



Research and Publication

WORKING PAPER SERIES

WP NO: 2017/01/EC

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**Human Capital Fostering
Service Sector as an Element in
Economic Growth**

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Human Capital Fostering Service Sector as an Element in Economic Growth

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Abstract: There is a long standing debate on the causality of human capital development and the service sector growth in the economy. Researchers have argued on whether a higher human capital base has resulted in the development of the service sector or a developing service sector and the opportunities presented therefrom has led to the increased demand for higher education. To identify this causality for the Indian economy, in this paper, a vector auto regressive analysis is undertaken. The study found evidence of significant positive impact of enrolment in higher education in India on the gross value added of the service sector implying that investment in service sector in India happens largely because of the availability of skilled workers.

Keywords: Human capital, service sector, economic growth, India

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1. Introduction

In the growth trajectory of a nation, it is typically the manufacturing or the modern sector on which depends the overall growth of the economy. As this sector keeps growing, the traditional sector – agriculture caters only to the primary need for existence – food. However, in the post second world war era, it is observed that the service sector has overtaken manufacturing as the largest sector in most economies. In many countries, the service sector now constitutes more than 50 percent of the GDP, and, is still growing faster than manufacturing (Das and Saha, 2011). This dynamic structural change has raised the question of whether services can be a source of sustained growth since for a long time the service sector was seen as unproductive, merely functioning as a complement to other sectors and traditionally viewed as composed of low productivity/stagnant activities, such that increased specialization towards services would lead to a growth slowdown (Baumol, 1967, Kaldor 1966). The service sector has received a major boost with technological changes allowing for the development of services such as communication, banking, insurance, and business-related services, that can be easily transported, face low transports costs and have a high potential to increase productivity through the incorporation of technological advances. These services, that share many characteristics with manufacturing, are known as modern impersonal progressive services (Ghani, 2010), and are also assumed to be relatively skill intensive, so human capital and thus education play an important role in driving growth in these subsectors (Peneder, 2007). Consequently, service sector can no longer be considered a homogeneous sector composed of only non-tradable services with no opportunity for scale economies and improvements in productivity. The erstwhile classification of service sector included services also known as traditional personal services. These included, for instance, trade, hotels, restaurants, and public administration. Now, the importance of this sector springs from the fact that it can lead to inclusive growth through backward and forward links (Banga, 2005), by ensuring equitable access to basic services at low prices (Deloitte, 2011), by creating employment opportunities, and by developing human capital.

In the context of the service sector an important consideration is the understanding of the causality between human capital formation and development of this sector. Technological progress in manufacturing sector is known to take place more towards physical capital and technological progress in service sector ensues more towards human capital (Zhou, 2016). The intensified bias of human capital in technological progress in service sector shows that development of a service economy will result in increased demand for high-skilled labour thereby generating higher return for such labourers. This observed higher return results in increased investment in human capital. Studies, however, have not asserted the causality between human capital formation and development of service sector, especially for India. As Zhou (2016) observes, given the increased demand for skilled workers, low-skilled workers have to upgrade their skill by learning and training, and high skilled workers have to continue learning to maintain and improve their position in the labour market thereby raising the share of heterogeneous human capital in the economy. The enhancement of heterogeneity of human capital in the service sector makes the availability of services more diversified and specialized. According to Becker and Murphy (1992), this heterogeneous human capital also promotes development of division of labour and technological progress thereby increasing labour productivity and realizing increasing returns to scale and long term economic growth. This has resulted in the development of various kinds of services. National accounts of most countries have roughly classified services into: Wholesale and Retail Trade; Hotels and Restaurants; Transport, Storage, Post and Telecommunications; Finance, Insurance, Real Estate and Business Services; Community, Social and Personal Service; Electricity, Gas and Water Supply; Construction. However, all types of services have not grown uniformly in all economies. In fact, Das and Saha (2011) found that business services have grown faster than non-business services. Estimates that are available on returns to scale in the service sector indicate increasing returns. For the U.S., Basu *et al.* (2006) report scale elasticities for transportation, communication, trade and a service basket including health, education, legal services, automotive repair, hotel business etc., which generally exceed unity. Scale economies are also found for retail trade in Israel (Ofer, 1973),

banking and finance in the U.S. (McAllister and McManus, 1993) and hospital industry in the U.S. (Berry, 1967; and Wilson and Carey, 2004).

Given this backdrop, this paper intends to study if the expansion of the services sector is related to human capital availability in the Indian economy. Section 2 describes the extant literature, section 3 describes the present scenario of the service sector in India, section 4 presents the empirical analysis of the relation between India's service sector and the level of human capital and section 5 concludes.

2. The Literature

Unlike the earlier studies as (Baumol, 1967, Kaldor 1966), the recent economic theories consider services to be a driver of sustained growth, as long as the change in the composition of production and employment occurs towards services sub-sectors that have benefited from what some authors call the 3Ts, technology, transportability, and tradability (see Ghani, 2010), that allow services to benefit from technological advances and become more productive as well as participating in global trade. Although value added and employment in the services sector are dominated by the so-called traditional personal services, which include activities like hotels, restaurants, and public administration, viewed as non-productive, modern impersonal services that include communications, banking, insurance, and business related services, can be an important driver of economic growth since these services take advantage of ICT, globalization, and scale economies and thus benefit from higher productivity growth rates (see e.g. Ghani (2010)). Kapur (2012) develops a model with heterogeneous services, progressive and asymptotically stagnant services, and manufacturing, where innovation drives productivity growth and delivers different endogenous stages of growth. At earlier stages, consumer demand is directed mainly towards manufacturing products and so innovation is more profitable in this sector. As income rises, demand shifts towards services, but progressive services are more productive and thus respond more to innovation so the latter should concentrate on this sector in order for the economy to maximize growth. Ngai and

Pissarides (2007) and Acemoglu and Guerrieri (2008), on the other hand, introduce some changes in the assumptions of Baumol's two-sector unbalanced growth model in terms of either the inputs considered or factors proportions and conclude that, even with differences in total factor productivity growth across sectors, it is possible for an economy, under certain conditions, to reach a balanced growth path in the aggregate so that structural change will have no impact on the growth rate of real income per capita. But even the traditional (stagnant) personal services can make a positive growth contribution, according to some authors. Pugno (2006) augments Baumol's model by considering that the consumption of services (such as education, health and culture), which the author also designates as household services to contrast with business services, may contribute to human capital formation and in this way offset the negative contribution to overall growth due to its low productivity. van Zon and Muysken (2005) focus on the importance of health for economic growth arguing also that it is not only an important factor in final goods production but also fundamental to knowledge accumulation and thus a driver of growth. Reverse causation from economic growth to the expansion of services is also possible since economic growth leads to higher income per capita levels which, according to Engel's law (higher income elasticity of demand in the services sector), results in a change in the structure of demand that shifts away from manufacturing products towards services (Echevarria, 1997, Foellmi and Zweimüller, 2008, Ngai and Pissarides, 2007 and Bonatti and Felice, 2008). Adjustments in the structure of production occur in response to demand side changes so that economic growth is causing structural change towards the services sector. Peneder (2003) also points out the possibility of higher income levels leading to more investment in R&D and education, which in turn would create incentives to higher specialisation towards services industries that make greater use of these complementary institutions.

The fact that skilled labour has played an important role in India's overall performance and especially so in the services sector has provoked much discussion but only limited rigorous analysis. Rodrik and Subramanian (2004) note that India's productivity growth in the last two decades has benefited from its stock of the highly educated but provide no formal evidence. Kochar *et al.* (2006)

show that India's share of output in skill-intensive industries is higher than that of China and comparable to that of much richer countries like Malaysia and Korea. Gordon and Gupta (2004) highlight a number of factors behind India's "services revolution" but human capital is not one of them. Bhide and Shand (2000) and Ahluwalia (2000) do include measures of human capital to analyze variations in growth rates across Indian states in the post 1980 period but both these studies rely entirely on literacy rates. A second problem with these two studies is that they do not address the problem that endowments of human capital could be endogenous. The role of services as complementary to the manufacturing process was developed to incorporate the relationship between services and scale, explicitly assuming that producer services are important to the coordination and control of specialized production processes Francois (1990). Francois and Reinert (1996) examined the role of services in the structure of production and trade. Aguayo *et al.* (2001) found there are important positive impact of the production of the agriculture and industry sectors on the service sector. Li *et al.* (2003) reviewed international experiences and examined the factors behind the lagging service sector in China. Breitenfellner and Hildebrandt (2006) endeavoured to see the relationship between tertiarization and per capita income in European Union and other developed countries and concluded that the process of tertiarization is compatible with growth in both employment and productivity. Buera and Kaboski (2009) analyzed the role of high-skilled labour in the growth of the service sector as a share of the U. S. economy and found that the consumption of services has driven the growth of the economy. The importance of skill intensive services has risen than low-skill jobs and this has raised the wages and quantities of high skilled labour. Kefela (2010) reviewed the international experience on service sector expansion, examining the current challenges and discussing the potential benefits of services trade. The study identified that growth in services surged due to urbanization, the expansion of public sector and increased demand for intermediate and final consumer services.

Rao (1979) studied the Indian economy and its structural changes, and found that the growth rates and productivity per worker, of secondary and tertiary sectors especially of the secondary sector in

the economy went up and that of the primary sector declined however, the service sector was growing faster than the commodity sector mainly due to the growth of informal sector employment. Datta (1989) tried to find out the sources of service sector growth in India with specific reference to the implications of the rapid growth of distributive trade and transport for Net Material Product (NMP) in India for the period 1950-51 to 1983-84. Bhattacharya and Mitra (1990) investigated the pattern of growth of the tertiary sector and its implications on growth and distribution in India in the post-independence period, 1950-51 to 1986-87. Mohanty and Raghavan (1990) analyzed the growth and structural characteristics of the Indian economy since the first five year plan, on GDP and its sectoral shares at constant prices. Nagaraj (1990) made an attempt to examine various alternative hypotheses on the long term growth rate of India's GDP and found that while movements of GDP over 1950-51 to 1984-85 are identical there is a sharp decline in the growth rate of 'Public Administration and Defence' in the revised series since 1977-78.

3. The Service Sector in India

3.1 *Growth and Contribution of Services in Indian economy*

In India the service sector crossed 50 percent share around the year 2000, and, has been growing faster than manufacturing and agriculture. The Gross Value Added (GVA) at current prices for services sector is estimated at Rs 61.18 lakh crore in 2014-15 and it accounts for 52.97 percent of total India's GVA of Rs. 115.50 lakh crore. As per the new method of India's National Accounts Statistics, the services grew by 9.1 per cent compared to 6.6 per cent total GVA growth and 6.9 per cent GDP growth at market prices. Including construction, a borderline service, the services share is 59.6 per cent and growth is 8.1 per cent

Table 1 India's sectoral growth by 5 year plans (%)

Sector	Eighth Plan	Ninth Plan	Tenth Plan	Eleventh Plan
Agriculture	4.72	2.44	2.3	4
Industry	7.29	4.29	9.17	10
Services	7.28	7.87	9.3	11

Source: Eleventh Five Year Plan (2007-2012).

The variations in growth and performance of different sub-sectors of services and their contribution to GDP is presented in table 2. Except for the contribution of public administration and defence services which had gone down marginally by 2009-10, contribution of all other services to GDP have increased.

Table 2: Decadal average share of service sub-sectors in GDP (%)

Sub-Sectors	1980-81 to 1989-90	1990-91 to 2000-01	2000/01-2009/10
Community, social & personal services	13.4	13.9	14
Public administration & defence	6.1	6.2	6
Financing, real estate & business services	8.9	12	14.7
Banking & insurance	3.1	4.9	6.5
Trade, hotels & restaurant	11.8	13	15.8
Transport, storage & communication	6.2	6.9	9.3

Source: Calculated from CSO.

In the context of employment generation, in 2009, services accounted for around 62 percent of total employment in the organized sector even though, within the service sector, over 80 percent of the employment was in the unorganized sector (Mukherjee, 2013). Finance, insurance, real estate, and business services and community, social, and personal services largely provided organized employment while retail and wholesale trade largely provided unorganized employment in the country (*ibid.*).

Table 3: Employment across various service sub-sectors (in millions), employment elasticity, and CAGR

Sector	Employment (in millions)			Employment	
	1999-2000	2004-05	2009-10	Elasticity	CAGR
Trade	36.63	43.36	42.08	0.35	-0.07
Hotels and restaurants	4.62	6.10	5.91	0.53	-0.08

Transport, storage & communication	14.61	18.47	19.36	0.48	0.08
Banking & insurance	2.25	3.10	3.74	1.24	0.27
Real Estate	2.67	4.65	5.75	1.09	0.48
Public Administration & defence	10.48	8.84	9.04	-0.91	0.05
Education	8.47	11.43	11.09	0.88	-0.08
Health	2.62	3.34	3.34	0.52	0.15
Community, social & personal services	9.99	8.75	8.29	-0.10	-0.14

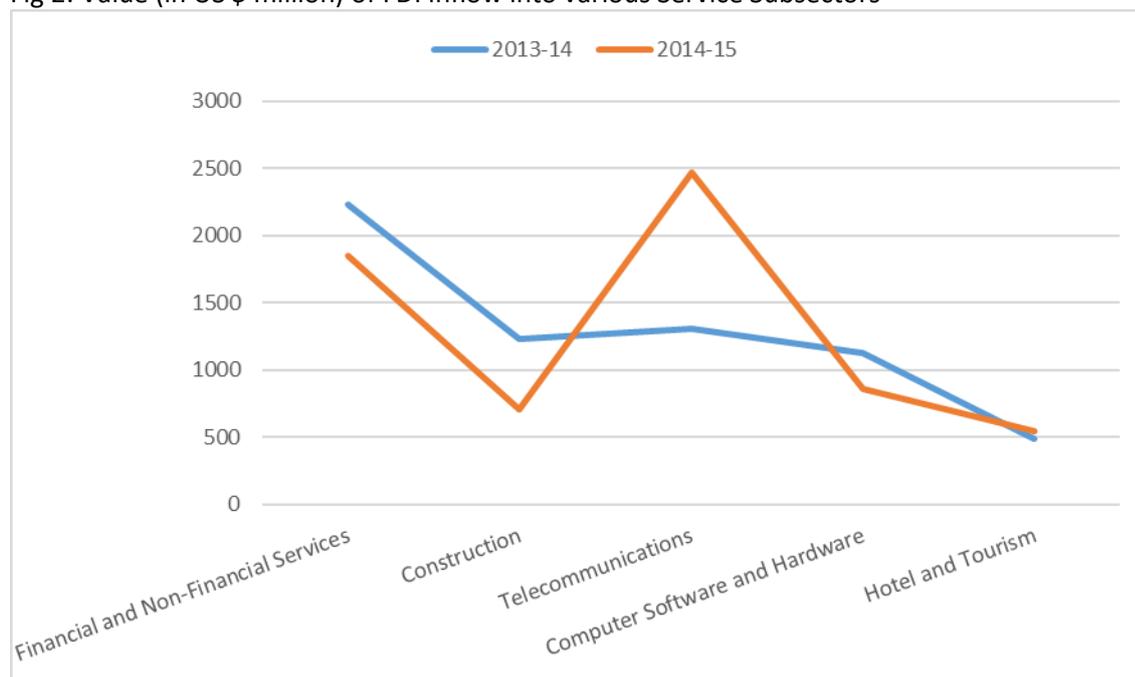
Source: Planning Commission, 2014

3.2 FDI inflow in Indian Service Sector

The ambiguity in classifying FDI in different activities under the services sector continues. The combined FDI share of financial and non-financial services under services sector, construction development, telecommunications, computer hardware and software, and hotels and tourism can be taken as the best estimate of services FDI, though it could include some non-service elements.

This share is 43.7 per cent of the cumulative FDI equity inflows during the period April 2000-November 2014.

Fig 2: Value (in US \$ million) of FDI inflow into various Service Subsectors



Source: Ministry of Finance, Govt. of India.

If the shares of some other services or service-related sectors like trading, information and broadcasting, construction (infrastructure) activities, consultancy services, hospital and diagnostic centres, ports, agriculture services, education, air transport including air freight, and retail trading are included, then the total share of cumulative FDI inflows to the services sector would increase to 53.8 per cent. In 2013-14, FDI inflows to the services sector (top five sectors including construction) declined sharply by 37.6 per cent to US\$ 6.4 billion, though overall FDI inflows grew by 8.4 per cent. However, during 2014-15 (April to November), the FDI inflows to services grew by 105.8 per cent compared to 22.2 per cent growth in overall FDI inflows. The total FDI inflows to the top five services in the first eight months of this year are higher than for the whole of 2013-14 owing to major inflows in telecommunications.

Table 4: FDI Equity Inflows in the Services Sector

Sector	Value (in US \$ million)			Percentage to total	Growth rate	
	2013-14	2014-15 (Apr. Nov)	Cumulative (Apr. 2000-Nov. 2014)		2013-14	2014-15 (Apr. Nov.)
Services Sector (Financial and Non-Financial)	2225	1847	41307	17.5	-54	24.9
Construction development	1226	703	24009	10.2	-8	-20.9
Telecommunications	1307	2472	16635	7	329.9	7390.9
Computer Software and Hardware	1126	862	13679	5.8	131.7	62.9
Hotel and Tourism	486	544	7662	3.2	-85.1	180.4
Total FDI Inflows	24299	18884	236465	100	8.4	22.2

Source: Ministry of Finance, Govt. of India.

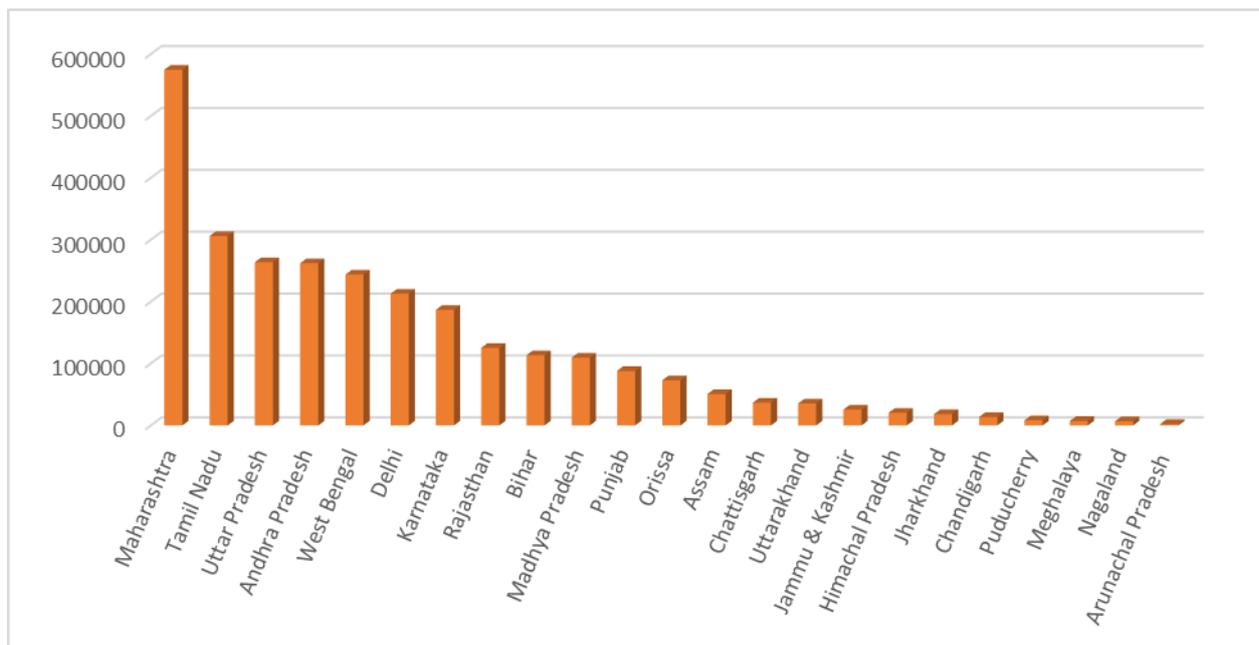
The services sector also has the highest share (54.6 per cent) in the gross capital formation (GCF) of Rs. 35.4 lakhs in 2013-14. This is owing to the GCF in real estate, ownership of dwelling and professional services at 20.1 per cent, though the share has fallen in the last two years, followed by trade and repair services (10.6 per cent) and public administration and defence (10.6 per cent) where there is improvement in shares. The growth rate of services GCF at 3.1 per cent has also been higher than the total GCF growth of 1.4 per cent. In fact, the positive GCF growth in services led to positive growth in total GCF as GCF growth in agriculture and industry was negative at - 0.3 per cent and - 0.6 per cent respectively. GCF growth in manufacturing was even more negative at - 5.4 per cent. As per the old method of estimating GDP at factor cost (GDP at FC), the services sector accounting for 57 per cent of GDP grew by 6.8 per cent in 2013-14, marginally lower than in 2012-13. This is mainly due to a fall in the growth rate of the combined category of trade, hotels, and restaurants and transport, storage, and communications to 3.0 per cent from 5.1 per cent in 2012-13, and in spite of robust growth of financing, insurance, real estate, and business services at 12.9 per cent. The somewhat differing results in services growth under the two methods are due to conceptual changes of GDP at FC to basic price and adoption of latest data sources. There was also

drastic decline in services share under the new method. The major change took place in the share of trade, repair, hotels, and restaurants from 17.2 per cent in 2012-13 using the old factor cost method to 11.3 per cent using the new basic price method. This is because trade carried out by manufacturing companies has now been shifted to manufacturing from trade and the data on unorganized trade enterprises has been updated with the 2010-11 survey instead of the 1999-2000 survey. However, this sector's growth was much higher using the new method than under the old method. As per the Advance Estimates (AE) in 2014-15, growth of the services sector accelerated further to 10.6 per cent as compared to 9.1 per cent in 2013-14. This is mainly due to growth acceleration in financial, real estate, and professional services to 13.7 per cent from 7.9 per cent and public administration, defence, and other services to 9.0 per cent from 7.9 per cent in the previous year. There was also good growth in trade, hotels, transport, communication, and related services at 8.4 per cent in 2014-15 though it was lower than the 11.1 per cent growth in 2013-14.

3.3 State-wise Comparison of Services

The services sector is the dominant sector in most states of India with a share of more than 40 per cent in the gross state domestic product (GSDP) in 2013-14 except for Arunachal Pradesh and Sikkim. Chandigarh is at the top with a share of 88.4 per cent followed by Delhi with 87.7 per cent. The major services in most of the states with high share are trade, hotels, and restaurants followed by real estate, ownership of dwellings and business services. Banking and insurance has an important share only in a few states/ union territories (UT) like Delhi, Maharashtra, and Chandigarh. In 2013-14, Bihar had the highest services growth of 17.3 per cent and Uttarakhand the lowest of 5.5 per cent. Bihar has been consistently showing double-digit growth in the services sector in the last five years due to high growth in trade, hotels, and restaurants.

Fig 1: Contribution of Services to GSDP, 2014 (Rs. Crore)

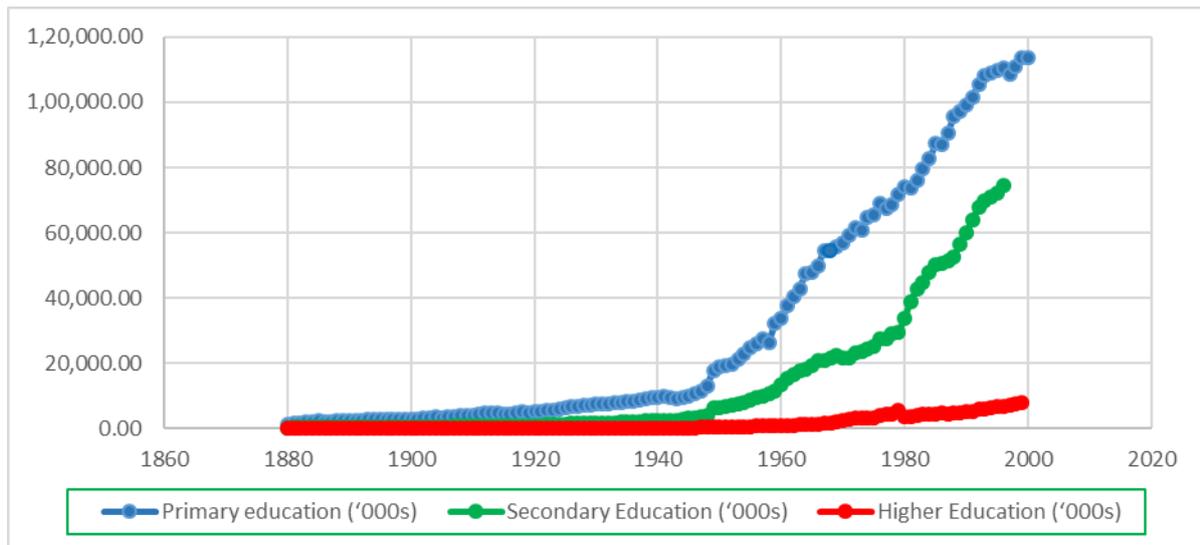


Source: CSO

4. The Level of Education in India

In India, secondary and higher education enrolments were quite high at the start of the century. If one looks at enrolments in secondary education divided by the enrolment in primary education, which gives a rough indication of how many children continued in secondary education after having successfully concluded the primary level, one finds that in 1880 this figure was 15%. From the numbers enrolled in secondary education about 5 % further enrolled in higher education. This figure increased after World War II to around 10%. Although not as impressive as the enrolment in secondary education, this figure was large enough to lead Sundaram (1946) to argue that ‘high school education came to be unduly dominated by the requirements of the universities, and representatives of the universities on the boards of high school education have dictated what the high schools should turn out.’ In absolute numbers, secondary and higher education did increase. Where in 1890 the gross enrolment ratio for secondary education had been 0.84%, in 1950 it was 16.6%.

Fig 2: Enrolments per level of education in India, 1880-2000



Source: Bas van Leeuwen (2007)

A reason for the relatively slow growth of the share of secondary and higher enrolments may be the industrialisation policy after independence. In general the idea was that education (especially secondary and higher) was necessary for the development of an industrial sector. The reconstruction of university education was considered essential to meet the demand for technical labour (Gosh 2000). This idea also furthered cooperation with individual entrepreneurs. For example, in the universities of Bombay and Calcutta, cooperation of local industrialists and the colleges took place in technical courses which increased job opportunities (Caldwell and Wright 1952). Thereafter, over the last century, literacy in India has increased from 5.3% in 1901 to 74.04% in 2011. However, the improvement is much more pronounced for the males compared to the females, especially till 1981. As a result, the gender gap in literacy soared from 9.2 points in 1901 to 26.8 points in 1981, but declined thereafter to 16.68 points in 2011. However, during the 1995-2000 period, total enrolment in secondary and higher secondary level increased by 4.1% and that in higher education by 10.5%. It is to be noted that enrolment of girls in these stages have increased almost twice as fast as that of the boys. This rise in female enrolment in the higher levels of education might have been due to the urban factor

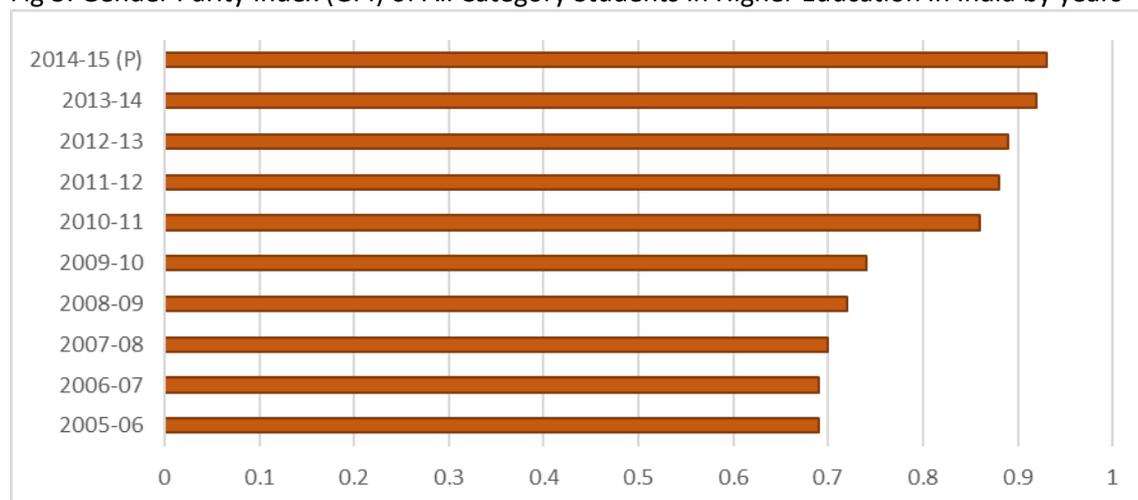
Table 5: Gross Enrolment Ratio of All Categories Students (18-23 Years) in Higher Education in India by years

Year	Boys	Girls	Total
2001-02	9.3	6.7	8.1
2002-03	10.3	7.5	9
2003-04	10.6	7.7	9.2
2004-05	11.6	8.2	10
2005-06	13.5	9.4	11.6
2006-07	14.5	10	12.4
2007-08	15.2	10.7	13.1
2008-09	16.1	11.3	13.8
2009-10	17.1	12.7	15
2010-11	20.8	17.9	19.4
2011-12	22.1	19.4	20.8
2012-13	22.7	20.1	21.5
2013-14	23.9	22	23
2014-15	24.5	22.7	23.6

Source: Ministry of Human Resource Development, Govt. of India.

The completion rate of education have increased for the middle and secondary stages but has declined for the primary level during 1995-2000 period. The completion rates are lower for the girls with only 37% and 26% of them completing middle and secondary schools (Mukherjee, 2004). From 2005-06 onwards, however, the gender parity index in higher education, across all category of students in India, shows a favourable trend. From 0.69 in 2005-06 it has increased to 0.93 in 2014-15 (see fig 3).

Fig 3: Gender Parity Index (GPI) of All Category Students in Higher Education in India by years



Source: Ministry of Human Resource Development, Govt. of India.

5. The Relation between Human Capital and Service Sector Growth

The main aim of this section is to examine whether the increasing tertiarization of the Indian economy is related to the human capital availability in the economy. It is likely that the relation between initial schooling levels and employment growth in schooling-intensive industries is stronger for more open economies. Studies have also observed that faster educational attainment growth seems to lead to faster shifts in production towards human capital-intensive industries. It is thus also likely that the availability of high levels of human capital, by facilitating technology adoption in education-intensive services sub-sectors, leads to faster employment growth in modern progressive services. To this effect, an econometric time-series analysis techniques is undertaken to examine the relationship between services sector expansion human capital growth.

Theoretically, there have been questions as to the order of development of human capital and service sector in the economy, however, empirical evidence on this is few, especially for India. Therefore, to study whether a higher human capital base has resulted in the development of the service sector in India or a developing service sector and the opportunities presented therefrom has led to the increased demand for higher education, we undertake a Vector Autoregressive analysis (VAR). A vector-autoregressive (VAR) model is a multivariate way of modelling time series data where we expect the two series to be impacted by their own past realizations and past realizations of the each other.

Data for the gross value added of service sector in India (GVA_s) is taken from the Ministry of Statistics and Programme Implementation, India and data on enrolment in higher education is taken from Ministry of Human Resource Development, India. Data is considered from the period 1950 to 2012. We consider a structure such that each variable is a linear function of past lags of itself and past lags of the other variables. Thus, estimate the following equations

$$y_t = c_1 + \phi_{11}y_{t-1} + \phi_{12}y_{t-2} + \phi_{13}m_{t-1} + \phi_{14}m_{t-2} + \varepsilon_{1t} \quad (1)$$

$$m_t = c_2 + \phi_{21}m_{t-1} + \phi_{22}m_{t-2} + \phi_{23}y_{t-1} + \phi_{24}y_{t-2} + \varepsilon_{2t} \quad (2)$$

where, y_t = log of GVA of service sector

and, m_t = log of enrolment in higher education

The error term (ε_t) follows i.i.d $N(0, \Sigma)$ where Σ is the variance-covariance matrix of the error term.

To identify the role of service sector's growth and its interdependencies with human capital, a Granger causality test was done. The co-integration technique pioneered by Engle and Granger (1987), Hendry (1986) and Granger (1986) made a significant contribution towards testing Granger-causality. Two or more variables are said to be co-integrated, i.e. they exhibit long-run equilibrium relationship(s), if they share common trend(s). According to this technique, if two variables are cointegrated, the finding of no causality in either direction - one of the possibilities with the standard Granger (1969) and Sims (1972) tests - is ruled out. As long as the two variables have a common trend, causality (in the Granger sense, not in the structural sense), must exist in at least one direction either unidirectional or bi-directional (Granger, 1986, 1988). Evidence of cointegration among variables also rules out the possibility of the estimated relationship being 'spurious'. However, although cointegration indicates the presence or absence of Granger-causality, it does not indicate the direction of causality between variables. This direction of the Granger (or temporal) causality can be detected through the vector error correction model derived from the long-run cointegrating vectors.

The VAR is estimated in reduced form and then structural form parameters are obtained via identification conditions. Since for a VAR model both series have to be stationary, the study variables were tested using a Phillips-Perron and Dicky-Fuller test. Both the test tells us these two series are non-stationary. A unit root test is a method to detect non-stationarity of the data. If non-stationarity of macro variables is not corrected, it would lead to the problem of spurious relationships among the variables. When a series contains unit root, it is common to transform the variables so as to make it stationary. Such a transformation process can be carried out through differencing. The number of times in which the series is differenced to attain stationarity is referred to as the order of

integration. If the data requires differencing once to make it stationary then it is said to be integrated of order one, I(1) (Green, 2003). Therefore, the first differenced version of the variables: natural log of gross value added of service sector in India (*flenrol*) and natural log of gross enrolment in higher education (*flgva*) is generated. Since stationarity of the results confirmed that all variables were integrated of order 1, before identifying the number of co-integrating vectors, we first applied VAR test in order to determine optimal lag length. The estimated reduced form VAR is reported below in Table 6. The optimal lag order is determined with the Final Prediction Error (FPE), the Akaike Information Criterion (AIC), the Schwarz Information Criterion (SIC) and the Hannan-Quinn Information Criterion (HQIC). Two lag structure was found to be appropriate. It is evident from Table 6 that all the lagged variables are significant. Next we check the stability of the VAR model. All the All the eigenvalues lie inside the unit circle. Therefore, VAR satisfies stability condition.

Table 6: Results of VAR Analysis

Variables	Coefficients
For flgva	
flgva	
L1	0.40*
L2	0.34**
flenrol	
L1	0.19**
L2	0.23*
constant	0.22*
For flenrol	
flgva	
L1	0.24
L2	0.17
flenrol	
L1	0.67*
L2	0.22
constant	0.12**

Note: (1) ** significant at 5%, * significant at 1%

(2) Log likelihood = 193.0975, SBIC= -10.32151, Det (Sigma_ml) = 4.00e-08

Source: Own Calculations

Test for Granger causality in Table 7. The null hypothesis is that the estimated coefficients of lagged values of the other endogenous variables are jointly zero. The relevant test statistic is Wald Statistics. It is evident that enrolment in higher education Granger causes higher GVA of the service

sector at 1% level of significance. So by and large Granger causality is established. This shows an inter-temporal interaction among the two variables of the model. However, Granger causality is not causality in a deep sense of the term. It just talk about linear prediction, and it only has meaning if one thing happens before another. Therefore, Granger causality measures whether one thing happens before another thing and helps predict it.

Table 7: Results of Granger Causality Wald Test

Equation	Excluded	χ^2 statistic
flgva	Flenrol	8.2205*
flgva	ALL	8.2205*
flenrol	Flgva	0.1112
flenrol	ALL	0.1112

Note: ** significant at 5%

* significant at 1%

Source: Own Calculations

Finally, we estimate the structural model to find the nature of contemporaneous relations among the endogenous variables. The matrix A is allowed to have arbitrary off diagonal elements. Under this interpretation, then, the stochastic parts of individual structural equations are allowed to be contemporaneously correlated in an arbitrary way; however, the correlation between any two equations arises explicitly because the equations are influenced by one or more of the same fundamental shocks ε_t . The model can also be identified by imposing restrictions on the elements of the matrix B (Greene, 1997). The matrix B describes the effects of the lagged endogenous variables on output and money. That is, this matrix describes the dynamic relationships between the variables in the model. The lagged endogenous variables are predetermined, meaning that they do not correlate with the contemporaneous or future realizations of the structural shocks. Variables that are predetermined can be treated, at least asymptotically, as if they were exogenous. Even though this makes these variables easy to handle empirically, restrictions on lagged endogenous variables are difficult to justify from a theoretical perspective, since economic theory usually does not say much regarding the dynamic relationships between variables, and for this reason it is preferable to

let these coefficients be determined by the data (Amisano and Giannini, 1997). In SVAR models, no restrictions are imposed on the elements of B.

The structural VAR model, in this case, is over identified with two more restrictions than are needed for identification. This version of the model is finally found to be the best in terms of several measures of goodness of fit. The LR test of over identifying restriction is not rejected at 5% (or even at 10%) level with a χ^2 value of 0.93 with degrees of freedom 1 and the probability being 0.335. For this short run restrictions for identification was imposed. B being structural innovations one can safely assume zero covariance between the two innovations, the principal diagonal of A is unity for normalization, rest of the constraints are exclusion conditions on the coefficients of A. Rest coefficients are estimated. After several trial and errors an appropriate structural form model was found as described by the estimated A matrix and B matrix is given below.

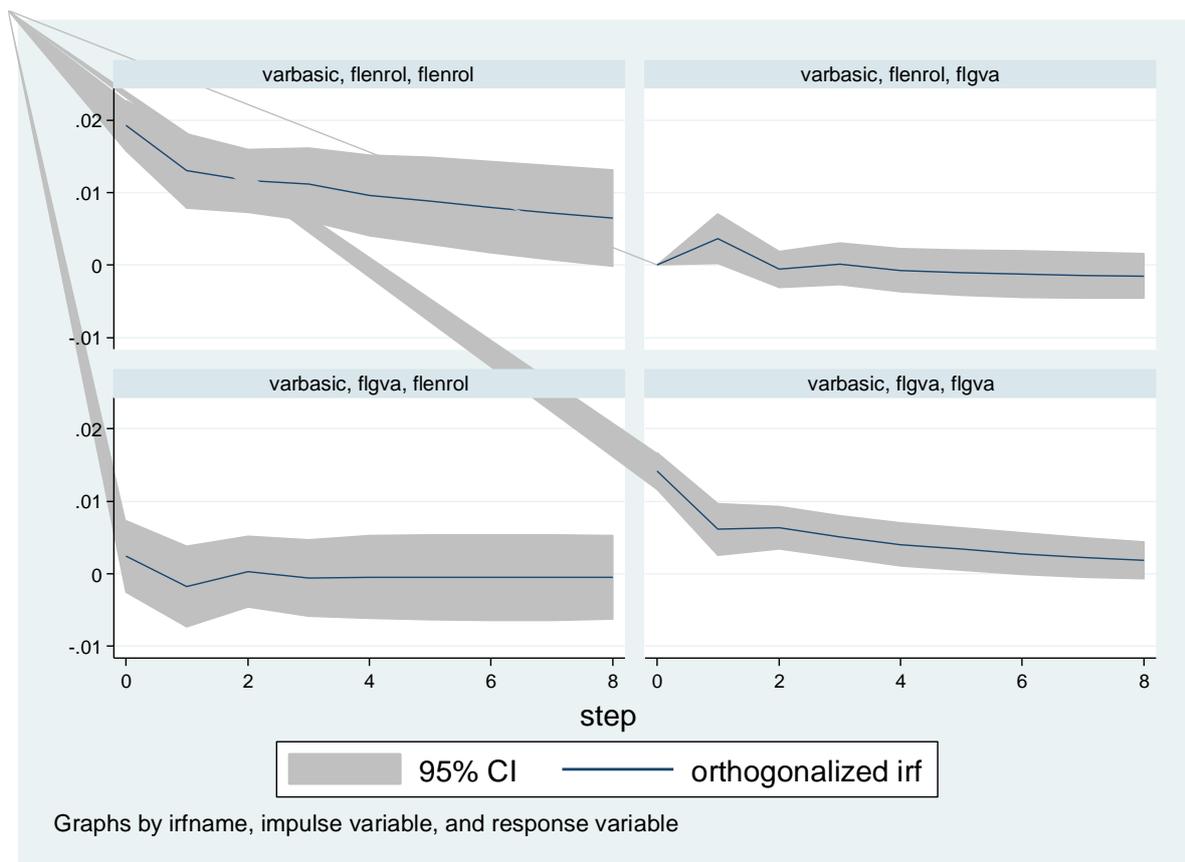
$$A = \begin{bmatrix} 1 & 0 \\ 0.91 * & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 0.14 * & 1 \\ 0 & 1 \end{bmatrix}$$

This implies that enrolment in higher education in India has a significant positive impact on the gross value added of the service sector. This also implies that the common argument of causality that greater opportunity in the service sector is resulting in increase in levels of higher education is not true. In fact, it is the existing levels of higher education which is resulting in greater inflow of service sector employments in the country.

In addition to Granger causality test the paper present the impulse response function graphs that could provide us some insights about the interaction between the variables. In general IRF analysis in time series analysis is important in determining the effects of external shocks on the variables of the system and shows how an unexpected change in one variable affects another variable through time.

Fig 4: Orthogonalized IRF



6. Concluding Remarks

There have been a significant rise in the contribution of services to the Indian GDP. The service sector has seen tremendous increase in its gross value added and employment capabilities over the years. The level of human capital in India has also increased over the years. Gross enrolment in higher education has seen a steady increase for both male and females. This has led to the debate on the causality of human capital growth and service sector growth.

This paper seeks to identify whether the specialised human capital base of the Indian economy has been the causal factor in development and growth of the service sector in India. The study found evidence of significant positive impact of enrolment in higher education in India on the gross value added of the service sector. This implies that investment in service sector in India happens largely because of the availability of skilled workers. Now, a significant part of service industry is also in the unorganised sector and the skilled requirement in those areas are not very high. But the major sub

sector where foreign investment comes in is telecommunications and IT and IT enabled services. These areas require high skilled workers and these are also the areas that actually account for higher GVA.

Therefore, policy makers and / or the government should strive to create institutional capacity that increase school enrolment and improve basic health service. That means, the policy makers and the government should centre on securing more resources and structures that are essential and appropriate for better school enrolment. Such measures should focus not only on creating new institutional capacity, but also on strengthening and changing the existing institutional setups of the education in India.

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Annexure 1

Services Sectors included in the National Industrial Classification 2008

- Wholesale and retail trade; repair of motor vehicles and motorcycles
- Transportation and storage
- Accommodation and food service activities
- Information and communication
- Financial and insurance activities
- Real estate activities
- Professional, scientific and technical activities
- Administrative and support service activities
- Public administration and defence; compulsory social security
- Education
- Human health and social work activities
- Arts, entertainment and recreation
- Other service activities
- Activities of households as employers; undifferentiated goods and services producing activities of households for own use
- Activities of extraterritorial organisations and bodies

Source: Extracted from National Industrial Classification, Central Statistical Organisation, Ministry of Statistics and Programme Implementation (MOSPI), Government of India,