borrowers. According to Popper (1996), exchange rate can affect the profitability of its domestic banking operations. Popper (1996) explains that an appreciation in exchange rate of a country to another country might negatively affect

the exporter of the first country as they might loose competitiveness against foreign firms. This may result in reduction in profitability of the exporter. This diminishes the probability of timely loan repayment, leaving negative impact on bank profitability.

Relevant data on all explanatory variables discussed above are obtained from Reserve Bank of India. In order to examine the impact of the two sets of variables discussed above in determining TFP growth of the banks, regression analysis is carried out using panel data framework, where individual banks are considered as cross section units here. The study employed two linear models. In the first model, only bank specific micro factors are included while both bank specific micro and overall macro factors of the economy were considered as explanatory variable in the second one. Expected signs and notations of the explanatory variables discussed above and descriptive statistics of those variables are presented in Table 4.9 and 4.10 respectively. The present analysis is based on an unbalanced panel data set consisting the period 1995-96 to 2013-14. The period has been selected on account of availability of comparable bank specific as well as macro economic data. In order to remove extreme outlier in the dataset, a simple method outlined by Devore (2012, p.40) has been utilised. According to the method, an observation is considered as an extreme outlier if it is three times more of the difference between median of the largest and smallest half of the data series. In the model, the variables which are in absolute values i.e. GDP, total asset and total deposit are taken in their log form while those variables in ratios are included in their original form.

Using the notations shown in Table 4.9, the panel regression models are specified below.

Model 1:

$$TFPG_{it} = \beta_0 + \beta_1 NII_{it} + \beta_2 ICost_{it} + \beta_3 LnAst_{it} + \beta_4 LnDep_{it} + \beta_5 CAR_{it} + \mu_{it} \quad (4.4)$$

Model 2:

$$\begin{aligned} TFPG_{it} = {} & \beta_0 + \beta_1 NII_{it} + \beta_2 ICost_{it} + \beta_3 LnAst_{it} + \beta_4 LnDep_{it} + \beta_5 CAR_{it} \\ & + \beta_6 LnGDP_t + \beta_7 FD_t + \beta_8 WPI_t + \beta_9 PLR_t + \beta_{10} ExRate_t + \mu_{it} \end{aligned} \quad (4.5)$$

In the equation, TFPG is the Malmquist Productivity Index estimated in section 4.4.2. (Jeon and Miller, 2004) and Jeon and Miller (2005) used fixed effect panel model in their study of performance of Korean banks and have pointed out that fixed effect model makes

interpretation of the parameters appropriate when the whole population of banks rather than sample from it is used. The present study also deals with large number of cross sections and likely to be affected by unobserved cross section heterogeneity.

In the present study, Hausman model specification test has been conducted and follow-

Table 4.9: Description of Variables used in the Regression Analysis

Variables	Notation	Expected sign
Non Interest Income to Total Asset	NII	+
Intermediary Cost to Total Asset	ICost	-
Capita Adequacy Ratio	CAR	+
Log value of Total Asset	LnAst	+/-
Log value of Total Deposit	LnDep	+/-
log of GDP	LnGDP	+/-
Ratio fo Fiscal Deficit to GDP	FD	+/-
Wholesale Price Index	WPI	+/-
Prime Lending Rate	PLR	-
Exchange Rate	ExRate	-

Table 4.10: Descriptive Statistics of Determinants of TFP Growth

Variable	Mean	Std. Dev	Min	Max
Ratio of Non Interest Income to Total Asset	1.58	0.85	-2.04	5.10
Ratio of Intermediary Cost to Total Asset	2.36	0.81	0.48	5.80
Capita Adequacy Ratio	15.50	13.45	0.83	168.11
Log value of Total Asset	13.06	1.73	7.39	17.71
Log value of Total Deposit	12.75	1.88	6.35	17.45
log of GDP	10.29	0.37	9.76	10.96
Ratio fo Fiscal Deficit to GDP	5.01	0.99	2.54	6.46
Wholesale Price Index	101.97	31.43	64.92	177.60
Prime Lending Rate	11.56	1.89	8.25	16.50
Exchange Rate	45.44	5.72	35.42	61.02

Source: Various issues of Statistical Table Relating to Banks in India and Handbook of Statistics on the Indian Economy. This table presents the summary of data after removing the outlier.

Table 4.11: Determinants of Bank Productivity

	Model 1		Model 2	
Variable	Coefficient	't' Statistic	Coefficient	't' Statistic
NII	0.025	3.50***(0.007)	0.019	2.54**(0.007)
ICost	-0.031	-3.95***(0.007)	-0.028	-3.15***(0.008)
CAR	0.002	1.65(0.001)	0.0009	0.58(0.001)
LnAsset	0.018	0.53(0.035)	0.0221	0.64(0.0347)
LnDep	-0.035	-1.02(0.034)	-0.058	-1.68*(0.0347)
LnGDP	-	-	0.035	0.41(0.085)
FD	-	-	0.015	3.36***(0.004)
WPI	-	-	-0.0010	-0.98(0.001)
PLR	-	-	-0.009	-1.67(0.005)
ExRate	-	-	0.0024	1.32(0.001)
Constant	1.22	14.13***(0.086)	1.14	1.25(0.922)
R^2	0.13		0.16	
F	7.43***		7.10***	
Hausman Test	29.10***		42.97***	
Sample Size	1200		1200	

Note: Figures in parentheses represent standard error. '***', '**, and '*' indicate significance at 1, 5 and 10 percent respectively.

ing the results of Hausman test, fixed effect model has been considered appropriate over random effect model in both the regression models. Estimation of the regression model has been carried out using statistical software STATA 14.1. Results of fixed effect panel regression model based on equation 4.4 and 4.5 are presented in Table 4.11. 'F' statistic, which indicates joint significance of the coefficients is found to be significant at 1 percent level for both the models. For model 1, the results show that ratio of non interest income to total asset has positive relationship with productivity growth of bank and the relationship is statistically significant at 1 percent. This implies that with increasing exposure to non traditional activities, productivity of bank increases. This finding is similar to earlier studies such as Kumar and Gulati (2014) in Indian banks and Sufian (2009) in Malaysian banking industry. Ratio of intermediation cost to total asset exerts significant negative im-

pact on banks' TFP growth. This suggest that increasing operating cost hampers banks' productivity growth in banks in India. Positive coefficient of *LnAst* although insignificant indicates that larger the banks' asset, higher is the TFP growth of a bank. The positive sign of bank size might be because of larger market power and increasing returns to scale as explained by Hauner (2005). Therefore, it can be said that increasing returns to scale has helped to reduce fixed cost of the larger banks and thus positively influence productivity growth of those banks. The regression results show an insignificant negative coefficient for *LnDep*. Describing such negative relationship between deposit to TFP growth, Sufian (2009) pointed out diminishing market leadership argument. According to this arguments banks with lower market share exhibit higher efficiency as large market share or expansion of market share increases costs and input requirement, which in turn reduces efficiency of a bank. Coefficient of capital adequacy ratio is found to have a positive sign but the coefficient is statistically insignificant. The positive coefficient supports the argument that well capitalized banks operates more efficiently and hence are more productive. In the second model (i.e. Model 2) also, among the bank specific micro factors, ratio of non interest income to total asset and ratio of intermediation cost to total asset are found to be significant at 5 percent and 1 percent level of significance respectively. In addition, log value of deposit which has been proxied for market share of a particular bank is found to be significant at 10 percent level of significance. Among the macro factors, ratio of fiscal deficit to GDP which has been used as proxy for fiscal policy of the government found to be positive and significant at 1 percent level while coefficient of other macro determinants are found to be statistically insignificant.

4.6 Summing Up

In the present chapter, an attempt has been made to explain the pattern and trends in growth of commercial banking service in India in terms of banking parameters such as expansion of branch, accumulation of deposit, credit etc. Moreover, the present chapter ha also tried to capture overall performance of banking services in terms of growth in their productivity under different ownership categories such as public sector banks, private sector banks and foreign banks. Finally, the present chapter makes an attempt to determine the effects of different bank specific and macro economic factors on the growth of productivity of banking services in India. The discussion reveals significant expansion in India's banking

services in terms of number of branch during the study period. In the overall bank composition, private sector bank has made considerable improvement while share of public sector bank declined over the period. This indicates an increasing space for private sector banks in Indian banking sector. Increasing presence of private banks is expected to bring more competition in the entire banking sector. It has been observed that, expansion of branch in metropolitan areas is much more rapid compared to rural, semi-urban and urban areas. Steady progress in other parameters such as accumulation of deposit, credit to deposit ratio, ratio of deposit to national income have also been recorded. The banking service in India also registered moderate growth in their productivity over the sample period considered in the study. The study found growth in productivity of banks owned by public sector is higher compared to banks owned by private sector and foreign banks. Overall banking sector has registered higher productivity growth during the latter part of the sample period compared to the earlier period. In the examination of possible explanatory factors of productivity growth in banking service, ratio of non interest income to total asset is found to be significant and positive while ratio of intermediary cost to total asset and size of deposit affects the productivity growth negatively. In addition, macro variable such as fiscal deficit is found to be positive in explaining the productivity growth among the banks. This might happen as a result of productive government expenditure which boosts overall economic activity in the economy.A negative coefficient of prime lending rate indicates that tight monetary policy reduces bank productivity. It is to be noted that the magnitude of the coefficients is somewhat different in the two models, however, the coefficients remain qualitatively same. This indicates that the results obtained in the regression analysis are robust.

In sum up, India's banking services has made considerable growth during the period of the present study. The study observes higher growth in productivity among the banks owned by public sector banks. This reveals that public sector banks have successfully withstood the competition brought in by the private and foreign banks in the Indian banking services. The findings of the study suggest that productivity growth among the banks can be improved by raising its non interest income and reducing operating cost.

5

Growth and Determinants of Telecommunication Services

5.1 Introduction

The discussion of the third chapter shows that among various other services sub-sectors, some of the sub-sectors such as communication experienced comparatively rapid growth during the last two-three decades. According to Gordon and Gupta (2004) and Eichengreen and Gupta (2011), Information and Communication Technology (ICT) or ICT enabled service categories are the fastest growers among overall services. They considered these service categories as the prime drivers of economic growth of India. However, despite this growth in ICT or ICT enabled services, the physical growth of these services is considerably low as substantial section of population in India is still out of the access of modern telecommunication facility such as basic telephone connection which is so crucial for overall economic development.[18] It is important to note that the telephone is one of the core instruments of modern ICTs among various other instruments such as radio, television and internet. With the advent of modern ICTs, the number of telephone subscribers have grown substantially across the globe. However, this growth is not uniform among the countries and there exists significant disparities. For example, according to the World Bank database, one fourth of the population in countries like Brazil, China and South Africa had telephone connections at the beginning of the current century, while only four percent people had a telephone connection in India. In the next fifteen years, countries like Brazil, China and South Africa have registered phenomenal growth and recorded more than hundred percent telephone connections. During this period India has also experienced remarkable growth in the number of telephone subscribers although not at par with the global trend.[19] Despite

being one of the fastest growing telecom markets and substantial increase in the number of telephone connections in the last decade, digital divide continues to be significant in India (Government of India, 2012). Moreover, the growth in the access to telecommunication is also not uniform across states in India. Several studies documented the uneven growth in number of telephone subscribers and highlighted the prevailing digital divide or digital gap across states in India (Sridhar, 2010; Ghosh and Prasad, 2012). It is interesting to note that the disparity in access to telecommunication across the states exists in spite of similar policy framework guides the matters of telecommunication throughout the length and breadth of the country.

In this context, the present chapter is an attempt to capture the growth of telecommunication services in terms of teledensity across states in India. In doing so, inter-state disparities and spatial disparity between urban and rural area during the period 2001 to 2015 are examined. The present study investigates the pattern of teledensity and its changing dynamics across states over the sample period. Furthermore, the study also examines the effect of net state domestic product in explaining the existing differentials in terms of teledensity across states. Specifically, this chapter attempts to answer the following research questions,

i. What is the trend in growth of basic telecommunication services in terms of number of telephone subscribers and teledensity?

ii. What is the pattern of interstate teledensity and its dynamics over the years?

iii. what are the drivers of telecommunication diffusion across states in India?

The discussion of the present chapter is organised into five sections including this introduction. Section two presents a brief discussion about the pattern and growth in telecommunication services in India. The third section discusses the sources of data and methods utilised in the present study. Section four analyses the empirical results of the study while summary of the chapter is presented in the fifth section.

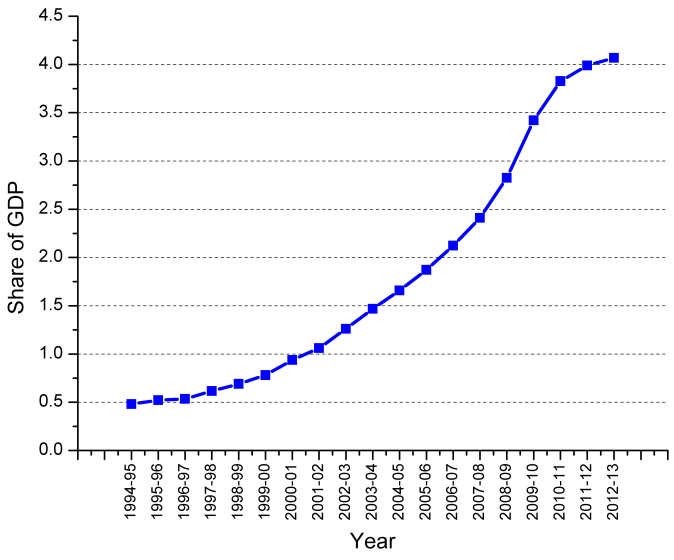
5.2 Telecommunication in India: the Growth Pattern

The brief literature review discussed in the introduction tells about the importance of telecommunication services in the overall economic development of a nation. Therefore,

for rapid economic development in India, better and efficient telecommunication services can be considered as one of the essential infrastructures. In this background, this section makes an attempt to capture the pattern of growth and trend in the telecommunications services in terms of teledensity in India during the period of 1994-95 to 2012-13. Selection of 1995 as the base year is crucial as cellular mobile service which has significant contribution to the overall growth in the number of telephone subscribers, started in India in the year 1994-95. Furthermore, this particular time period allows us to examine the most important telecom policies of government of India (i.e. National Telecom Policy 1994, New Telecom Policy 1999 and National Telecom Policy 2012) and their outcome. The basic parameter to trace the growth of any industry or services is its gross value addition. However, India's National Account Statistics does not provide information on gross value addition for telecommunication segment separately. Due to unavailability of data on gross value addition in telecommunication, the present study considers gross value addition for entire communication sector as proxy. The available data reveal that the sector has grown exponentially in terms of its contribution to the GDP of the country. Figure 5.1 presents the share of communication sector to the overall GDP of the country at 2004-05 prices for the period of 1994-95 to 2012-13.

The figure depicts that the contribution of communication sector to the GDP of the

Figure 5.1: Contribution of Communication Sector to the GDP of India



Source: Central Statistical Office, Government of India

Table 5.1: Category Wise Number of Telephone Subscribers (In Million) & Their CAGR

Year	Fixed line	Mobile Cellular	Total Subscriber
1995	11.98	0.08	12.05
2000	32.44	3.58	36.01
2005	50.18	90.14	140.32
2010	35.09	752.19	787.28
2013	29.03	886.30	915.34
CAGR (1995-2013)	5.04	68.15	27.19

Source: World Development Indicator 2014.

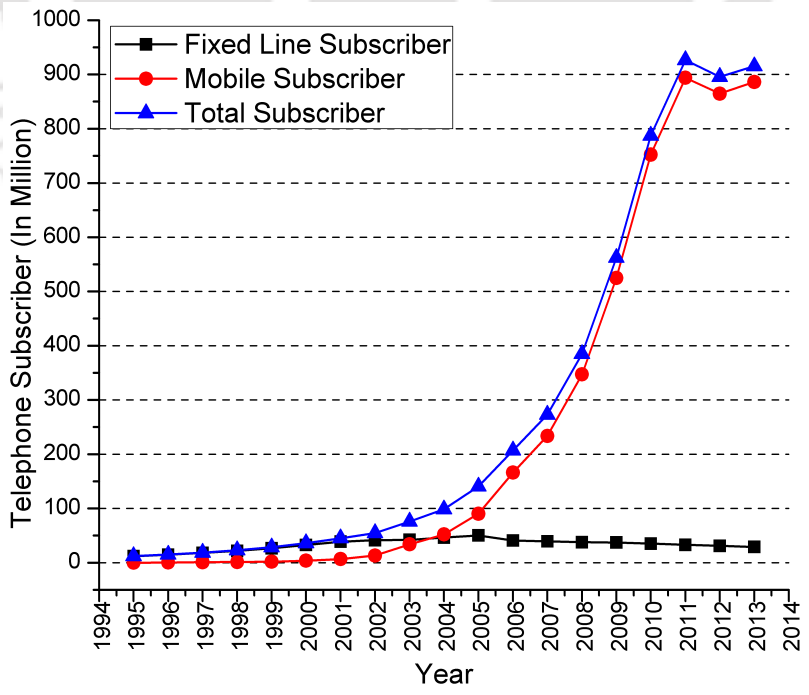
country was very low in 1994-95. During 1994-95, share of communication to GDP of the country was only 0.48 percent which almost doubled in 2000-01. It can be observed that the contribution of communication segment grew at slow rate during 1994-95 to 2000-01. During the subsequent ten years i.e. 2000-01 to 2010-11, sharp increase in the contribution of communication sector is observed. The share of communication sector has increased by more than four times during this period, i.e. from 0.94 percent in 2000-01 to 3.83 percent in 2010-11. Since 2010-11, a declining trend in the share can be observed from figure 5.1. However, contribution of communication continues to rise, and by the end of the year 2012-13, communication segment contributed 4.07 percent of the GDP of the country.

Another dimension to examine the growth of telecommunication services is to investigate the physical growth of telecommunication services in terms of number of telephone subscribers. Table 5.1 depicts number of telephone subscribers for the year 1995, 2000, 2005, 2010 and 2013. During 1995 to 2005, number of subscribers increased from 12.05 million to 140.32 million while in the subsequent 8 years total number of telephone subscribers have increased by more than 775 million. It is worth mentioning that, the growth in number of subscribers during the period 1995-2013 have mostly been driven by mobile telephone subscribers. In contrast to the rising number of mobile subscribers, number of fixed line telephone subscribers have declined over time. This can be seen more distinctly in Figure 5.2. Table 5.1 shows that the number of fixed line telephone subscribers was 11.98 million during 1995 which increased to 50.18 million in 2005. However, during the subsequent period, the fixed line subscribers have sharply declined. By the year 2013, fixed line subscribers have reduced to 29.03 million. In contrast, the number of mobile

telephone subscribers consistently registered rapid growth during the entire period from 1995-2013. In 1995, the number of mobile telephone subscribers was only 0.08 million but it slowly increased to above 3.5 million during the subsequent five years. Since then the number of mobile subscribers have started growing exponentially and its number stood at 90.14 million in 2005. During the next five years, the number of mobile telephone subscribers has climbed up to 752.19 million and reached 886.30 million in 2013. It can be seen that the growth of subscribers in telecommunication was relatively slow till 2005 even after more than a decade of economic liberalisation. However, in the subsequent eight years (i.e. 2005-2013), the growth in numbers was considerably high. During this period number of telephone subscribers have gone up by more than 775 million compared to only 128.27 million during 1995-2005. To get more insight of the growth, Compound Annual Growth Rate (CAGR) of number of subscribers is estimated for both the segments i.e. for number of fixed line telephone subscribers and number of mobile telephone subscribers separately along with overall growth rate. Table 5.1 also presents the estimated growth rates.

It can be seen that the number of fixed line telephone subscribers grew at a compound

Figure 5.2: Number of Telephone Subscribers in India (1995-2013)



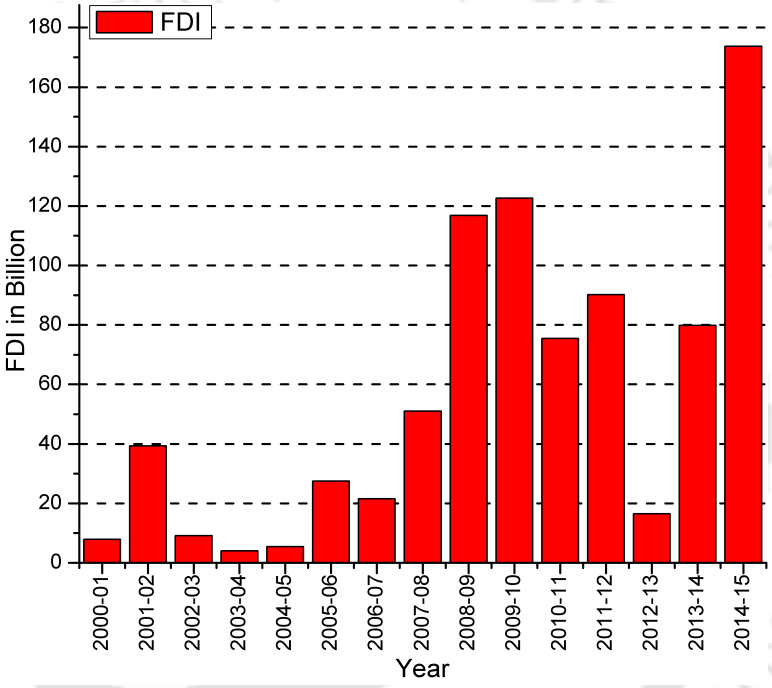
Source: World Development Indicator 2014

growth rate of 5.04 percent annually for the period of 1995-2013, while mobile cellular telephone subscribers grew at a rate of more than 68 percent. During the period, total number of telephone subscribers have grown at CAGR of 27.19 percent annually. This comparison of CAGR clearly indicates the importance of mobile telephone in the expansion of overall telecommunication services in India.

However, a mere look at the number of subscribers or at their growth rate may not give a deeper insight on how well the telecommunication services have penetrated in a large and diverse country like India. Therefore, the present study has utilised the concept of teledensity which is a simple indicator used in the literature of telecommunication in order to look at the pattern of growth in the telecommunication services in India.[20] In line with the rising number of subscribers, India's teledensity has also improved over the years. Considerable improvement in teledensity in India, particularly after liberalisation can be attributed to structural changes related to telecom policy which started with the process of economic reforms in 1990s when private players were allowed to operate in India (Panagariya, 2008). The entry of private players brought structural changes in the telecommunication sector from government monopoly to market competition. Further, National Telecom Policy 1994 (NTP 1994) and New Telecom Policy 1999 (NTP 1999) brought major changes related to telecom policies in India. It was mentioned in the NTP 1994 that during that time teledensity in India was one of the lowest as compared to the world average. The policy document pointed out that teledensity of India was lower than many developing countries like China, Pakistan, Malaysia etc. Therefore, with an aim to improve the telecommunication scenario in India, NTP 1994 set some physical targets such as telephone services on demand and telecommunication services to all village by 1997, at least one Public Call Office (PCO) for every 500 persons by 1997 in urban areas etc. In order to achieve these ambitious targets, NTP 1994 emphasised on making use of private investment in Indian telecom sector. However, the policy failed in attaining its physical targets particularly in rural telephony (Prasad, 2008). The government realised that the outcome of privatisation was far from satisfactory. The main reason was the deficit in revenues of the operators to make resources available to complete their projects (Government of India, 1999). Furthermore, according to Panagariya (2008), Department of Telecommunication put in place some rigid rules which were not favourable to the private operators resulting in huge financial losses to them. Considering the poor achievements of NTP 1994, the gov-

ernment announced NTP 1999 with a new policy framework which further liberalised the scope of telecom sector. NTP 1999 highlighted the importance of telecommunications in the achievement of other social and economic goals of the country. The policy set teledensity target of 7 and 15 by the year 2005 and 2015 respectively. NTP 1999 also allowed up to 49 percent FDI under automatic route in order to boost private investment in the telecom sector.[21]

Figure 5.3: Inflow of Foreign Direct Investment (FDI) to the Telecommunication Sector in India During 2000-01 to 2014-15 (₹ in Billion)



Source: Department of Telecommunication; Government of India

In Figure 5.3, year wise inflow of FDI in India's telecom sector during 2000-01 to 2014-15 is presented. The figure clearly shows considerable inflow of FDI in telecommunication sector in India during the period. It can also be observed that flow of FDI was comparatively more during 2007-08 to 2014-15 as against during 2000-01 to 2006-07. The entry of private investment and service providers brought a major shift in the telecommunication sector in India which can be seen in terms of rising number of subscribers and consequent increasing teledensity. However, this rise in overall teledensity is not uniform across urban vis-a-vis rural areas and significant disparity exists between the two regions in terms of teledensity. The disparity in urban and rural teledensity can be viewed in Table

5.2, which presents teledensity for rural and urban areas along with the overall teledensity.

Table 5.2: Teledensity in India (Rural, Urban and Overall)

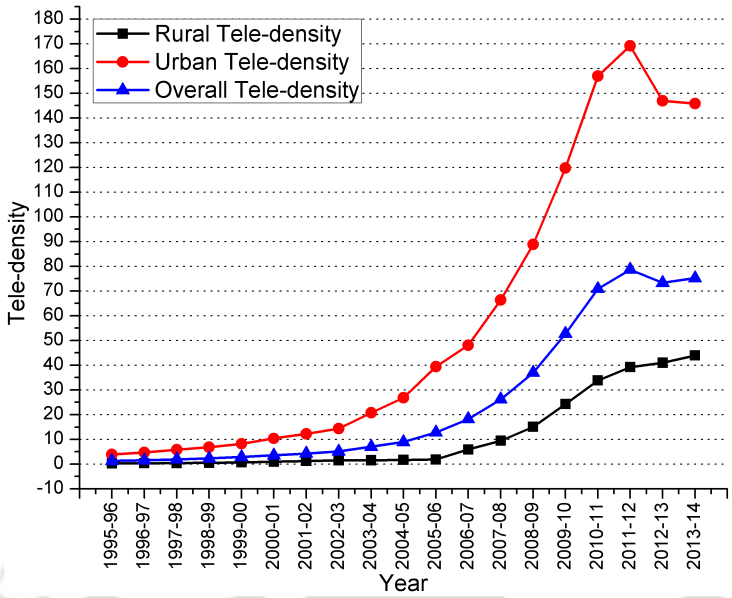
Year	Rural Teledensity	Urban Teledensity	Overall Teledensity
1995-96	0.29	3.95	1.28
1996-97	0.34	4.76	1.56
1997-98	0.43	5.78	1.94
1998-99	0.52	6.87	2.33
1999-00	0.68	8.23	2.86
2000-01	0.93	10.37	3.58
2001-02	1.21	12.2	4.29
2002-03	1.49	14.32	5.11
2003-04	1.57	20.74	7.04
2004-05	1.73	26.88	8.95
2005-06	1.86	39.45	12.86
2006-07	5.89	48.1	18.23
2007-08	9.46	66.39	26.22
2008-09	15.11	88.84	36.98
2009-10	24.29	119.73	52.74
2010-11	33.83	156.94	70.89
2011-12	39.26	169.17	78.66
2012-13	41.02	146.96	73.32
2013-14	43.96	145.78	75.23

Source: Department of Telecommunication, Government of India

The Table reveals that overall teledensity in India stood at meagre 1.28 percent in 1995-96, by the end of the year 1999-2000, teledensity increased to 3.58 percent. This represents very poor telephone penetration in India during that period as less than four people per 100 had a telephone connection. The slow pace of growth in teledensity in India continues till 2004-05. However, since 2004-05 a significant improvement in teledensity can be seen in Indian telecommunication service. It is impressive to observe that during 2004-05 to 2013-14 the overall teledensity has improved to 75.23 percent from 8.95 percent i.e. an

increment by more than 66 percentage points. Although the overall teledensity attained sizeable growth during the last ten years, the comparative picture of rural and urban areas is quite disappointing. While teledensity in urban areas registered rapid growth during the period, the growth of teledensity in rural areas remained very low. For example, urban teledensity has increased from 3.95 percent to 145.78 percent, an increment of more than 141 percentage points during the 1995-96 - 2013-14. In contrast, the picture of teledensity in rural India is very dismal as rural teledensity is still below 50 percent. During 1995-96 rural teledensity was only 0.29 percent, which increased to 1.73 percent during 2004-05. Although since 2004-05 it has shown a significant growth to 43.96 percent in 2013-14, yet more than half of the rural population are still out of the coverage of telecommunication services. A closer look at the data reveals that during the period 1995-96 to 2004-05 rural teledensity increased by 1.44 point, while in the same period, urban teledensity grew by 22.93 percentage points. In the following nine years i.e. 2004-05 to 2013-14, rural teledensity registered a growth by 42.23 points, whereas urban teledensity increased by a whopping 118.9 percentage points. This contrasting picture depicts that, telecommunication services in India has mostly concentrated in urban areas as compared to the rural areas leaving behind a wide scope to improve penetration of modern telecommunication services in rural areas of the country. Figure 5.4 shows the widening gap between rural and urban teledensity in India. Poor teledensity in rural areas as compared to urban areas indicates limited access of telecommunication services in rural India, which is a serious matter of concern as a developmental bottleneck. Another important point comes out form Figure 5.4 that the gap in teledensity between rural and urban areas has further widened during the period of 2005 to 2012, which is the phase of rapid telecom growth in India. In a report TRAI mentions that according to 61st round of National Sample Survey (NSS) data, rural households spend approximately one percent of their total expenditure on telephones as against 3.59 percent to their urban counterparts (Telecom Regulatory Authority of India, 2012). Small spending on telephones in rural areas might be because of poor spending capacity of rural households or lack of telephone services in those areas as compared to urban areas. Rego et al. (2013) also mentions that although there has been rapid growth of telecommunication industry in India, penetration rate of such services is lesser in rural as compared to urban areas which resulted in the low access of the services in rural areas. Concentration of telphone services in the urban areas has also been pointed out by Ghosh

Figure 5.4: Teledensity in India



Source: Department of Telecommunication; Government of India

and Prasad (2012).

Apart from the widening gap between rural and urban teledensity, inter-state differences in teledensity is also very large in India. For example, during 2000, teledensity in the Northeast region of India was 1.67 as compared to the national average of 2.85 percent. Mid term appraisal of the Ninth Five Year Plan pointed out that along with Northeast region, states like Bihar, Orissa (now renamed as Odisha), Jammu and Kashmir and Madhya Pradesh also registered a low teledensity during the same period. Considerably low teledensity in some states indicates that the penetration of telecommunication services in India is not uniform across states. Furthermore, it is also far away from universal access agenda of the government of India, according to which the Government of India committed to provide access to basic telecom services for all people at affordable and reasonable prices under NTP 1999. In addition, given the changing dynamics of the telecom sector and with an objective to provide secure, affordable and high quality telecommunication services to all citizens, the Government of India launched National Telecom Policy 2012 that envisaged broadening telecom infrastructure to enable in both rural and urban areas (Government of India, 2012).

In this context, the present chapter focuses on examining the growth pattern of teledensity among different states in India and their distribution dynamics over time. The study is

based on the data of 16 Indian states for the period 2000-01 to 2014-15.[22]

5.3 Data and Methods

5.3.1 Data

The relevant data for this study are obtained from five different sources: (i) Department of Telecommunication, Government of India; (ii) Handbook of Statistics on the Indian Economy; (iii) Ministry of Human Resource Development, Government of India; (iv) Office of the Registrar General and Census Commissioner India, Government of India and (v) Publications Division, Ministry of Information and Broadcasting, Government of India.

The present study obtains data on telephone subscription and teledensity from the annual reports of the Department of Telecommunication (DoT) which comes under the Ministry of Communications, Government of India. The study considers 2000-01 as the starting point because prior to 2000-01, the number of telecom subscribers in India starts rising rapidly since 2000-01 (refer figure 5.4).[23] However, the annual reports are available online only since 2007. Therefore, teledensity data for the remaining period (2001 to 2006) are extracted from http://www.indiastat.com. Government of India divided the entire geographical area of the country into twenty three telecom service areas referred to as "telecom circles". Among these circles, the jurisdictions for nineteen coincide approximately with the respective state borders while the remaining circles represent four metropolitan cities in India . Since one of the objectives of the present study is to examine the distribution dynamics across states in India, we intend to select a telecom circle that coincides with a single state. However, data related to teledensity in some of these circles are not uniform over the study period. These inconsistencies appear as three new states were carved out from erstwhile Bihar, Uttar Pradesh (UP) and Madhya Pradesh (MP) in the year 2000. Due to the formation of the new states, data on teledensity presented in the annual reports of DoT are not consistent for these states. For example, data for the new states were published separately from 2002 to 2011. Subsequently, the teledensity data for these states were merged with data for their respective parent states. Therefore, for consistency of data for the entire study period i.e. 2001-2015, teledensity for erstwhile Bihar, Madhya Pradesh and Uttar Pradesh are obtained by combining the data for the new states with the respective parent states. Similarly, data for the six northeast states namely Meghalaya, Mizoram,

Tripura, Arunachal Pradesh, Manipur and Nagaland were combined and reported as for North East for the year 2001 and 2002. During 2003 to 2011, data for these states were presented under two groups: North East-I that includes Meghalaya, Mizoram and Tripura; and North East-II that consists of Arunachal Pradesh, Manipur and Nagaland. Again in 2012, the agency went back to the earlier practice of presenting combined data for these six states as a single entity as North East. In order to construct and use a consistent data series, in this case, North East-I and North East-II are clubbed for the period 2003 to 2011 as well. Furthermore, continuous data on teledensity of Tamil Nadu and West Bengal cannot be obtained due to inconsistencies in the available data. For example, data on teledensity in Tamil Nadu are available excluding data for Chennai for certain years while they include data for the metropolitan city for other years. This lack of uniformity makes it difficult to construct consistent teledensity data for the entire state. Similarly, data for West Bengal include Andaman and Nicobar Islands for a number of years and include data for Sikkim for some other years. Therefore, Tamil Nadu and West Bengal are also excluded from the analysis of the present study.

Data on Per Capita Net State Domestic Product (NSDP) and gross value addition in services sector across states are gathered from various issues of the Handbook of Statistics on the Indian Economy published annually by the Reserve Bank India (RBI). The Handbook of Statistics on the Indian Economy presents data on NSDP at different base years. To make it comparable, the data are spliced to construct a continuous series of NSDP with a common base year. Relevant data on school enrolment ratio in the age group of 6-11 year are obtained from Statistics of School Education (various year) published by the Ministry of Human Resource Development, Government of India. Summary statistics of the variables discussed above are presented in Table 5.3.

5.3.2 Methods

The focus in this chapter is to examine the extent of penetration of telecommunication services across states in India and to examine the distribution dynamics of teledensity across states in India over the period 2001 to 2015. In order to examine how the distribution of teledensity in India has evolved over time, we first define a relative teledensity measure as follows.

$$R_{i,t} = Teledensity_{i,t} - \overline{Teledensity_t} \tag{5.1}$$

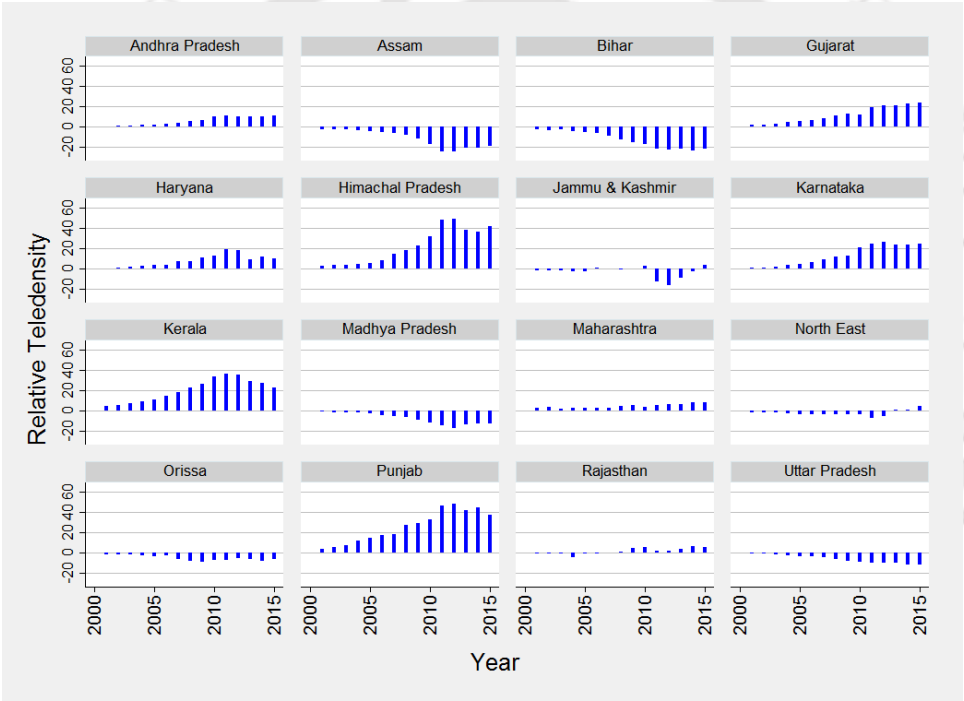
Table 5.3: Summary Statistics of the Major Variables across Sample States

	Teledensity (per 100 person)				Per Capita NSDP in Indian Rupee				Share of Services to NSDP				Enrolment Ratio			
State	Mean	Std.Dev	Min	Max	Mean	Std.Dev	Min	Max	Mean	Std.Dev	Min	Max	Mean	Std.Dev	Min	Max
AP	28.8	27.92	4.1	80.93	52509.25	11096.76	38494.94	68866	57.61	2.52	52.85	60.61	96.77	4.35	87.72	104.07
Assam	14.7	15.95	1.33	46.66	33740.34	4344.09	28344.23	41142	56.35	2.64	53.23	61.04	100.1	11.57	81.5	117.43
Bihar[a]	14.05	17.14	1.15	48.95	18871.96	3906.23	14759.77	26503.38	56.54	5.38	49.59	64.34	103.61	24.19	74.16	137.4
Gujarat	33.12	30.48	5.19	92.23	59024.95	17237.29	36497.75	87481	54.08	2.29	51.62	57.8	118.8	4.72	110.4	126.16
Haryana	31.53	30.66	4.07	89.42	76106.28	18508.62	52558.12	107343	56.37	4	48.88	62.16	84.68	6.48	75.25	94.9
H P	41.94	41.42	5.94	120.76	66175.17	12949.93	49441.44	87721	58.87	1.42	57.17	61.47	106.1	8.61	88.64	116.42
J & K	21.1	20.83	1.72	54.88	41752.57	5737.54	34687.17	51382	62.86	2.87	59.15	67.03	96.2	10.47	82.1	111.4
Karnataka	34.46	33.08	4.69	97.3	68110.08	14902.88	50936.96	89899	63.52	3.37	55.72	68.55	107.46	3.37	102.6	113.58
Kerala	42.77	35.9	7.67	106.91	69749.19	17512.9	47296.86	97912	74.66	2.31	70.3	78.05	92.1	3.83	85.5	98.11
Maharashtra	27.63	25.4	6.08	77.19	70369.81	18514.6	47921.42	98910	53.73	2.11	50.85	57.8	107.04	4.05	101.83	113.61
MP[b]	17.44	18.85	2.43	53.86	35371.31	6901.26	26332.16	46863.5	53.73	2.11	50.85	57.8	125.75	13.7	99.74	144.2
NE[c]	20.56	22.85	1.92	65.72	39640.53	7332.99	29735.82	52265.5	65.93	1.97	63.54	68.63	134.23	20.9	108.59	165.22
Orissa	19.14	22.62	1.5	65.88	36628.18	7873.68	25932.74	47019	58.32	3.2	52.55	63.3	115.47	6.86	103.02	129.69
Punjab	45.69	38.99	6.82	119.35	68250.79	10656.36	56879	85577	48.61	2.07	44.45	52.37	85.78	13.65	71.12	108.3
Rajasthan	24.47	26.23	1.32	73.05	41016.47	8649.06	29111.12	57427	56.76	2.28	51.66	59.63	114.09	7.55	97.25	122.36
UP[d]	18.65	20.93	2.14	61.02	27146.17	4667.28	22118.35	35224.56	56.07	2.88	50.71	59.22	104.64	15.95	65.69	118.02

Source: Author's estimation. Note: a. Includes Jharkhand, b. Includes Chhattisgarh, c. Includes Meghalaya, Mizoram, Tripura, Arunahcal Pradesh, Manipur and Nagaland. d. Includes Uttarakhand.

where, $R_{i,t}$ is the measure of relative teledensity while $Teledensity_{i,t}$ and $\overline{Teledensity_t}$ indicate absolute teledensity in state i in period t and national average in time t respectively. A negative value of $R_{i,t}$ implies teledensity below national average. In contrast, a positive value of $R_{i,t}$ indicates higher teledensity above the national average. The estimated relative teledensity of the states over the study period is presented in Figure 5.5 which shows that relative teledensity in eight of our sample states, namely Andhra Pradesh, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Maharashtra and Punjab remained positive throughout the study period while relative teledensity in Assam, Bihar, Madhya Pradesh, Odisha and Uttar Pradesh continued to be negative for the entire period.

Figure 5.5: Pattern of Relative Teledensity in sample States



Source: Estimated using data obtained from DoT, Government of India and http://www.indiastat.com

In case of the remaining three states i.e. Jammu and Kashmir, North East and Rajasthan, relative teledensity is found to be unstable and to fluctuate between positive and negative values around zero. The pattern of relative teledensity in the two groups, i.e. the states with positive relative teledensity and the one with negative relative teledensity, reveals that the deviation from the national average continues to rise until 2012. However, the pattern reversed since 2012 and a declining trend in the deviation is observed. In order to examine the changing dynamics of teledensity across states in India, the present study

utilises both parametric and non-parametric methods. In the first leg, panel unit root technique is used to examine whether relative teledensity across states is converging towards a steady state in the long run. In order to assess the stationarity property of relative teledensity, we begin with frequently used panel unit root tests proposed by Levin et al. (2002) (LLC) and Im et al. (2003) (IPS). The LLC, one of the most frequently used unit root tests, examines the stationarity of panel data using the following regression model.

$$\Delta y_{it} = \rho y_{i,t-1} + \sum_{L=1}^{p_{ij}} \theta \Delta y_{i,t-L} + \alpha_{mi} d_{mt} + \varepsilon_{it} \tag{5.2}$$

where y_{it} is the variable of interest, d_{mt} is the vector of deterministic elements and ε_{it} is the independently and identically distributed error term. The null hypothesis is that each individual time series contains a unit root ($H_0 : \rho = 0$) and the alternative hypothesis is that each time series is stationary ($H_1 : \rho \neq 0$). However, Levin et al. (2002) test is restrictive in nature as the alternative hypothesis requires ρ to be homogeneous across cross-sections (Enders, 2014). In contrast, Im et al. (2003) allows for heterogeneous autoregressive coefficients for all cross sections. The null hypothesis in Im et al. (2003) is that each panel contains a unit root against the alternative hypothesis that some of the cross sections have unit roots.

However, these panel unit root tests are criticised for their assumption of cross sectional independence. Baltagi (2014) considers this assumption as restrictive and points out existence of significant cross-sectional correlation in panels. Therefore, the present study also conducts second generation panel unit root test proposed by Pesaran (2007) which allows cross sectional dependence. The method, also known as cross-sectionally augmented ADF test (CADF), augments the standard ADF regression with lagged value of cross sectional average and its first difference as shown in equation 5.3.

$$\Delta y_{it} = \alpha_i + \rho_i \overline{y_{i,t-1}} + \sum_{j=0}^{p} \theta_{j+1} \Delta \overline{y_{t-j}} + \sum_{k=1}^{p} \lambda_k \Delta y_{i,t-k} + \varepsilon_{it} \tag{5.3}$$

where, $\overline{y_{t-1}}$ and $\Delta \overline{y_{t-1}}$ denote lagged averages of all cross sections at time t and its first difference respectively. The individual CADF statistic is given by the coefficients of ρ_i. The Pesaran (2007) test which is a modified version of the IPS unit root test, averages CADF of all cross sections in the panel to obtain the cross-sectionally augmented IPS (CIPS) statistic. Then the null hypothesis that all series have unit roots; against the alternative hypothesis that at least one series is stationary is examined using the CIPS statistic.

In addition, it would be informative to know the speed of the converge towards a steady state or its mean. The half-life is a frequently used tool to estimate the speed of mean reversion (Hegwood and Nath, 2014). Half-life is the required time period necessary to reduce an initial value to its half. In our case, half-life tells about the time required to eliminate the deviation in relative teledensity from the national average by one half. Half-life can be estimated using the following simple equation.

$$H(\rho) = \frac{ln(0.5)}{ln(\rho)} \tag{5.4}$$

where, $H(\rho)$ is the half-life and ρ is the AR(1) coefficient.

However, the empirical investigation of convergence using parametric methods like panel unit root is not free from criticism. One primary limitation of these techniques is parametric assumptions on the data generation process. In contrast to the parametric studies, the non-parametric methods are appealing as they allow the data to determine an appropriate model, relaxing parametric assumptions in the data generating process (Racine, 2008). According to Quah (1996), standard convergence empirics are uninformative because of their inability to explain the entire distribution dynamics. Therefore, in addition to the parametric techniques, we also resort to non-parametric methods to examine the distribution dynamics of relative teledensity across the states over the years. In the first phase of non-parametric methods, the distribution dynamics of relative teledensity are examined with the help of probability density using the following kernel density estimator.

$$\hat{f}(x) = \frac{1}{nh} \sum_{i=1}^{n} \left(\frac{x - X_i}{h} \right) \tag{5.5}$$

where, X_i's are samples of independently and identically distributed observations on a random variable X, h denotes the bandwidth of the interval around x and K is the kernel function. Kernel density estimator assigns a weight between 0 and 1 to each of the observations in the sample within an interval, say x, based on the distance of the centre of that interval and the observation. The resulting density estimation provides primary information and properties such as skewness and multi-modality of the given set of data (Silverman, 1986).

Next, the Markov transition matrix of relative teledensity across states is estimated to examine the evolution of its distribution over time. A transition probability matrix depicts the transition of data from one category to another.[24] In the present study, we define

two categories, one corresponding to the states having negative relative teledensity and other having positive relative density. This categorization is done in order to capture the transition of relative teledensity across states from a state of below to above the national average. In matrix notation, the transition probability matrix as given in can be written as follows.[25]

$$Q_{t+l} = M + Q_t \tag{5.6}$$

where Q_t is the data distribution of relative teledensity across states at time t. Q_{t+l} represents the distribution dynamics from period t to period $t+l$ where $l = 1,2,3...m$. In the equation, M is a finite discrete Markov transition matrix. Matrix M contains a complete description of the distributional dynamics as it maps Q_t into Q_{t+l}. The transition matrix M can be presented as below.

$$\begin{bmatrix} p_{ii} & p_{ij} \\ p_{ji} & p_{jj} \end{bmatrix}$$

where p_{ii} denotes the probability of a state which is in category i at time period t remains in the same category at time $t+l$ as well. Similarly, p_{ij} denotes the probability of a state which is in category i in the initial period makes transition to category j in period $t+l$. Assuming transition probabilities are time invariant and independent of previous transitions, the evolution in distributions can be studied by iterating equation 5.6 k times. Taking k to the limit as the iteration yields the long run or ergodic distribution is presented below.

$$\lim_{k\to\infty} M_{ij}^k = \delta_j > 0, \sum_j = 1 \tag{5.7}$$

In the equation, i, $j = 1 \ldots N$ indicate the initial and final category at time t and $t+l$, respectively. The ergodic distribution eventually allows us to analyse the long-run tendencies of relative teledensity across states in India.

In addition to the distribution dynamics of relative teledensity, the present study also made an attempt to identify the determinants of teledensity across states using a regression analysis under panel data framework. The dependent variable of the regression analysis is the teledensity across states over the sample period. The explanatory factors included for the present analysis are-per capita Net State Domestic Product (NSDP), level of education and share of services sector to the NSDP.

Role of income in driving teledensity is discussed in many studies. According to Jha and Majumdar (1999), higher income implies higher prosperity which generates more demand for telecommunication services. A number of empirical studies (e.g. Quibria et al. (2003); Madden et al. (2004); Gutierrez and Berg (2000); Ono and Zavodny (2007); Chinn and Fairlie (2007) and studies specific to India (e.g. Narayana (2011); Sridhar (2010)) examined per capita income as one of the determinants of different information and communication technologies (ICTs) including telephone.

Enrolment ratio is used to capture the effect of literacy rate which can be regarded as an indicator of capability to use ICT such as telephone. Studies by Fuchs and Horak (2008); Quibria et al. (2003); Madden et al. (2004); Gutierrez and Berg (2000); Biancini (2011) identified literacy as an important determinant of telecommunication services. Assuming primary education as sufficient to enable an individual to operate a telephone, gross enrolment ratio for primary education in the age group of 6-11 years is used as an explanatory variable to capture the impact of education in the regression analysis.

As discussed above, Indian economy experienced rapid growth in services sector during the last one and half decades. This acceleration in the overall services sector is not uniform across its segments and concentrated mainly in communication and IT enabled business services (Gordon and Gupta, 2004). Ghani (2010) observes that information and communication technology affects the overall output of services sector by making services transportable and tradable. Therefore, it is possible that rapid growth of services sector may also have generated demand for telecommunication services leading to higher teledensity. In order to capture the effect of services sector in determining teledensity, we consider the share of services sector to the NSDP as one of our explanatory variables.

In addition to the variables discussed above, we have included one period lag of the dependent variable as an independent variable in the regression analysis. Teledensity of a state at one period lag can be interpreted as network externality. Larger existing subscribers are likely to generate higher positive externality which in turn induces more subscriptions (Sridhar, 2010). Notation and expected sign of each of the explanatory variables discussed above are presented in Table 5.4.

Using the notations of the explanatory variables presented in Table 5.4, the panel re-

Table 5.4: Description of the Explanatory Variables used in Regression Analysis

Variables	Notation	Expected Sign
Log of Per Capita NSDP	lnNSDP	+
Gross Enrolment Ratio	EnRatio	+
Share of Services Sector to NSDP	Service	+
$\text{Teledensity}_{\text{t-1}}$	$\text{Tele}_{\text{t-1}}$	+

gression model is specified as below.

$$Tele_{i,t} = \beta_1 lnNSDP_{i,t} + \beta_2 EnRatio_{i,t} + \beta_3 Service_{i,t} + \beta_4 Tele_{i,t-1} + \mu_i + \eta_t + \varepsilon_{i,t} \tag{5.8}$$

where, μ_i and η_t are unobserved state fixed and time fixed effects respectively while ε_i, t is the independently and identically distributed error term in the model. Ordinary least square (OLS) estimation of the above equation will be biased and inconsistent because of the dynamic nature of the regression model. According to Baltagi (2014), lagged dependent variable as regressor is correlated with unobserved state specific effects and, consequently, the OLS estimates are biased and inconsistent. Furthermore, possible influence of dependent variable on the explanatory variables may result in endogeneity problem in the estimation. The endogenety problem may also arise as some of the variables may be determined within the system. Anderson and Hsiao (1981) proposed to transform the equation by taking its first difference to eliminate the state specific effects. In order to remove correlation of the lagged dependent variable with the error term, they suggest second order lag of the dependent variable as instruments for the lagged dependent variable in the model. However, the method produces biased estimates because of the correlation between the new error term and the first difference of the lagged dependent variable (Shiu and Lam, 2008). In order to control the potential endogeneity issue in the model, generalised method of moments (GMM) estimator developed by Arellano and Bond (1991) is used for the regression. This method transforms the basic regression equation by differencing the model. The differencing of the model eliminates the country specific effects and ensures stationarity of the variables (Lam and Shiu, 2010). In addition, the method uses lagged values of dependent and independent variables as additional instruments in the estimation of the model. This part of analysis is based on data of sixteen states and for the period of 2001 to 2012 as data

on some of the variables such as enrolment ratio are not available for post 2012 period.

5.4 Empirical Results

5.4.1 Unit Root Test and Half-Life

Table 5.5 presents estimates of Levin et al. (2002), Im et al. (2003) and Pesaran (2007) panel unit root test and the estimated half-life from the AR(1) coefficient of the unit root test equations. The null hypothesis of unit root is rejected at least at 10 percent level in all three tests. Rejection of the null hypothesis implies that relative teledensity across states

Table 5.5: Results of Panel Unit Root Tests and Half-Life

Test methods	't' statistic	Average ρ	Half-life
Levin et al. (2002)	-3.53***	-0.25	2.40
Im et al. (2003)	1.82*	-0.14	4.59
Pesaran (2007)	-3.27**	-	-

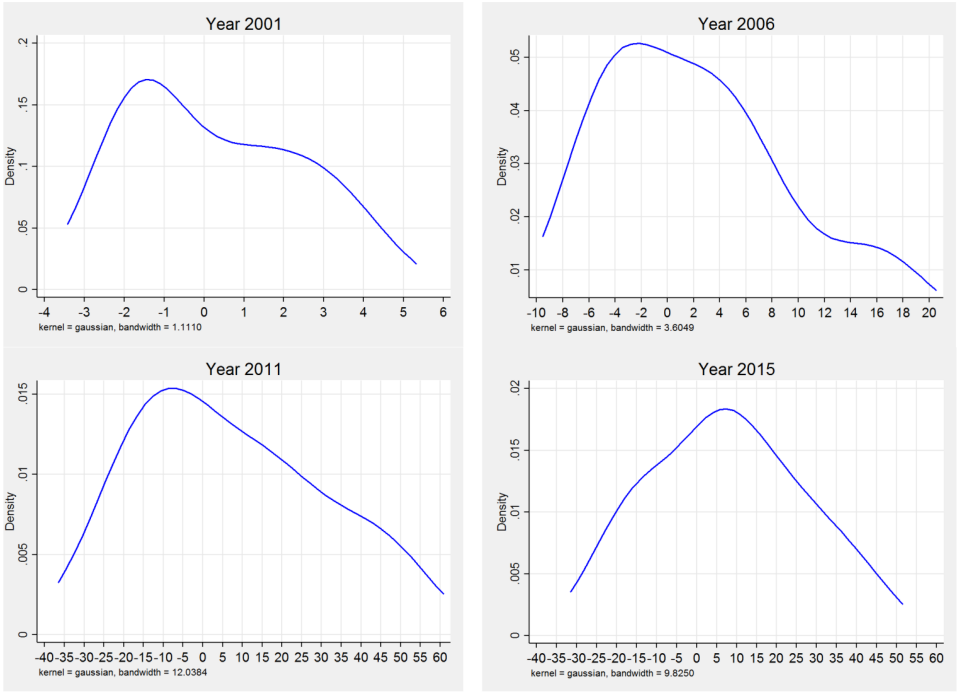
***, ** and * indicate significant at 1, 5 and 10 percent level.

for our sample period converges to a steady state. This indicates that the deviations in teledensity across states in India will diminish over time. The estimated half-life is found to be 2.4 and 4.6 years using AR(1) coefficient of Levin et al. (2002) and Im et al. (2003) respectively. This implies that about two and half to four and half years are needed to cover half of the gap in teledensity of states from the national average.

5.4.2 Kernel Density Estimates

In addition to the unit root test, the distribution dynamics of relative teledensity are explored using the kernel density plot. The kernel density distributions of the relative teledensity for the years 2001, 2006, 2011 and 2015 are presented in Figure 5.6. The kernel density plot for 2001 which is the starting point of our sample period is skewed with two peaks having larger concentration of probability mass on the negative side around -1.5 (larger peak). Such concentration of probability mass on the negative side of the density curve implies that relative teledensity of a large number of sample states were negative in 2001. This indicates that in 2001, teledensity of a large number of states were lower

Figure 5.6: Kernel Density Plots of Relative Teledensity



Source: Estimated using data obtained from DoT, Government of India and http://www.indiastat.com Note: Different scale is used for each diagram.

than the national average. The other peak, which is not so distinctive, concentrates around the value 2.5 which represents a small bunch of states having larger relative teledensity. Five years later, in 2006 moderate changes in the distribution of relative teledensity are recorded, as concentration of probability mass shifted farther to the negative side around -2.5 with a wide peak while a small cluster of mass is seen to be concentrated on the positive side around 15. Larger probability mass around -2.5 means relative teledensity of more and more states sliding below to the national average. However, the small cluster of probability mass on the extreme right reveals existence of few states with relatively higher teledensity as compared to the national average. In the next five years, considerable changes in the distribution emerged. The density curve in 2011 is a single peak density curve concentrated around -10 representing further deviation of teledensity from the national average of the country. This indicates that during this period penetration of telecom services grew more unevenly among the states as variance of relative teledensity has also increased considerably compared to the previous two density plots. In the subsequent five years, significant changes in the shape of the density curve occurred. The kernel density plot for the year 2015 shifts towards right and it shows concentration of probability mass

around 7.5 with a smaller variance in contrast to the kernel density plot of 2011. This indicates considerable improvement in teledensity across our sample states, most of which lies above the national average. The single peak of the density curve is an indication of convergence in teledensity across the states in India.

5.4.3 Transition Probability Matrix

In addition to the kernel density plot, the distribution dynamics of relative teledensity over our sample period is examined using transition probability matrix for 1, 3 and 5 year time horizon. The transition probability matrix presented in Table 5.6 depicts that the probabilities for transition along the diagonal elements of the matrix are higher than those off the diagonal elements. Higher diagonal elements imply persistence in relative teledensity across the sample states for the corresponding time horizon. This means that the states having lower teledensity and those having higher teledensity than the national average are likely to remain in same respective categories in the time horizon considered in the present study. For example, states with negative relative teledensity (Below National Average) is 95 percent likely to remain in the same category in 1 year time horizon. Similarly, the

Table 5.6: Transition Probability Matrix of Relative Teledensity

	Below National Average	Above National Average
1 Year		
Below National Average	0.95	0.05
Above National Average	0.02	0.98
3 Year		
Below National Average	0.89	0.11
Above National Average	0.02	0.98
5 Year		
Below National Average	0.83	0.17
Above National Average	0.03	0.97

Source: Estimated using data accessed from DoT, Government of India and http://www.indiastat.com

likelihoods are 89 percent and 83 percent for 3 and 5 year horizon. Correspondingly, there is 98 percent to 97 percent chance that a state with positive relative teledensity (Above National Average) remains in its initial position. The declining value of upper left corner elements in the transition matrix in the successive time horizon is an indication that states with negative relative teledensity (Below National Average) make transition to the category of positive relative teledensity (Above National Average) over the period. Ascending upper right elements in the transition probability matrix indicate that there is 5 to 17 percent chance that a state with initially negative relative teledensity (Below National Average) will make transition to the category of positive relative teledensity (Above National Average) in the time horizon of 1 to 5 years. On the contrary, in the 5 year time period, there are 2 to 3 percent chances that a state moves from a category of positive to negative relative teledensity.

To sum up, the transition probability matrix shows an increasing likelihood of states moving from the category of below national average to above national average. Contrary to this, the probability of a state remaining in the category of below national average declines over the years. These shifts imply that states with relatively poor teledensity are gaining in its teledensity over time and moving towards national average. Overall, there is an indication towards convergence of teledensity across states with national average.

5.4.4 Determinants of Teledensity Across States

The regression results from the GMM estimation to identify important drivers of teledensity in India are presented in Table 5.7. Estimated coefficient for log values of per capita NSDP is found to be positive and significant at one percent level. The point estimate of per capita NSDP is 32.26 which indicates a one percent increase in per capita NSDP leads to 0.32 percentage point increase in teledensity. In other words, higher per capita NSDP generates more demand for telecom services leading to higher teledensity. Therefore, size of NSDP can be considered as an important explanation of higher teledensity in some of the rich states as compared to some poor states in terms of NSDP.

Coefficients of all the remaining variables are also found to be positive and statistically significant. The results indicate that one unit increase in gross enrolment ratio and share of services to the NSDP leads to increase in teledensity by 0.20 and 0.60 percentage points respectively. This supports the intuition that literate people are more likely to avail of tele-

Table 5.7: GMM Estimation Results (Dependent Variable: Teledensity)

Variables	Coefficient	"z" Statistic
Log of Per Capit NSDP	32.26	17.32***(1.86)
Gross Enrolment Ratio	0.20	6.14***(0.03)
Services	0.60	2.76***(0.22)
$Tele_{t-1}$	0.91	66.15***(0.01)
No. of Observation		144
Hansen's J statistic		15.26
Hansen's J p-value		0.23

Note: *** indicates significance at 1 percent. Standard errors are in parentheses.

com services. Positive and statistically significant coefficient of the magnitude of services sector substantiates the argument that expansion in services sector in the economy foster telecom demand leading to higher telecom subscription. Finally, the coefficient of one period lag value of dependent variable as an indicator of network externality is also found positive and significant at one percent level of significance. The coefficient for network externality is 0.90 which means teledensity increases by 0.90 percentage point with a one unit increase in teledensity of the previous year. This is in accordance with the argument that higher number of existing subscribers are likely to generate higher positive network externality. Higher positive network externality as a result of large number of subscribers further induces more subscriptions in successive time period adding more benefits to both existing and new subscribers. Test statistic of Hansen's J-test for the model under the null hypothesis that the instruments are valid could not be rejected. This indicates that the instruments used in the model are orthogonal to the error term.

To sum up, the results of the regression analysis suggest positive and statistically significant impact of per capita income on teledensity among the states in India. Similarly, education, size of the services sector and network externality are significant determinants of teledensity across Indian states.

5.4.5 Distribution Dynamics in Rural and Urban Teledensity

The present chapter also explores the distribution dynamics of teledensity across states separately for rural and urban teledensity. This exercise was carried out to understand the distribution pattern of teledensity in rural vis-a-vis in urban areas separately. This exercise provides us the distribution pattern of teledensity in rural vis-a-vis in urban areas and would make us enable to compare the same with the overall distribution dynamics. Furthermore, we also examined the determinants of rural and urban teledensity in line with the baseline model.

Firstly, unit root tests were conducted to check the stationarity of relative teledensity separately for urban and rural teledensity. Results of the unit root tests reveal that the null hypothesis is rejected at least at 10 percent level in all three tests for rural teledensity but not for urban teledensity (presented in Table 5.8). Rejection of null hypothesis implies that relative teledensity for rural areas across states moves towards to a steady state, however no such evidence is found for urban areas. It indicates that the deviations in rural teledensity across states diminish over time. The half-life, estimated using the AR(1) coefficient shows a longer convergence period (2 to 9 years) for the for rural areas.

Secondly, the distribution dynamics of rural and urban teledensity were examined using kernel density plots for 2001, 2006, 2011 and 2015. The kernel density plots for the rural and urban areas are presented in Figure 5.7 and 5.8 respectively. The kernel density plots for rural areas indicates convergence of rural teledensity towards a steady state during the 15 year time horizon as the multi-model kernel density curve in 2001 makes transition to a single peak kernel density curve in 2015. However, such pattern of convergence could not be concluded from the kernel density plot for urban teledensity.

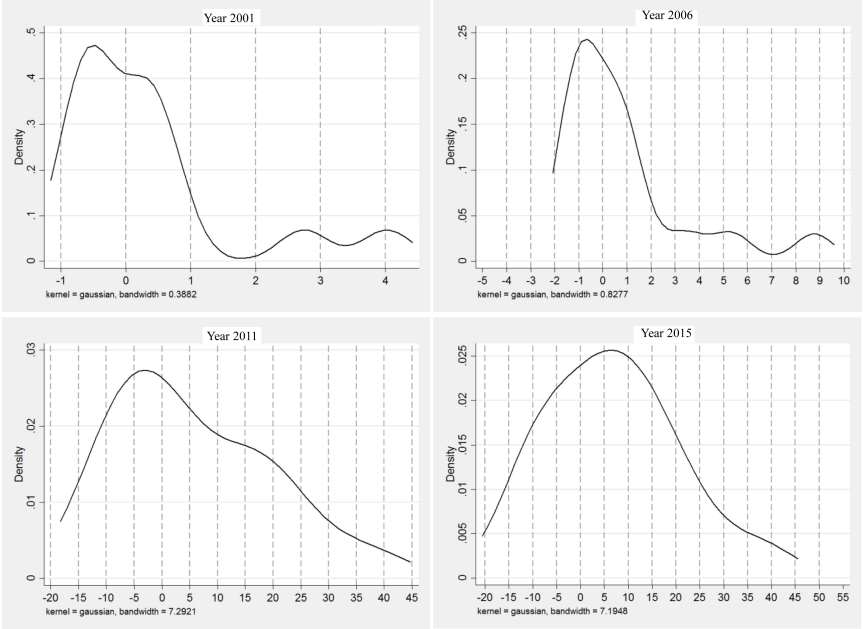
In addition to the unit root test and kernel density plot, the distribution dynamics of relative teledensity in rural and urban areas are examined with the help of transition prob-

Table 5.8: Results of Unit Root Test and Half-Life: Rural and Urban Teledensity

Test Methods	Rural Teledensity			Urban Teledensity		
	't'	Average 'ρ'	Half-life	't'	Average 'ρ'	Half-life
Levin et al. (2002)	2.08**	-0.07	8.84	-0.84	-	-
Im et al. (2003)	1.66*	-0.29	1.96	-0.27	-	-
Pesaran (2007)	-6.16**	-	-	-0.88-	-	-

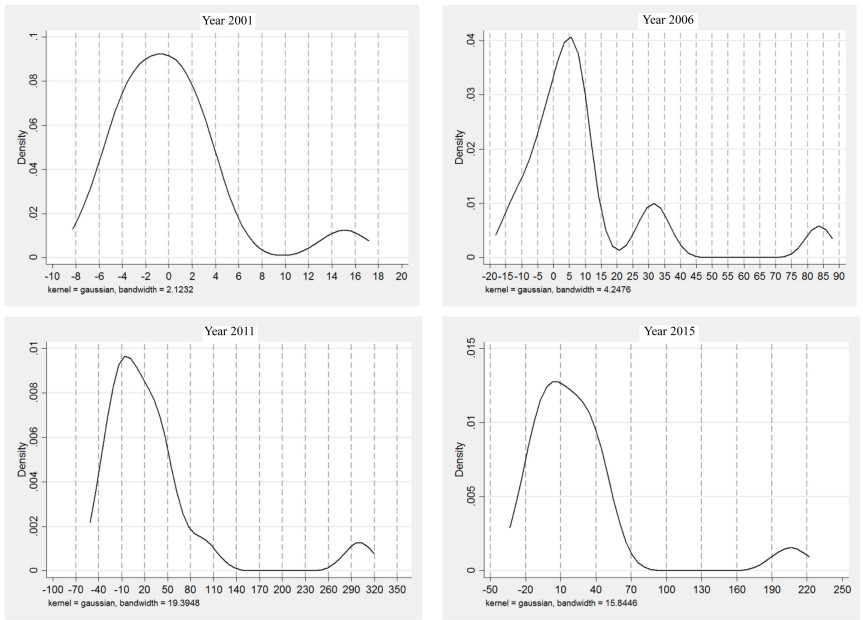
** and * indicate significance at 5 percent and 1 percent respectively.

Figure 5.7: Kernel Density Plots of Relative Teledensity (Rural)



Source: Estimated using data obtained from DoT, Government of India and http://www.indiastat.com. Note: Different scale is used for each diagram

Figure 5.8: Kernel Density Plots of Relative Teledensity (Urban)



Source: Estimated using data obtained from DoT, Government of India and http://www.indiastat.com. Note: Different scale is used for each diagram

ability matrix for 1, 3 and 5 years time horizon (presented in Table 5.9). The results of the transition probability matrix show transition of both rural and urban teledensity from the category of below national average to the above national average. However, the speed of transition is found to be considerably faster in urban areas in contrast to the rural areas. For example in the 15 year time horizon, there is 12 to 40 percent probability that a state moves from the category of below national average to above national average in urban areas while there is only 7 to 15 percent probability for such transition in rural areas. Similarly, the probability of a state which remain in the category of below national average declines faster (from 88 to 60 percent) in urban areas whereas the transition is slower (93 to 85 percent) in rural areas during the 15 year time horizon. This reveals that the expansion of teledensity is more rapid in urban areas compared to the rural areas.

Table 5.9: Transition Probability Matrix of Relative Teledensity: Rural and Urban Areas

	Rural teledensity		Urban teledensity	
	BNA	ANA	BNA	ANA
1 Year				
Below National Average (BNA)	0.93	0.07	0.88	0.12
Above National Average (ANA)	0.04	0.96	0.10	0.90
3 Year				
Below National Average (BNA)	0.87	0.13	0.72	0.28
Above National Average (ANA)	0.05	0.95	0.23	0.77
5 Year				
Below National Average (BNA)	0.85	0.15	0.60	0.40
Above National Average (ANA)	0.03	0.97	0.31	0.69

Source: Estimated using data obtained from DoT, Government of India and www.indiastat.com. ANA and BNA indicate above national average and below national average respectively.

5.4.6 Determinants of Teledensity: Rural and Urban Teledensity

The distribution dynamics of rural and urban teledensity discussed in the previous section reveals considerable disparity in the penetration of telecommunication services in rural areas as compared to urban areas. Following the disparity, a regression analyses in line with our baseline model is also carried out in order to examine the drivers of rural and urban teledensity. The regression analysis was conducted using two different models. In the first one, the dependent variable taken is rural teledensity while urban teledensity is taken as the dependent variable for the second model. However, as data for our explanatory variables are not available for rural and urban areas separately, we considered the same set of explanatory variables for both the models. The results obtained in the regression analysis are reported in Table 5.10. For both of the dependent variables, per capita NSDP, level of education and network externality are found to be positive and significant in driving teledensity in rural as well as in urban areas. However, the coefficient of share of services to the NSDP is found to be insignificant for both the models. It is worth mentioning that the coefficients of both per capita NSDP and gross enrolment ratio is higher in magnitudes for urban teledensity compared to rural teledensity.

To summarize, it is found that teledensity in rural areas is tending towards convergence whereas the pattern of urban teledensity does not show any such trend. The regression analysis reveals that similar determinants drive teledensity in rural as well as in urban areas.

Table 5.10: Determinants of Teledensity: Rural and Urban Areas

	Rural teledensity		Urban teledensity	
Variables	Coefficient	"z" Statistic	Coefficient	"z" Statistic
Log of Per Capita NSDP	24.28	11.25***(2.15)	77.42	4.70***(16.47)
Gross Enrolment Ratio	0.12	5.33***(0.02)	0.52	2.89***(0.18)
Services	-0.004	-0.02(0.17)	-0.97	-1.05(0.92)
$\text{Teledensity}i_{t-1}$	0.9	41.56***(0.021)	0.93	31.38***(0.02)

*** indicates significant at 1 percent.Standard errors are in parentheses.

5.4.7 Additional Explanatory Variables

In order to examine the robustness of the results of our baseline regression model, we expanded the regression model with three new variables, namely, available surfaced roads per thousand square kilometre, percentage of urban population and per capita annual electricity consumption. Selection of road connectivity as measured road length per thousand square kilometres is guided by the intuition that well developed road network provides smooth, cheap and timely transportation of equipment and materials required for telecommunication services. Similarly, electricity can be considered as another important infrastructure for ICTs. According to Chinn and Fairlie (2007) electricity is an essential infrastructure for information and communication technologies such as personal computers and internet service. ICT such as telephone is also not an exception as electricity is essential not only to provide the basic telecommunication services but also to utilize those services. Finally, we included the percentage of population living in the urban area to the total population in our model. As noted by Graham and Marvin (1995), urban centres as hub of economic, social and cultural life tend to have strong relation with infrastructure like telecommunication. As a result urban centres exert extensive demand for telecommunication.

For this part of analysis, we obtained data on road length from Infrastructure Statistics 2013 and 2014, published by Central Statistics Office, Government of India. Relevant data on per capita electricity consumption are accessed from annual report on the working of state power and electricity department 2013-14 and data related to the percentage of population living in urban areas are collected from Office of the Registrar General and Census Commissioner, Government of India. In the Indian context, yearly data on urban population for the states are not available as census enumeration takes place decennially. However, in 2006, Office of the Registrar General and Census Commissioner, India, published a report projecting the population of India and its states for the period 2001 to 2026. The present study utilises the projected population figures to obtain the percentage of population living in urban areas across the sample states. Data related to per capita electricity consumption is not available for the entire sample period of the present study. Therefore, we split our expanded model into two different models. The first model includes roads length per thousand square kilometres and percentage of urban population as additional explanatory variables while in the second model, all three new variables are included. The time frame for the first model is the entire sample period i.e. 2001 to 2012 whereas the

limitation of data restricted us to estimate the second model for the period 2007 to 2012 only. The comparative results of the expanded models along with the baseline model are presented in Table 5.11.

The results of both expanded models show that, estimated coefficients of per capita income, education and network externality remained positive and statistically significant in accordance with our baseline model. In contrast to the baseline model, we find coefficient of share of services to the NDSP not statistically different from zero in the first expanded model while it is found to be statically significant at 10 percent in the second expanded model. Among the additional variables, coefficient of road length per square kilometre is positive and statistically significant at one percent level in the first expanded model but not in the second one. The coefficient of percentage of population in urban areas is found to be statistically insignificant in both the expanded models. The other additional variable i.e. per capita electricity consumption is also appeared statistically insignificant in the second expanded model.

In summary, we find that the results of our baseline model are robust in indicating the positive and significant impact of per capita NSDP, education, share of services to the NSDP and network externality in driving teledensity across states in India.

Table 5.11: Results of GMM Estimation with Additional Explanatory Variables (Dependent Variable:Teledensity)

Variables	Coefficients		
	Baseline Model	Expanded Model 1	Expanded Model 2
Log of Per Capita NSDP	32.26***	28.09**	143.53***
Gross Enrolment Ratio	0.20***	0.22***	0.31***
Share of Services Sector to NSDP	0.60***	0.17	1.47*
$Teledensity_{i_{t-1}}$	0.91***	.090***	0.53***
Log of Road Length/1000 square KM		18.36***	-29.73
Percentage of Urban Population		-2.42	-2.75
Log of Per Capita Electricity Consumption			-2.72
No. of observation	144	144	48
Hansen's J statistic	14.97	13.69	10.44
Hansen's J p-value	0.24	0.18	0.31

Note: *** and * indicate significant at 1 and 10 percent level respectively.

5.5 Summing Up

Telecommunication sector in India has shown significant improvement in its growth rate in recent years. The Government of India through implementation of various policies (NTP 1994, NTP 1999 and NTP 2012) is constantly making effort to improve the telecommunication services across the length and breadth of the country. As a result, during last one and half decades, telecommunication services in the country expanded considerably in terms of number of subscriptions and teledensity. Although policy reform such as privatisation and deregulation were introduced way back in 1991, the sector shows rapid growth only after 2000. Over the years, the telecommunication services has expanded rapidly not only in terms of its share to GDP but also in terms of number of users. It has been found that mobile telecommunication has grown more rapidly and most of the expansion in subscribers can be attributed to the expansion in mobile telecommunication services during the sample period of the present study. However, despite having similar pan-India policy, the expansion of telecommunication services is uneven across states and significant differences in terms of teledensity continue to prevail.

In such a background, this chapter analyses the dynamics of differential penetration of telecommunication services in terms of teledensity across states in India. This chapter examines specifically the pattern, dynamics and determinants of teledensity across states in India during the period from 2001 to 2015.

The results of the unit root tests carried out to examine convergence of teledensity reveals a pattern of convergence of teledensity across states to the national average. The non-parametric kernel density plots and the transition probability matrix also confirm the convergence of teledensity across states towards the national average. The regression analysis suggest that per capita income, education, the size of the service sector, and network externality are significant determinants of teledensity across states in India.

However, some important differences are observed when distribution dynamics of rural and urban teledensity are examined separately. For example, while the interstate gaps in telecom services in rural areas seem to have declined, there is little evidence of such a tendency in urban areas. However, the regression results with respect to the importance of per capita income, education, and network externality for telecom services are robust to the rural-urban divide and to the inclusion of some additional explanatory variables.

6

Summary of Findings and Conclusion

This chapter summarizes the broad findings of the present study. This chapter is organised into three sections. In the first section, the findings of the present study are recapitulated. In the second section, major findings of the study are summarised. Some of the limitations in the present study are outlined in the third section. In addition, the third section also presents future scope of research in the present topic.

6.1 Recapitulation of the Broad Findings

Magnitude and trend of Services sector, its subsectors and segments

- Among the five sub-sectors within the overall services sector, contribution of financing, insurance, real estate and business services (FIRE) is the highest during 2012-13. It is observed that the share of FIRE has increased from about 8% in 1980-1981 to 19% in 2012-13.
- The study found the growth rate of transport storage and communication to be the highest among the sub-sectors. The sector grew at compound annual growth rate (CAGR) of 9.03%. Within this sub-sector, communication exhibits the fastest growth rate i.e. 15.68% annually.
- Except storage and railways, all sub-sectors and segments within services sector registered compound annual growth rates more than 6% during the study period. This implies that services, its various sub-sectors and different segments within these sub-sectors have recorded healthy growth rate during the period considered in the present study.

- It appears in the study that the decade of 2000s was more favourable to most of the services sectors within the high growth era of 1980 to 2013.
- The study observes acceleration in the growth of overall services sector along with all the services sub-sectors except FIRE.
- At disaggregated level, banking and insurance, real estate and ownership of dwellings and public administration and defence registered neither acceleration nor deceleration in their growth.

Drivers of Services sector

- All the time series considered in the study i.e. the sub-sectors, segments, per capita income and export except storage are found to be not stationary. However, the storage is appeared to be a stationary at level and thus an $I(0)$ variable.
- While all the remaining variables are found to be stationary at their first difference level, railways and communication are found to be stationary at their second difference level. Thus all other variables except the railways and communication appeared to be $I(1)$, whereas railways and communication are found to be $I(2)$.
- The Johansen cointegration test suggest evidence of cointegrated relation of hotel and restaurant, transport by other means, public administration and defence; and other services with per capita income and export of the economy while no such relation could be found for trade banking and insurance, real estate and business services.
- The results indicate significant causality of export to trade as the test statistic for Johansen conintegration is found to be highly significant.
- Gross value addition of hotels and restaurants is also significantly caused by export value of the country. Similar results are found for communication and real estate, business services, public administration and defence and other services as the respective test statistics are found to be significant at least at ten percent level.
- Per capita income is found to have significant impact in determining gross value addition of transport by other means, railways, banking and insurance, real estate and public administration and defence.

- Coefficient of ratio of inter industry input to total output indicated by *IO* ratio is found to be statistically insignificant which implies that splintering does not have any significant impact on the rapid expansion of services sector in India at least during the time period considered in the present study.

Pattern of growth in banking services

- Growth in number of bank offices is much rapid in metropolitan areas as compared to the other population categories i.e. rural, semi-urban and urban.
- Number of bank offices expanded by about 5.22% in metropolitan areas while the growth rates of rural, semi-urban and urban areas are 1.43%, 4.36% and 4.50% respectively.
- In urban areas the growth of foreign banks is much higher (8.57%) as compared to the public sector banks (3.89%) and private sector banks (8.03%).
- Higher rates of growth in the urban and metropolitan areas indicate that expansion of branch offices has taken place at a faster rate in the relatively developed areas.
- Higher growth rate of the private banks indicates growing space for the private sector and increasing competition in the banking services in India.

Growth in productivity of banking services

- On an average, the banking sector in India has shown one percent growth in their productivity during the period from 1991-92 to 2014-2015.
- According to bank ownership category, it is found that Total Factor Productivity (TFP) of public sector has grown by 2.1 percent during the entire study period whereas, foreign banks have registered 1.1 percent growth in its productivity. In contrast, a decline in productivity is observed among the private sector banks.
- Overall productivity of the banking sector for the period (1991-92 to 2005-06) grew at a moderate growth rate of 0.5 percent while in the subsequent period (2006-07 to 2014-15), productivity of banking services has grown at a much faster rate (2.4 percent).

- In terms of bank ownership, during the first sub period i.e. 1991-92 to 2005-06, public sector banks attained productivity growth of 1.8 percent while private sector registered a decline in their productivity. During the period, moderate growth in productivity can be observed among foreign banks. In contrast to the first period, in the second sub-period i.e. 2006-07 to 2014-15, all categories of banks exhibited growth in their productivity. During the second period, productivity of the public sector banks grew by about 2.5 percent while the rate of productivity growth for private sector banks and foreign banks were 1.6 percent and 2.1 percent respectively.

Determinants of productivity growth in banking services

- Ratio of non interest income to total assets exert a significant positive impact on the productivity growth of banks. This implies that with the increasing exposure to non traditional activities, productivity of banks increases.

- The results of the study reveal that the ratio of banks' intermediation cost to their total asset exerts negative impact on TFP growth. This suggests that rise in operating cost reduces productivity of banks.

- Among the macro factors, fiscal deficit which was used as a proxy for fiscal policy of the government is found to be positive and statistically significant while coefficient of other macro determinants are found to be statistically insignificant.

Pattern of growth and distribution dynamics of telecommunication service

- Relative teledensity in the states of Andhra Pradesh, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Maharashtra and Punjab remained positive throughout the study period. This suggests that teledensity among these states remained higher than the national average for the entire sample period. In contrast, relative teledensity in Assam, Bihar, Madhya Pradesh, Odisha and Uttar Pradesh continued to be negative for the entire period.

- For the remaining three states i.e. Jammu and Kashmir, Rajasthan and North East which is a cluster of six states, relative teledensity is found to be unstable and fluctuating between positive and negative values around zero.

- The pattern of relative teledensity in the two groups, i.e. the states with positive relative teledensity and the one with negative relative teledensity, reveals that the deviation from the national average continues to rise until 2011-2012. However, the pattern has reversed since 2011-2012 and a declining trend in the deviation is observed.

- The unit root tests performed to examine the distribution of teledensity across states indicates a pattern of declining deviations in teledensity across states in India. The estimated half-life i.e. the time required to reduce half of the deviation in teledensity across states to the national average is about 2.4 and 4.5 years. This implies that about 2.4 to 4.5 years are needed to cover half of the gap in teledensity of states from the national average.

- The kernel density plot shows a shift from a bi-model and skewed curve to a single peak curve indicating pattern of convergence in teledensity across states in India.

- The transition probability matrix shows an increasing likelihood of states moving from the category of below national average to above national average. The matrix shows that there is 5 to 17 percent chance that a state with initially negative relative teledensity will make transition to the category of positive relative teledensity in the time horizon of 1 to 5 years.

- In contrast, the probability of a state remaining in the category of below national average declines over the years. For example, states with negative relative teledensity is 95 percent likely to remain in the same category in 1 year time horizon. Similarly, the likelihoods are 89 percent and 83 percent respectively for 3 and 5 year horizon.

- In short, the transition probability matrix reveals that states with relatively poor teledensity are gaining in its teledensity over time and moving towards national average. Overall there is an indication towards convergence of teledensity across states with national average.

Determinants in the growth of telecommunication services

- Estimated coefficient of per capita NSDP is positive and significant at one percent level with a point estimate of 32.26. This indicates, a one percent increase in per capita NSDP leads to 0.32 percentage point increase in teledensity.

- The results indicate that one unit increase in gross enrolment ratio and share of services to the NSDP leads to increase in teledensity by 0.20 and 0.60 percentage points respectively.

- The coefficient of one period lag value of dependent variable as an indicator of network externality is also found positive and significant at one percent level of significance. The coefficient for network externality is 0.91 which means teledensity increases by 0.91 percentage point with a one unit increase in teledensity of the previous year.

Pattern of growth and distribution dynamics of telecommunication service in rural vis-a-vis urban areas

- Results of the unit root tests for rural and urban teledensity implies that relative teledensity for rural areas across states moves towards a steady state, however, no such evidence is found for urban areas.

- The half-life, estimated using the AR(1) coefficient shows a longer convergence period (2 to 9 years to reduce half of the deviation) for the rural areas.

- The kernel density plots for rural areas indicates convergence of rural teledensity towards a steady state during the 15 year time horizon as the multi-model kernel density plot in 2001 makes a transition to a single peak kernel density curve in 2015. However, no such pattern is observed for urban teledensity.

- The results of the transition probability matrices reveal that the speed of transition for urban teledensity is considerably higher in contrast to the rural areas. For example in the 15 year time horizon, 12 to 40 percent of states move from the category of below national average to above national average for urban areas while it is only 7 to 15 percent for rural areas.

Determinants in the growth of telecommunication services: rural vis-a-vis urban areas

- For both rural and urban teledensity, dependent variables, per capita NSDP, level of education and network externality are found to be positive and significant in driving the level of teledensity. It is to be noted that coefficients of both per capita NSDP and

gross enrolment ratio is higher in magnitudes for urban teledensiy compared to rural teledensity. It indicates that a given level of income and eduction perhaps generate more demand for telecom services in urban areas as compared to rural areas.

6.2 Conclusion

The present study has been carried out to address two broad research questions. The first research question is- what is the trend and pattern in the growth of services sector, its sub-sectors and their segments. This study tries to address this question by examining the trend in the gross value addition of the services sector in addition to its sub-sectors and segments.

It has been observed from the foregoing analysis and discussion that the share of the services sector has increased rapidly and the sector now dominates Indian economy in terms of its contribution to the GDP of the country. Among the five sub-sectors within the overall services sector, contribution of financing, insurance, real estate and business services is found to be the highest. In terms of growth rate, overall services sector has grown at compound annual growth rate of 7.6 percent during 1980-1981 to 2012-2013. Among the sub-sectors transport, storage and communication registered the most rapid growth rate. It has been observed that in the first decade of 2000s, the growth of most of the services sub-sectors and segments is higher compared to the previous decades. Thus the study finds that most of the services sub-sectors registered considerably higher growth trend in their respective gross value addition during the period of the present study.

The examination of trend in the growth of banking services shows sizeable expansion of banking services in terms of basic banking parameters such as number of branches, deposit, credit etc. Moreover, the present study finds that the banking services in India has also registered marginal growth in their productivity. It is to be noted that the productivity growth of the public sector banks is relatively higher in comparison to the privately owned banks and foreign banks. In a similar line, the study finds significant growth in the telecommunication services in India in terms of number of subscribers and teledensity. The study observes disparity in the penetration of telecommunication services across states in the country. In addition, such disparity has also been observed in rural vis-a-vis urban areas. However, the findings of the study reveal that the inter-state disparity in penetration of telecommunication services is in a declining trend and over years teledensity across states is converging towards the national average.

The second research question of the present study is- what are the important factors that explain the growth in the various services segments. The present study attempts to address this question by identifying important factors for each of the services segments with the help of regression analysis under time series and panel data framework.

The study reveals that per capita income plays crucial role in the expansion of service segments like transport by other means, railways, banking and insurance, real estate and business services and public administration and defence. However, no such conclusion could be drawn for the segments like trade, hotel and restaurants, storage and communication. Similarly, size of export plays important role in driving services segments like trade, hotel and restaurants, communication, real estate and business services, public administration and defence and other services but not for services segments like transport by other means, railways, storage and banking and insurance. The findings of the study show that splintering i.e. outsourcing of services output in other sectors does not have any impact in the expansion of services sector at least for the period considered in the present study. Therefore, it is evident from the study that role of important determinants in the expansion of services sector cannot be generalised across sub-sectors and segments within the broad category of services sector, rather different determinant(s) are found to be important for different services segments.

While examining the determinants for the banking services, the present study finds that among the bank specific factors, ratio of non-interest income to total asset is found to be significant and positive. This indicates that banks' earning from non-traditional activities such as commission, exchange and brokerage improves their productivity whereas banks' may gain in their productivity by reducing operating expenses which include payment and provision to employees, rent, taxes etc. The study also reveals that rising fiscal deficit is favourable for productivity growth among the banks. This might be because of the fact that fiscal deficit borne out of higher public expenditure might have long run effect on economic growth which gradually percolates to the banking sector.

In the discussion of the determinants of telecommunication services, it has been found that per capita NSDP and education are significant factors in the expansion of telecommunication services across Indian states. Significant coefficient of per capita income suggests that rich states in terms of per capita NSDP are likely to have relatively better telecom penetration in India. Similarly, a significant coefficient of education indicates that edu-

cated persons would have higher demand for telecommunication services. In addition, the study also reveals important role of size of the services sector in the expansion of telecommunication services in India. Thus, an expansion of the services sector in the economy generates telecom demand leading to higher telecom subscriptions. Furthermore, network externality is also found to have significant impact in driving teledensity among the states in India. It indicates that increase in the number of existing subscribers is likely to generate higher positive network externality leading to more expansion of the telecommunications services.

6.3 Limitations of the Study and Future Research Scope

The present study recognizes a number of limitations, some of them are appended below. The first and foremost limitation of the present study is its limited coverage. As mentioned in the introduction, services sector consist of several sub-sectors and segments. The sub-sectors and segments are not similar in terms of their output, input as well as how they operate in the economy. Therefore, to conduct a scientific study, each of these require specific and individual attention. However, because of limitation of time and resources, the present study has taken up only two of these segments individually.

Furthermore, the study concentrates only in the aspect of output growth and ignores several other important dimension of services sector such as employment generation. This makes the present study limited in its scope. However,the study opens up future scope of research in services sector.

The study is also limited by availability of data. Although, for some of the variables, data are systematically available for a sufficiently ample time period to carry out econometric study, but in case of some other variables, dearth in data availability compels the study to restrict its scope in both time and cross section dimension.

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Notes

Notes

[1]As per the World Bank Database, available in 2015.

[2]According to the National Account Classification of India, agriculture sector includes agriculture, forestry, and logging and fishing; industry includes mining and quarrying, manufacturing, electricity, gas and water supply. The services sector comprises of five sub-sectors which are (i) construction; (ii) trade hotel and restaurant; (iii) transport, storage and communication; (iv) financing, insurance, real estate and business services and (v) community, social and personal services. It is to be noted that World Trade Organization and Reserve Bank of India list construction in the services category (Government of India, 2013).

[3]A financial year in India runs from April 1 in a year to March 31 in the next year. For example 1980-81, refers to the financial year of April 1 in 1980 to March 31 in 1981.

[4]National Account Statistics is the primary source of national accounts data for Indian Economy. These data are available and can be accessed from website of Ministry of Statistics and Programme Implementation, Government of India.

[5]The segments namely real estate and public administration and defence are excluded due to non-availability of data.

[6]Both banks and insurance provide financial services. Bank basically intermediates in managing money from its customers while insurance is based on the risk averseness nature of the society. Furthermore, banking and insurance are different in terms of their liabilities and assets. For example liabilities of banks are more volatile, while liabilities of insurance are not much liquid (Weert, 2011).

[7]Scheduled bank's in India consists of two broad groups-scheduled commercial banks, scheduled co-operative banks. Scheduled commercial banks in India have further been categorised into five different groups depending upon their ownership and mode of operation. These groups are (i) State bank of India and its associates, (ii) Nationalised banks, (iii) Private banks, (iv) Foreign banks and (v) Regional rural banks. As on March 2013, Scheduled commercial banks posses more than 94 percent of the total deposits in banks while scheduled co-operative banks hold only about 3 percent of the total deposits.

[8]According to 2015 data.

[9]Priority sector lending means lending to some selected sections which does not get adequate bank credit

[10]Capital Adequacy Ratio (CAR or CRAR) is ratio of capital to risk weighted assets. CAR or CRAR is obtained at by dividing the capital of the bank with aggregated risk weighted assets for credit risk, market

risk and operational risk (Reserve Bank of India, 2015).

[11]Technical efficiency refers to the efficient utilization of the given inputs, while the scale efficiency means exploiting scale economies by operating at constant returns to scale (Ataullah et al., 2004).

[12]The part of analysis is based on Ray (2012).

[13]This is similar to Das and Ghosh (2006).

[14]Various volumes of Statistical Table Relating to Banks in India can be accessed from www.rbi.org.in.

[15]This classification of population group is based on Census 2001 and followed by Reserve Bank of India in the compilation of Statistical Table Related to Banks in India.

[16]Population per branch is a demographic measure of physical access of banking services. It shows average size of population each bank office needs to provide banking services.

[17]The entire period is classified into two sub-period base on Zivot-Andrews unit root test which shows a break in combined output of banking and insurance sector in 2005-06.

[18]Information and telecommunication technology (ICT) is considered as one of the major infrastructures. Modern ICTs occupy a central place in public policies across the countries including the developing ones because of its importance in overall economic development of a country. According to Leff (1984), modern telecommunication facilitates faster transmission of information which eventually promotes overall economic development by reducing transaction and information cost. A well-developed telecommunication infrastructure increases efficiency in an economy by reducing information asymmetry among producers and consumers (Abraham, 2006; Eggleston et al., 2002; Sen, 1994). Studies such as Lam and Shiu, (2010) for European countries, Roller and Waverman (2001) and Agarwal (2004) for OECD countries, Ghosh (2016) for India established empirically the importance of telecommunication on the overall economy.

[19]World Bank (2017)

[20]Teledensity measures telephone connection per 100 person.

[21]Under automatic rout no prior approval is needed either from Government of India and Reserve Bank of India.

[22]As mentioned in the third chapter of this dissertation, India's financial year runs from 1st April in a year to 31st March in the next year. For instance, 2000-2001 comprises data from 1st April of 2000 to 31st March of 2001. In order to make our description simple, we write 2000-2001 as 2001, 2001-2002 as 2002 and so on.

[23]Furthermore, consistent data on teledensity is not available prior to 2000-01

[24]Here category indicates a particular group based on certain criteria.

[25]This is similar to Nath et al. (2015).

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