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Articles

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Artha Vijnana was started in March 1959. It is a quarterly journal of the Gokhale Institute of Politics and Economics and is a peer reviewed journal. It has been publishing papers on economics, demography and subjects allied to economics.

From September 2022, the Journal announced an expansion in its focus. The journal would hence forth have a broader and an inter-disciplinary approach. Articles in the areas of economic sociology, political economy are also welcome. *Artha Vijnana* is committed to publishing high quality research, aimed at the broad audience of academicians, practitioners and policy makers, across South Asia and beyond.

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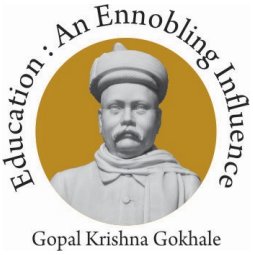

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Announcement

Artha Vijnana announces the institution of the Gopal Krishna Gokhale Memorial Annual Prize, awarded in recognition of the paper of most outstanding merit appearing in *Artha Vijnana*, irrespective of the author's age. This prize carries an award of ₹10,000, to be shared equally between all authors. In addition, *Artha Vijnana* announces the institution of the Prof. D R Gadgil Memorial Annual Prize, awarded in recognition of the paper of most outstanding merit appearing in *Artha Vijnana*, by a single author of below 40 years of age. This prize carries an award of ₹10,000.

Announcement of prizes for the best articles published in *Artha Vijnana* in the year 2024

We are happy to announce the following:

1) The Gopal Krishna Gokhale Memorial Annual Prize for the most outstanding article published in it by one or more authors (irrespective of age) be awarded to Swathy Krishna and Shacheendran V for the article entitled "*Impact of Goods and Services Tax on the Economic Growth of India*" (Vol. LXVI, No. 1, March 2024, pp. 115-124) and,
2) The D.R. Gadgil Memorial Annual Prize for the most outstanding article published in it by a single author below the age of 40 years be awarded to Tanusree Paul for the article entitled "*Towards a Kuposhan Mukt Bharat: An Exploration of Nutrition Sensitive Budgeting in India*" (Vol. LXVI, No. 1, March 2024, pp. 1-34).

Our heartiest congratulations to the prize winners.

Shankar Das
Editor

Artha Vijñāna

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Growth, Direction, and Pattern of Migration in Assam: An Evaluation from the Last Three Decades

Pinky Konwar and Komol Singha

This study looks at the growth, pattern, and direction of migration in Assam and the main reasons for it. Though the number of in-migrants entering Assam initially outnumbered the number of out-migrants, the position was reversed in subsequent censuses. Regarding inter-state migrants, Bihar and West Bengal sent the largest and second-largest number of in-migrants to Assam, respectively. On the other hand, most of Assam's out-migrants found their way to its sister states, the north-eastern region. Most of these out-migrants were not Axomiyas (i.e., indigenous Assamese), but rather economic migrants with roots either outside the country or in neighbouring Indian states. Nonetheless, due to socio-cultural proximity, West Bengal remains the most chosen destination for Assam's out-migrants for 'marriage' and 'moved with household' reasons. Bangladesh and Nepal contributed the highest and second-highest percentages of immigrants, respectively. However, the share of the former has steadily decreased in subsequent censuses, while the latter has risen.

Keywords: Assam; migration; Population census; Socio-cultural proximity

I Introduction

Migration is an integral part of human civilisation. Every ethnic group, individual, or ancestor may have migrated to the current habitat from other location(s) at some point (Singha and Firdos 2021). Nonetheless, if such population movement surpasses a certain threshold, it has a direct impact on land and resources (Lusome and Bhagat 2020), which is also a major source of conflict/contestation between the host and the migrant communities. According to the 2011 population census, India had 450 million internal migrants based on their last place of residence, accounting for roughly 37 per cent of the total population. (Rajan and Bhagat 2021). Apart from internal migration, India has received a significant number of international migrants, both legally and illegally, from its neighbours, at various times in history for a range of reasons. For instance, in the 2001 census, India received around 10-20 million immigrants from Bangladesh alone (Mayilvaganan 2019).

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Assam continued to be a popular destination not only for immigrants (especially from Bangladesh), but also for domestic migrants, primarily from the northeastern region (henceforth NER or simply region), and the Indian states of West Bengal (W.B. in Figure 1) and Bihar. Since the colonial era, Assam has seen an increase in large-scale migrant inflows, mainly to work in newly developed tea estates, basic infrastructural development activities including railway and oil refineries, and trade and commerce (Doley 2020, Weiner 1978). In terms of international migrants, there has been a significant increase in the influx of Bangladeshis in Assam since 1971, due to political and economic considerations in Bangladesh, causing major socioeconomic challenges not just in the state but also throughout the region (Sarma 2022, Goswami 2010). With the apprehensions of the large-scale influx of migrants into the region in recent decades, several indigenous communities have begun to demand a restriction on migrants' inflow, as well as security for indigenous peoples' land, culture and resources (Lusome and Bhagat 2020).

Recognising the need for these safeguards, the majority of the hill states in the region have passed many constitutional provisions (e.g., Sixth Schedule, Article 371, Autonomous Councils, inner line permit, and so on) to preserve land, population, culture, and natural resources from migrants. As a result of these entry restrictions in the neighbouring hill states, as well as Assam's relatively better economic prospects in comparison to other sister states in the region, large-scale migrants (both domestic and international) have made Assam their destination over the previous few decades. Since the 1970s and 1980s, this has resulted in severe population pressure on both land and natural resources in Assam. For instance, the overall number of migrants arriving in Assam from other states was estimated to be 2.53 lakhs in 2001, and it increased to 4.96 lakhs in 2011, which was almost double in a decade (Singha and Firdos 2021).

As expected, the in-migrant populations chose Assam's towns and commercial centres as their destinations, and they quickly dominated or occupied substantial portions of the state's primary trade and commerce in the last few decades. According to Weiner (1978), on the eve of independence, out of 103,000 lakh jobs, 50,000 were being captured by the migrants in the centrally controlled services, which was around 50 per cent of the total employment in Assam. As economic and employment opportunities for locals dwindled over time, a protest was held in 1972 against the central government, demanding that the state's major refineries and petrochemical complexes/recruitment offices, which were all located outside Assam, be relocated within the state, primarily to meet the growing demand for employment in the state (pp. 127-128). Apart from ethnic identity and political movements, one of the fundamental causes of the well-known Assam Movement (1979-1985), a protest against migrants, was the ever-shrinking employment opportunities for natives (Singha 2018, Goswami 2007).

However, migration data from the last few censuses in Assam speaks otherwise. A large number of youths have out-migrated to other states from Assam in recent years. The pace of outmigration has accelerated in recent years,

particularly since 1991. For example, the compound annual growth rate (CAGR) of out-migrants from 1991 to 2011 was 2.11 per cent, compared to 0.06 per cent of in-migration during the same period (Singha and Firdos 2021). Why has the out-migration rate exceeded the in-migration rate if there are so many opportunities and resources in Assam? Were there any significant changes in the growth and pattern of migration in recent censuses in Assam compared to previous ones?

II Brief Review of Literature

In recent years, the out-migration rate from NER to other states within the country and even beyond has increased to a great extent. The main reasons for this ever-increasing out-migration seem to be employment and education purposes. According to Sarkar (2020), a large number of youths have out-migrated to other states from Assam due to limited economic opportunities, poor infrastructural facilities, and limited higher educational institutions. Most of these out-migrants generally prefer to make mega-cities like Delhi, Mumbai and Bangalore their destination, primarily due to inadequate employment opportunities, shortage of educational institutions and poor economic growth in their home states (Marchang 2017). The share of out-migrants from Assam (out of the total out-migrants from NER) to other states during 1991 was estimated at 58.8 per cent. In 2001, it rose to 61.4 per cent and further rose to 64.55 per cent in 2011 (Singha and Firdos 2021). According to Mistri (2022), employment and marriage were the highest recorded share of migration that showed in the last three censuses in NER. For employment, its share was estimated at 18.2 per cent, 20 per cent and 28.1 per cent in 1991, 2001 and 2011, respectively. As for marriage purposes, its share was estimated at 26.2 per cent, 35.9 per cent and 24.6 per cent in 1991, 2001 and 2011, respectively. Whereas, the students' out-migration rate from the region has been decreasing gradually because of the establishment of centrally funded educational institutions, research centres, tribal universities, and sports and cultural universities (RGCC 1991; 2001; 2011).

Since the country's independence, immigrants from countries such as Bangladesh have had a significant impact on the socioeconomic and cultural environment of Assam. Using 2011 population census data, Mayilvaganan (2019) estimated that nearly one-third of Assam's population are immigrants. The districts such as Dhubri, Goalpara, Barpeta, Morigaon, Nagaon, Dhemaji, Cachar, Karimganj, and Hailakandi attracted the majority of the migrant population from Bangladesh. As a result, the decadal growth rate of the population in these districts was estimated to be around 20-30 per cent. According to Kumar (2020), economic and political issues have been important push factors for Bangladeshis to migrate to Assam. Apart from domestic in-migrants from other regions/states, the impact of Bengali migrants (Muslim and Hindu, on rural agricultural land and the urban centres, respectively) from neighbouring states (West Bengal and Tripura) and countries (Bangladesh) has been one of the key concerns throughout Assam's

migration history. It was followed by the in-migrants from Hindi-speaking northern and eastern India, especially Bihar, Uttar Pradesh, and present Jharkhand, etc. They generally entered the informal job markets. The Assam movement, a campaign against migrants, was one of the ramifications of the natives' loss of jobs and economic possibilities at the hands of migrants (Weiner 1978).

In terms of intra-state migration, Assam's urbanization and rapid infrastructural improvement have resulted in considerable rural-urban mobility since the 1990s. For example, rural-to-urban migration in Assam was roughly estimated to be around 5.5 lakhs in 1991, 6.7 lakhs in 2001, and 10.4 lakhs in 2011. It is also observed that Assam's rapid population growth appears to be a direct reflection of the recent population inflow, which has further contributed to rural-to-urban migration in the state (Kazi 2020). Apart from serving as a gateway to its sister states (the other six NER states, except Sikkim), Assam's major urban centres (especially Guwahati, Dibrugarh, Silchar, Jorhat, Tezpur, and so on) have been providing economic opportunities and educational facilities to the people of these NER states. As a result, Assam receives many migrants from other NER states (Singha and Firdos 2021). However, according to the 2011 population census, the out-migration rate from Assam to other states within the country has increased significantly, estimated at 2.11 per cent compared to a 0.06 per cent rate of in-migration (p. 390).

III Objectives and Methodology

Using the most recent three population census data (1991, 2001, and 2011), the present study investigates the three following objectives:

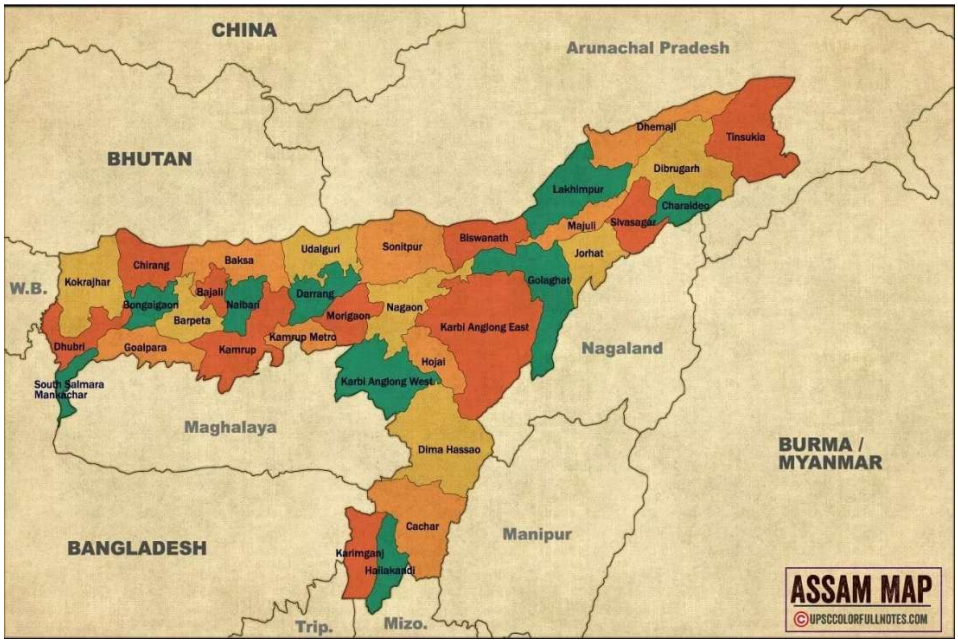
- To examine the growth, direction and pattern of migration in Assam.
- To identify the districts that attract the most migrants and why.
- To investigate the various reasons for in-migration to and out-migration from Assam.

The present study used three population census data, 1991, 2001 and 2011, collected from the Office of the Registrar General & Census Commissioner, Government of India. Descriptive statistics, including the growth rate, percentage, basic figures, and tables, have been used to achieve the set objectives.

To understand the functional definitions clearly, in this study, a person is treated as a migrant if his/her place of birth is different from the place of enumeration. In this study, 'in-migration' refers to people coming into Assam from other parts/states of India, whilst 'out-migration' refers to people moving out of Assam to other parts/states of India. In short, both in-migration and out-migration imply domestic migration. The term 'immigrant' refers to someone who comes to Assam from another/foreign country, whereas 'emigrant' refers to someone who leaves Assam for another/foreign country. However, the present study did not

include a detailed analysis of emigrants, due to a lack of data on it. Similarly, despite being one of NER's sister states, Sikkim is excluded from this study due to a lack of uniform data. Nonetheless, Figure 1 depicts Assam's geographical situation and those of its neighbours in order to grasp an approximate idea of migratory pathways.

Figure 1: Political Map of Assam



Note: Map not to scale; The total number of districts in Assam was 35. However, on 31 December 2022, the Assam Cabinet announced the merging of four newly formed districts into their parent districts, making the total number of districts in the state 31.

Source: https://upsccolorfullnotes.com/assam-map/

IV Migration Scenario of Assam

The recorded history of migration for the state of Assam may be traced back to the colonial era when the British became the state's protectorate. With the establishment of tea plantations in the state in 1832, the phenomenon of migration became very visible (Healthy and Hygiene 2022). A large number of migrants were brought to the state for cultivation and other tertiary activities. As a consequence, migration has become a debatable issue in the state since the colonial period (Saikia, *et. al.* 2016, Bandyopadhyay and Chakraborty 1999). Assam is the gateway to its sister states, which are economically and infrastructurally weak in comparison to the former. The state is also surrounded by four Asian countries, Bangladesh, Myanmar, Nepal, and Bhutan, all of which are economically weak, in comparison to India, and politically volatile (Figure 1). Assam's geopolitical

and geographical position is also one of the main reasons for large-scale migrants entering the state. At the same time, some studies (e.g., Singha and Firdos 2021, Sarkar 2020) have recently shown a large-scale out-migration from Assam to other states of the country for various reasons. All of these (both the inflow and outflow of migrants) can be analysed using different census data.

In-migrants and Out-migrants

Table 1 depicts the growth trends of in-migrants and out-migrants in Assam for the last three census reports. Initially, in the 1991 census, the in-migration from other states to Assam was much bigger than the out-migrants, around 1.5 lakh more population was coming into the state from other states over the number of out-migrants. However, in the subsequent censuses, that is, in 2001 and 2011, the out-migrant populations were much bigger than the in-migrants. The number of out-migrants outnumbered the number of in-migrants by approximately 2.2 lakh in 2001. The compound annual growth rate (CAGR) of in-migration in the 2001 over 1991 census was negative, estimated at -1.78 per cent, while the growth rate of out-migration during the same period was estimated at 5.92 per cent. The trend continued in the 2011 census as well, the out-migrant number was much bigger than that of the in-migrants.

Table 1: Growth of In-migrants and Out-migrants in Assam

Year	1991	2001	2011	CAGR 1991-2001	CAGR 2001-2011	CAGR 1991-2011
Out-migrants	352163	626055	659235	5.92	0.52	2.11
In-migrants	487035	407140	495606	-1.78	1.99	0.06

Source: Authors' estimation from RGCC 1991, 2001 and 2011.

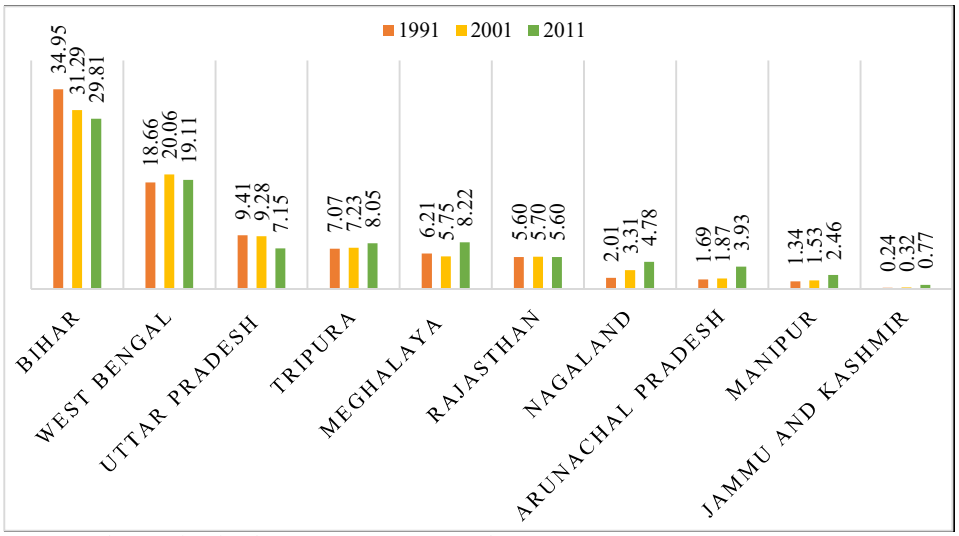
Though the out-migrant population was larger than the in-migrant population (a little more than 1.6 lakhs) in 2011 compared to the 2001 census, the CAGR of out-migration was estimated at 0.52 per cent compared to the in-migration rate of 1.99 per cent due to a sharp drop in in-migration in 2001 and rise in 2011. When we measure the out-migration rate for the last three decades, from 1991-2011, it was estimated at 2.11 per cent compared to 0.06 per cent of the in-migration growth rate during the same period. According to the data presented above, the growth rate and absolute number of out-migrants from Assam to other states increased following the 1991 census.

Top 10 States Sending Migrants to and Receiving Migrants from Assam

To have a better understanding of the growth and pattern of domestic migration, Figure 2 depicts the top ten states of the country that sent migrants to Assam. Bihar remained at the top in sending migrants to Assam in all three census periods,

accounting for 35 per cent of all in-migrants coming from other states of the country in 1991, followed by 31 per cent in 2001 and 29 per cent in 2011. It was followed by West Bengal, which contributed the second-highest share of in-migrants coming to Assam, with around 19 per cent, 20 per cent and 19 per cent in 1991, 2001, and 2011, respectively. Though it was quite low, the state of Uttar Pradesh ranks third, sending around 9 per cent of total in-migration in 1991 and 2001, and approximately 7 per cent in 2011. Despite being a modest percentage in contrast to Bihar, West Bengal, and Uttar Pradesh, the share of in-migrants from Rajasthan has remained consistent at little less than 6 per cent over the last three decades. The majority of Rajasthani migrants are from business communities, concentrated in cities and urban centres in Assam.

Figure 2: Top 10 States Sending In-migrant Populations to Assam (% of the total)



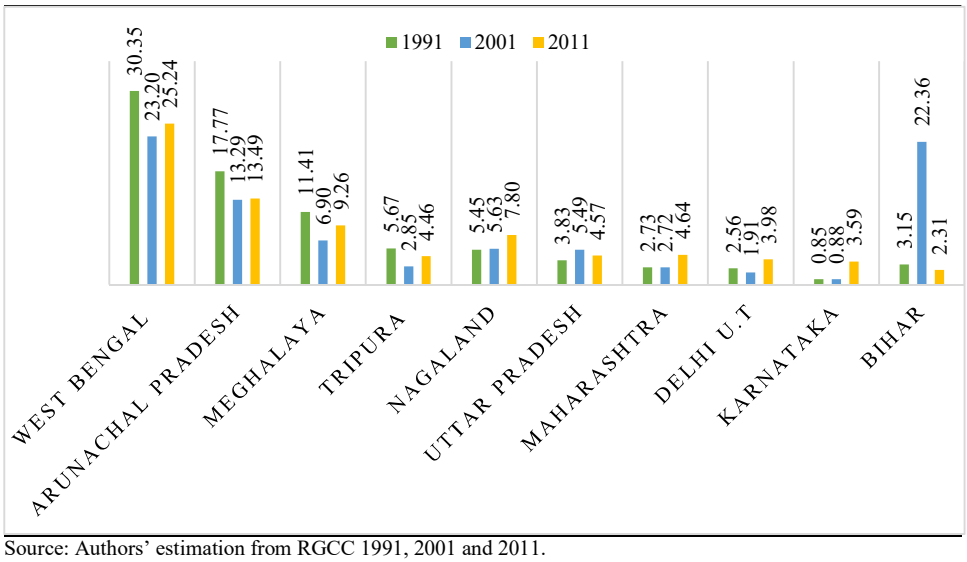
Source: Authors' estimation from RGCC 1991, 2001 and 2011.

Nonetheless, the in-migrant population from the NER states to Assam has been noticeably different. Even though the number and share of migrants from NER are small in comparison to Bihar and West Bengal, the states of Meghalaya, Arunachal Pradesh, Tripura, Manipur, and Nagaland have sent a significant number of migrants to Assam, and their share has gradually increased in the subsequent census periods. Looking closely at the domestic/inter-state in-migration trend, while West Bengal's share remained approximately steady during the last three census periods, Bihar and Uttar Pradesh's portion appears to be consistently declining. However, the share of in-migrant populations from the NER states to Assam has been steadily increasing.

In contrast to the pattern described above for in-migrants, the out-migrant populations from Assam to other states within the country have two distinct points (Figure 3). One, out of all the states in India, Assam's out-migrant populations

largely target the NER states and a few mega-cities outside the region. West Bengal, notably Kolkata and Siliguri, are the most preferred destinations for the out-migrants from Assam. In 1991, the percentage of out-migrants from Assam reaching West Bengal was estimated to be somewhat higher than 30 per cent, but it fell to 25 per cent in 2011. Other prominent cities/states targeted by out-migrants from Assam include Delhi, Maharashtra (primarily Mumbai and Pune), Karnataka (primarily Bengaluru and Mysuru), and Uttar Pradesh (Noida and Ghaziabad, both of which are part of the Delhi NCR, Lucknow, Varanasi, Prayagraj/Allahabad, Aligarh, and so on).

Figure 3: Top 10 States Receiving Assam's Out-migrant Populations (% of the total)



Source: Authors' estimation from RGCC 1991, 2001 and 2011.

Second, a large number of out-migrant populations from Assam chose NER states such as Arunachal Pradesh, Tripura, Meghalaya, and Nagaland as their destinations for work and business opportunities. According to Singha and Firdos (2021), most of these migrants are not *Axomiyas* (indigenous Assamese), but rather economic migrants who have roots outside the country or have already relocated to Assam from other regions of the country. Abnormally, in the 2001 census, Bihar received a huge number of circular migrants from Assam (Bihari migrants returning home). This was most likely the result of the insurgent groups' attack on outsiders and Hindi-speaking communities in the late 1990s and early 2000s (Ghosh 2003).

Immigrants Arriving in Assam from Major Neighbouring Countries

Table 2 shows the distribution and magnitude of international migrants coming from foreign countries to Assam, measured as the place of last residence. Understandably, Bangladesh is the major source of immigrant populations in Assam, accounting for 87.1 per cent of the total immigrants coming to Assam in 1991, slightly decreased to 86.25 per cent in 2001 and further reduced to 83.25 per cent in 2011. This massive influx of international migrants from Bangladesh sparked the foreigners' movement, also known as the Assam Movement, in 1979, which culminated in the signing of the Assam Accord in 1985. The year 1971 was chosen as the base year for determining state citizenship, and everyone who arrived after this year was considered an illegal migrant.

Table 2: Country-wise Immigrants (by Place of Last Residence) in Assam (% of Total)

Countries	1991	Countries	2001	Countries	2011
Bangladesh	87.10	Bangladesh	86.25	Bangladesh	83.25
Nepal	6.78	Nepal	9.40	Nepal	10.86
Pakistan	4.57	Pakistan	3.73	Pakistan	4.72
Bhutan	0.31	Bhutan	0.30	Bhutan	0.59
Myanmar	0.27	Myanmar	0.15	Myanmar	0.32
Afghanistan	0.28	Afghanistan	0.09	Afghanistan	0.13
Other Countries	0.39	Other Countries	0.08	Other countries	0.13
Total	100	Total	100	Total	100

Source: Authors' estimation from RGCC 1991, 2001 and 2011.

As a result of the Assam Accord of 1985, the share of Bangladeshi immigrants has gradually decreased over time. On the other hand, the proportion of immigrants from Nepal, Pakistan, Bhutan, and Myanmar has gradually increased over time. Apart from contributing the least in comparison to other countries, the share of immigrants arriving from Afghanistan to Assam has gradually dropped over the years. The signing of the Indo-Nepal Friendship Treaty in 1950, followed by two additional similar treaties in 1951 and 1956, enabled the immigration of Nepalis to India. The majority of Bhutanese immigrants coming to Assam are from Nepali ethnic groups. Nepalis account for approximately one-sixth of Bhutan's population. When ethnic violence against the Nepalis erupted in Bhutan in 1991, a large number of Nepali people fled to Nepal and India, with a few moving to Assam (Goswami 2007).

V District-wise Inflow of Domestic and International Migrants in Assam

This section discusses the magnitude and pattern of the district-wise migrants coming into Assam. There were only 23 districts when the 1991 and 2001 census

data were prepared by the government. However, it increased to 27 districts for the 2011 census and at present, it stands at 31 districts (Figure 1). Therefore, a few district's data missing in different censuses; only 27 districts have been discussed in this section. Based on the geographical location, Assam's districts have been grouped officially into three valleys: Northern Brahmaputra Valley, Southern Brahmaputra Valley, and Barak Valley. The migration flow is also examined using this three-valley classification.

Inflow of Migrants (Domestic and International) and Their Shares in Different Valleys

Table 3 displays the district-wise inflow of in-migrant populations to Assam from other states of the country as well as immigration from foreign countries. In most districts of Assam's Northern Brahmaputra Valley, the percentage of immigrants was higher than that of in-migrants (domestic migrants) in the 1991 census.

Table 3: In-migrants and Immigrants and Their Shares in Northern Brahmaputra

Districts	1991			2001			2011		
	In-migrants	Immigrants	Total	In-migrants	Immigrants	Total	In-migrants	Immigrants	Total
Dhubri	24373	14292	38665	21,992	7686	29678	32620	4405	37025
	(4.54)	(4.21)	(8.75)	(4.26)	(4.03)	(8.29)	(5.84)	(4.04)	(9.88)
Kokrajhar	19578	13314	32892	17971	8666	26637	17571	3888	21459
	(3.65)	(3.92)	(7.57)	(3.48)	(4.55)	(8.03)	(3.15)	(3.56)	(6.71)
Bongaigaon	21490	22765	44255	20369	12,653	33,022	15876	4013	19889
	(4.01)	(6.70)	(10.71)	(3.95)	(6.64)	(10.59)	(2.84)	(3.68)	(6.52)
Barpeta	8631	21450	30081	6512	8991	15503	6636	4076	10712
	(1.61)	(6.32)	(7.93)	(1.26)	(4.72)	(5.98)	(1.19)	(3.73)	(4.92)
Nalbari	10297	9860	20157	6425	5577	12002	2464	951	3415
	(1.92)	(2.90)	(4.82)	(1.25)	(2.93)	(4.18)	(0.44)	(0.87)	(1.31)
Darrang	25990	19927	45917	18243	9766	28009	3601	2119	5720
	(4.85)	(5.87)	(10.72)	(3.54)	(5.13)	(8.67)	(0.64)	(1.94)	(2.58)
Sonitpur	40900	18120	59020	34877	10,628	45,505	28638	6476	35114
	(7.62)	(5.34)	(12.96)	(6.76)	(5.58)	(12.34)	(5.13)	(5.93)	(11.06)
Lakhimpur	11376	6070	17446	12943	2968	15911	12365	1544	13909
	(2.12)	(1.79)	(3.91)	(2.51)	(1.56)	(4.07)	(2.21)	(1.41)	(3.62)
Dhemaji	10317	7133	17450	9454	3044	12498	10107	1817	11924
	(1.92)	(2.10)	(4.02)	(3.54)	(1.60)	(5.14)	(1.81)	(1.66)	(3.47)
Udalguri	-	-	-	-	-	-	11046	3263	14309
							(1.98)	(2.99)	(4.97)
Chirang	-	-	-	-	-	-	5322	3146	8468
							(0.95)	(2.88)	(3.83)
Baksa	-	-	-	-	-	-	5718	4794	10512
							(1.02)	(4.39)	(5.41)

Notes: Figures in parentheses reflect percentages of total migrants in the state in their respective categories in each district.

Source: Authors' estimation from RGCC 1991, 2001 and 2011.

For example, the districts of Barpeta, Bongaigaon, Darrang and Sonitpur were found to have received a larger percentage of immigrants in the 1991 census in comparison to domestic migrants coming from other states of the country. In

terms of in-migrants, the districts of Sonitpur, Darrang, Dhubri, Kokrajhar and Bongaigaon received a larger share. In 2001, the districts of Bongaigaon, Sonitpur, Darrang, Barpeta, Kokrajhar, and Dhubri received the largest share of immigrants while, in descending order, the districts of Sonitpur, Dhubri, Darrang, Dhemaji, Bongaigaon, and Kokrajhar received a bigger percentage of in-migrants under the Northern Brahmaputra Valley. In the 2011 census, two districts, Sonitpur and Dhubri under the Northern Brahmaputra valley received migrants the most, both in-migrants and immigrants, in descending order.

When it comes to total migrants (both domestic and international), the districts of Darrang, Sonitpur and Bongaigaon within the Northern Brahmaputra Valley of Assam received more migrants (domestic and international) compared to other districts in the valley in the 1991 census. The pattern was similar in the 2001 and 2011 censuses, except the Darrang district which had the valley's second-lowest migrant share in 2011. Because these districts are not located near an international border, the majority of migrants are domestic.

Table 4: In-migrants and Immigrants and Their Share in Barak Valley

Districts	1991			2001			2011		
	In-migrants	Immigrants	Total	In-migrants	Immigrants	Total	In-migrants	Immigrants	Total
Karimganj	14615	29428	44043	12462	16152	28614	21061	11244	32305
	(2.72)	(8.67)	(11.39)	(2.42)	(8.48)	(10.9)	(3.77)	(10.30)	(14.07)
Hailakandi	6150	6326	12476	5186	3188	8374	5596	1933	7529
	(1.15)	(1.86)	(3.01)	(1.01)	(1.67)	(2.68)	(1.00)	(1.77)	(2.77)
Cachar	19339	36211	55550	19142	23474	42616	27348	16179	43527
	(3.61)	(10.66)	(14.27)	(3.71)	(12.32)	(16.03)	(4.90)	(14.82)	(19.72)

Notes: Figures in parentheses reflect percentages of total migrants in the state in their respective categories in each district.

Source: Authors' calculation from RGCC 1991, 2001 and 2011.

Table 4 depicts the district-wise pattern of in-migration populations (domestic) and immigrants (international) in Assam's Barak Valley. In the 1980s, the districts of Karimganj and Hailakandi in this valley were separated from the Cachar district. Throughout the three census periods, the share of immigrants out-numbered the in-migrants in all three districts of Assam's Barak Valley. The majority of the immigrants to this valley were mostly from Bangladesh, and the immigrant populations that have come to this valley/part of Assam are mostly due to historical, cultural, and geographical proximity with Bengalis residing on both sides of the borders.

In the Southern Brahmaputra Valley (Table 5), the pattern and direction of migration are more or less consistent over the three census periods. Across all three census periods, the districts of Kamrup/Guwahati and Tinsukia drew the highest and second-highest share of in-migrants, respectively. The trend of immigrants remained similar, with Nagaon and Kamrup districts receiving the highest and second-largest percentage of immigrants, respectively. Extraordinarily, these two districts attracted the highest shares of immigrants (14 per cent of the valley) and

in-migrants (20 per cent of the valley), owing to their Bengali majority and state capital, respectively. When we combined the two sorts of migrants, domestic and international, the position between the Nagaon and Kamrup districts was reversed.

Table 5: In-migrants and Immigrants and Their Shares in Southern Brahmaputra

Districts	1991			2001			2011		
	In-migrants	Immigrants	Total	In-migrants	Immigrants	Total	In-migrants	Immigrants	Total
Nagaon	30400	48481	78881	25791	26131	51922	31592	15466	47058
	(5.67)	(14.28)	(19.95)	(5.00)	(13.71)	(18.71)	(5.66)	(14.17)	(19.83)
Dibrugarh	40854	6780	47634	34225	3522	37747	32873	2197	35070
	(7.62)	(2.00)	(9.62)	(6.63)	(1.85)	(8.48)	(5.89)	(2.01)	(7.9)
Golaghat	18540	2803	21343	19540	1726	21266	15713	1233	16946
	(3.46)	(0.83)	(4.29)	(3.79)	(0.91)	(4.7)	(2.81)	(1.13)	(3.94)
Tinsukia	52456	11880	64336	50983	7934	58917	55943	4701	60644
	(9.78)	(3.50)	(13.28)	(9.88)	(4.16)	(14.04)	(10.02)	(4.31)	(14.33)
Kamrup	93714	27850	121564	108217	16169	124386	7374	1684	9058
	(17.47)	(8.20)	(25.67)	(20.98)	(8.49)	(29.47)	(1.32)	(1.54)	(2.86)
Kamrup metro	-	-	-	-	-	-	113214	8481	121695
							(20.38)	(7.77)	(28.15)
Jorhat	18435	2390	20825	23546	1414	24960	21636	1403	23039
	(3.44)	(0.70)	(4.14)	(4.56)	(0.74)	(5.3)	(3.88)	(1.29)	(5.17)
Goalpara	8452	12311	20763	8811	7860	16671	12348	5438	17786
	(1.58)	(3.63)	(5.21)	(1.71)	(4.12)	(5.83)	(2.21)	(4.98)	(7.19)
Karbi anglong	31391	10400	41791	28713	6629	35342	32513	3739	36252
	(5.85)	(3.06)	(8.91)	(5.57)	(3.480	(9.05)	(5.82)	(3.43)	(9.25)
Marigaon	5980	7780	13760	4350	4009	8359	4811	2040	6851
	(1.11)	(2.29)	(3.4)	(0.84)	(2.10)	(2.96)	(0.86)	(1.87)	(2.73)
Sibsagar	17051	1960	19011	20737	1171	21908	18883	912	19795
	(3.18)	(0.58)	(3.76)	(4.02)	(0.61)	(4.63)	(3.38)	(0.84)	(4.22)
NC hills	6090	2010	8100	5434	1198	6632	5444	503	5947
	(1.14)	(0.59)	(3.76)	(1.05)	(0.63)	(1.68)	(0.98)	(0.46)	(1.44)

Notes: Figures in parentheses reflect percentages of total migrants in the state in their respective categories in each district.

Source: Authors' calculation from RGCC 1991, 2001 and 2011.

Top Eight Assam Districts Receiving Domestic Migrants from Other States

This section illustrates the top eight districts in Assam receiving in-migrant populations from other states of the country. This is done primarily to demonstrate the character and interconnectedness of the districts with the states that provided in-migrant populations. For clarity, all three censuses have been presented separately, and the figures are represented as percentages of the district's total in-migrant populations from other states of India. Kamrup district taken in this section is the erstwhile undivided one.

Table 6: Top 8 Districts Receiving the Largest Share of In-migrants from Top 10 States in 1991 (in%)

Top 10 states to Kamrup		Top 10 states to Tinsukia		Top 10 states to Sonitpur		Top 10 states to Dibrugarh	
Bihar	36.25	Bihar	46.20	Bihar	41.52	Bihar	48.11
West Bengal	18.38	Uttar Pradesh	16.72	West Bengal	12.37	Uttar Pradesh	16.96
Meghalaya	10.54	West Bengal	7.15	Uttar Pradesh	11.88	West Bengal	6.30
Uttar Pradesh	8.46	Andhra Pradesh	4.99	Himachal Pradesh	8.00	Himachal Pradesh	5.73
Rajasthan	6.90	Rajasthan	4.73	Rajasthan	5.13	Rajasthan	3.45
Tripura	3.93	Arunachal Pradesh	4.02	Orissa	2.35	Tripura	3.35
Andhra Pradesh	2.24	Tripura	3.89	Gujarat	2.10	Punjab	2.11
Punjab	1.89	Orissa	2.63	Arunachal Pradesh	2.08	Andhra Pradesh	2.08
Orissa	1.62	Haryana	1.53	Meghalaya	2.05	Madhya Pradesh	2.06
Gujarat	1.18	Meghalaya	1.49	Punjab	1.78	Arunachal Pradesh	1.71
Others	8.61	Others	6.65	Others	10.74	Others	8.14
Total	100	Total	100	Total	100	Total	100
Top 10 states to Karbi Anglong		Top 10 states to Darrang		Top 10 states to Dhubri		Top 10 states to Bongaigaon	
Bihar	31.71	Bihar	48.48	West Bengal	54.95	West Bengal	40.67
Uttar Pradesh	20.32	West Bengal	17.66	Bihar	18.05	Bihar	31.74
Tripura	8.70	Madhya Pradesh	7.00	Meghalaya	13.74	Uttar Pradesh	7.26
Nagaland	8.00	Orissa	6.04	Rajasthan	6.24	Rajasthan	5.86
Meghalaya	7.10	Uttar Pradesh	4.81	Uttar Pradesh	2.26	Andhra Pradesh	2.98
West Bengal	5.78	Rajasthan	4.23	Manipur	1.11	Meghalaya	2.61
Manipur	4.59	Andhra Pradesh	1.92	Andhra Pradesh	0.78	Tripura	2.28
Himachal Pradesh	3.79	Meghalaya	1.77	Tripura	0.45	Punjab	0.98
Rajasthan	2.10	Tripura	1.73	Orissa	0.37	Kerala	0.79
Orissa	2.04	Haryana	1.27	Nagaland	0.29	Orissa	0.70
Others	5.87	Others	5.09	Others	1.76	Others	4.13
Total	100	Total	100	Total	100	Total	100

Source: Authors' estimation from RGCC 1991.

Table 6 shows the major eight districts that received the largest share of migrants from the top ten states of the country in the 1991 census. Bihar sent the largest share of migrants to six districts (Kamrup, Tinsukia, Sonitpur, Dibrugarh, Karbi Anglong and Darang) out of the eight highest districts listed, as much as 49 per cent of the respective district's total in-migrant populations received in 1991 census. The remaining two districts, Dhubri and Bongaigaon received the second largest share of in-migrants from the state of Bihar at the tune of 18 per cent and 32 per cent, respectively. West Bengal and Uttar Pradesh also became major states in terms of sending in-migrant populations to Assam. The districts of Dhubri and Bongaigaon received the largest share of the in-migrant populations from West Bengal as high as 41-55 per cent of the district's total due to their geographical

and ethnic proximity (W.B. in Figure 1), while Uttar Pradesh remained in the second to fourth position for contributing in-migrants to all the eight districts listed in the 1991 census. In comparison to bigger Indian states, the proportion of in-migrant populations arriving in the districts listed from NER states was found to be minimal. Understandably, this is due to the comparatively small population of these NER states, and Mizoram did not even appear anywhere on the list of top states that provide in-migrant populations to Assam or the districts of Assam.

Table 7: Top 8 Districts Receiving the Largest Share of In-migrants from Top 10 States in 2001 (in %)

Top 10 states to Kamrup		Top 10 states to Tinsukia		Top 10 states to Sonitpur		Top 10 states to Dibrugarh	
Bihar	37.10	Bihar	47.65	Bihar	37.17	Bihar	42.36
West Bengal	19.79	Uttar Pradesh	14.76	West Bengal	15.24	Uttar Pradesh	19.51
Meghalaya	9.01	West Bengal	7.50	Uttar Pradesh	13.52	West Bengal	9.67
Rajasthan	8.26	Arunachal Pradesh	4.61	Rajasthan	5.72	Rajasthan	3.54
Uttar Pradesh	7.18	Andhra Pradesh	3.85	Jharkhand	4.52	Tripura	3.12
Tripura	3.88	Rajasthan	3.65	Arunachal Pradesh	2.90	Jharkhand	2.61
Andhra Pradesh	1.82	Tripura	3.46	Orissa	2.21	Orissa	2.29
Punjab	1.65	Jharkhand	3.00	Haryana	2.02	Punjab	1.93
Orissa	1.30	Orissa	2.18	Kerala	1.67	Arunachal Pradesh	1.87
Haryana	1.28	Haryana	1.70	Meghalaya	1.60	Andhra Pradesh	1.81
Others	8.73	Others	7.64	Others	13.43	Others	11.29
Total	100	Total	100	Total	100	Total	100
Top 10 states to Karbi Anglong		Top 10 states to Nagaon		Top 10 states to Jorhat		Top 10 states to Dhubri	
Bihar	33.49	Bihar	36.79	Bihar	39.28	West Bengal	61.26
Uttar Pradesh	19.19	West Bengal	17.46	Rajasthan	14.54	Meghalaya	15.20
Nagaland	13.37	Tripura	11.57	Uttar Pradesh	10.77	Bihar	12.97
Tripura	7.51	Uttar Pradesh	11.47	West Bengal	9.29	Rajasthan	4.50
West Bengal	5.78	Rajasthan	5.89	Tripura	3.70	Uttar Pradesh	2.01
Meghalaya	5.05	Meghalaya	3.67	Nagaland	3.65	Jharkhand	1.88
Manipur	3.93	Nagaland	2.69	Jharkhand	1.77	Tripura	0.36
Rajasthan	2.51	Jharkhand	1.69	Punjab	1.74	Orissa	0.21
Jharkhand	1.86	Manipur	1.46	Kerala	1.46	Haryana	0.17
Orissa	1.69	Andhra Pradesh	1.38	Haryana	1.40	Madhya Pradesh	0.15
Others	5.62	Others	5.93	Others	12.40	Others	1.29
Total	100	Total	100	Total	100	Total	100

Source: Authors' estimation from RGCC 2001.

Table 7 shows the ten major states that sent the largest share of in-migrants to the major eight districts of Assam in the 2001 census. The pattern is more or less the same with the 1991 census. Bihar sent the largest share of migrants to the major eight districts listed, except Dhubri. Furthermore, the percentage share gap between Bihar (48 per cent) and the second-place state (Uttar Pradesh with 15 per cent), which sent the second-largest proportion of migrants to Tinsukia district, was very high. However, due to the same reason indicated above, the share of in-migrants coming from West Bengal in Dhubri district was recorded at 61.26 per

cent, and it was followed by 15.20 per cent from Meghalaya in second place. Similar to the 1991 census, Uttar Pradesh ranked second to fourth in terms of sending migrants to the districts listed in the 2001 census, and the shares of in-migrant populations from the states of NER were found to be still very negligible.

Unlike the 1991 and 2001 censuses, the migration pattern in the 2011 census was considerably different (Table 8). The contribution of in-migrant populations from NER states to the top eight districts of Assam has been noticeable, with Nagaland and Tripura contributing the largest share of in-migrant populations to Karbi Anglong and Cachar districts, accounting for 30 per cent each of total migrants in the districts, respectively. For the first time, the Cachar district received in-migrants from all other neighbouring NER states of Assam in the 2011 census. Meghalaya contributed the second and third largest shares of in-migrants to Dhubri and Kamrup metro districts, with 21 per cent and 11 per cent, respectively.

Table 8: Top 8 Districts Receiving the Largest Share of In-migrants from Top 10 States in 2011 (in %)

Top 10 states to Kamrup Metro		Top 10 states to Tinsukia		Top 10 states to Dibrugarh		Top 10 states to Dhubri	
Bihar	34.02	Bihar	48.27	Bihar	49.42	West Bengal	62.29
West Bengal	18.95	Uttar Pradesh	12.97	Uttar Pradesh	16.02	Meghalaya	20.89
Meghalaya	10.47	Arunachal Pradesh	12.19	West Bengal	8.87	Bihar	7.88
Rajasthan	9.46	West Bengal	6.87	Arunachal Pradesh	4.73	Rajasthan	2.92
Uttar Pradesh	6.31	Tripura	3.43	Tripura	3.66	Uttar Pradesh	1.20
Tripura	4.46	Rajasthan	3.14	Rajasthan	3.66	Jharkhand	1.09
Manipur	2.21	Andhra Pradesh	2.13	Jharkhand	1.99	Jammu & Kashmir	0.54
Andhra Pradesh	1.68	Jharkhand	1.70	Meghalaya	1.59	Tripura	0.35
Nagaland	1.56	Haryana	1.46	Odisha	1.52	Madhya Pradesh	0.31
Punjab	1.41	Odisha	1.37	Nagaland	1.27	Odisha	0.26
Others	9.47	Others	6.47	Others	7.27	Others	2.27
Total	100	Total	100	Total	100	Total	100
Top 10 states to Karbi Anglong		Top 10 states to Nagaon		Top 10 states to Sonitpur		Top 10 states to Cachar	
Nagaland	29.67	Bihar	32.25	Bihar	42.24	Tripura	30.04
Bihar	24.62	West Bengal	17.68	West Bengal	16.65	Manipur	18.65
Uttar Pradesh	14.52	Tripura	12.86	Uttar Pradesh	9.11	Bihar	11.83
Tripura	6.13	Nagaland	9.63	Arunachal Pradesh	7.08	Meghalaya	10.32
Manipur	5.35	Uttar Pradesh	7.88	Rajasthan	6.33	West Bengal	8.74
Meghalaya	4.94	Meghalaya	4.91	Meghalaya	3.16	Rajasthan	4.66
West Bengal	4.36	Rajasthan	4.67	Jharkhand	3.09	Mizoram	3.24
Jharkhand	2.38	Manipur	1.90	Nagaland	2.70	Nagaland	3.18
Rajasthan	1.93	Jharkhand	1.21	Tripura	1.71	Uttar Pradesh	3.05
Odisha	1.20	Andhra Pradesh	1.13	Odisha	1.41	Arunachal Pradesh	1.06
Others	4.90	Others	5.88	Others	6.52	Others	5.23
Total	100	Total	100	Total	100	Total	100

Source: Authors' estimation from RGCC 2011.

Nonetheless, Bihar remained the largest source of in-migrants to Assam, accounting for as much as 49 per cent of total in-migrants in four of the eight districts included in this study. Similarly, the state of West Bengal remained to be a major source of in-migrant populations to Assam. The data presented above indicate that geographical and socio-cultural proximity matter in the migration process. For instance, the districts of Dhubri, Karbi Anglong and Cachar received the largest share of in-migrants from the immediate neighbouring states of West Bengal, Nagaland and Tripura, respectively.

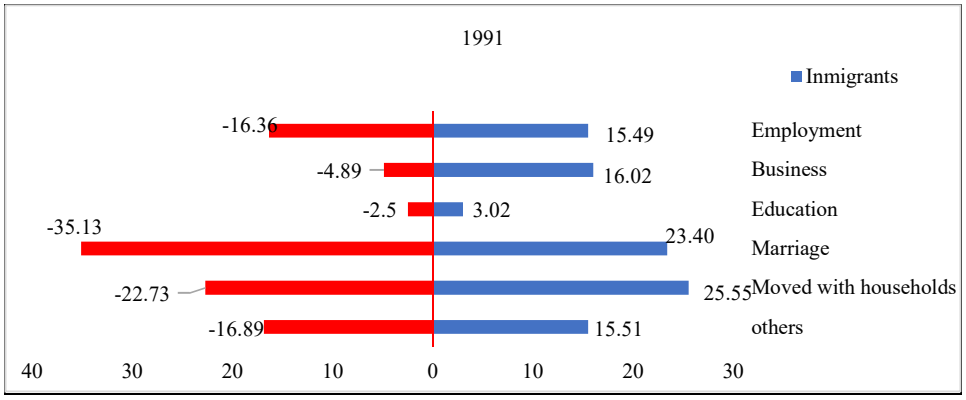
VI Reasons for Migration (Domestic and International)

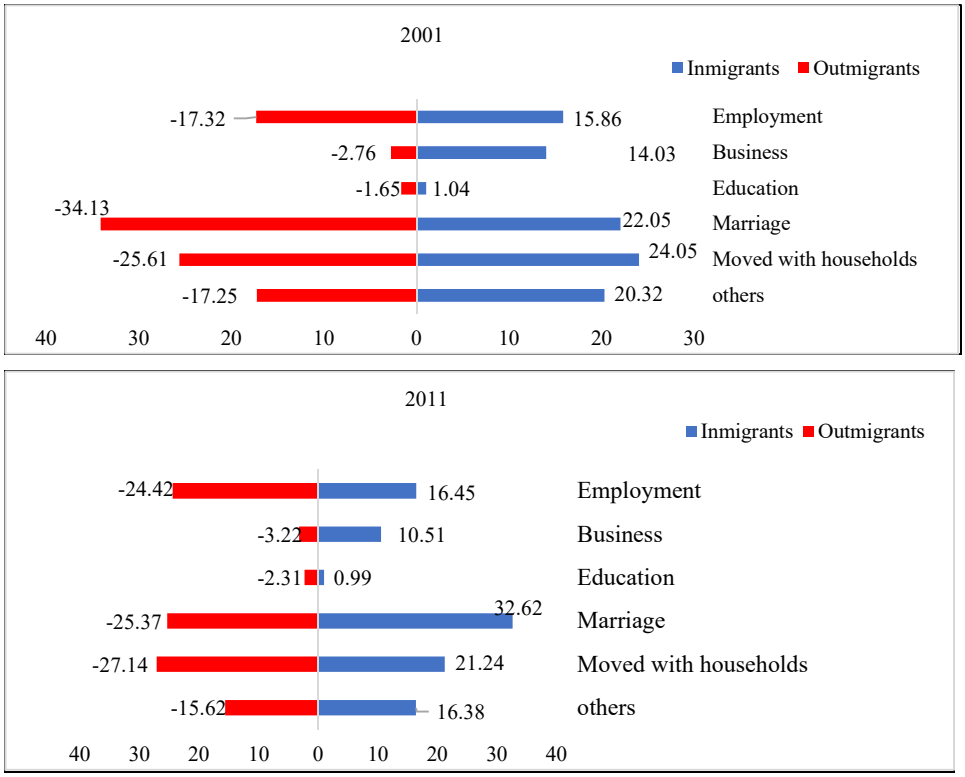
This section attempts to investigate the main causes for in-migrant populations coming to Assam from outside the state, but within the country, and out-migrants moving out of Assam to other states in the country, as well as the primary reasons for immigrants coming to Assam from neighbouring foreign countries. The major five reasons, most relevant to this study, for migration are drawn from India's population census data.

Major Five Reasons for Domestic Migration

Figure 4 depicts the five major reasons for in-migrants coming from other states to Assam and the out-migrants moving out from Assam to other states of the country. The legend in blue shows the percentage share of the different five causes for in-migrant populations entering Assam from other states of the country, while the legend in red with a negative sign shows the different five reasons for out-migration to other states.

Figure 4: Five Reasons for In-migration and Out-migration of Assam (in%)





Source: Authors' estimation from RGCC 1991, 2001 and 2011.

Marriage and moved with households occupied the largest proportions in both in-migration and out-migration phenomena over all three census periods, whereas migration for "education" purposes was the smallest across all three censuses. In the 1991, 2001, and 2011 census periods, the reason for in-migration to Assam from other states of the country for "marriage" was 23.40 per cent, 22.05 per cent, and 32.62 per cent, respectively. During the same periods (1991, 2001 and 2011) and for the same cause (marriage), the state's share of out-migration was 35.13 per cent, 34.13 per cent, and 25.37 per cent, respectively. The shares of in-migration to Assam from other states due to "moved with households" were estimated to be 25.55 per cent, 24.05 per cent, and 21.24 per cent in 1991, 2001 and 2011, respectively. Similarly, the percentage of out-migration from Assam to other states for the reasons of 'moved with households' was estimated to be 22.73 per cent, 25.61 per cent, and 27.14 per cent in 1991, 2001 and 2011, respectively. In the third place, the share of in-migrants reaching Assam for "employment purposes" was estimated at 15.49 per cent in 1991, rising slightly in subsequent censuses to 15.86 per cent in 2001 and 16.45 per cent in 2011.

However, the share of out-migrants from Assam to other states for "employment purposes" has always been larger than the share of in-migrants, rising significantly from 16.36 per cent in 1991 to 17.32 per cent in 2001, and then

to 24.42 per cent in 2011. Even though the in-migration rate for "business purposes" has been significantly larger than out-migration, it has steadily declined from 16.02 per cent in 1991 to 14.03 per cent in 2001 and subsequently to 10.51 per cent in the 2011 census. On the other hand, aside from being relatively low, the out-migration rate for "business purposes" has been gradually dropping from 4.89 per cent in 1991 to 2.75 per cent in 2001, and 3.22 per cent in 2011. Interestingly, the share of migrants (in or out) for educational purposes has remained low, hovering at one to three per cent, particularly for the in-migrant share, which fell to little less than one per cent in 2011.

Table 9 shows the main reasons for in-migration from the top 10 states. Bihar is notably distinct from the other states listed, with the largest share of in-migrant populations to Assam for employment, business, and educational purposes throughout all three census periods. Bihar sent the highest proportion of in-migrant populations to Assam for business purposes, accounting for 54 per cent each in the 1991 and 2001 censuses, and 50 per cent in the 2011 census. The pattern remained the same for employment purposes as well. The state sent approximately 42 per cent, 36 per cent, and 41 per cent of in-migrant populations for employment purposes to Assam in the 1991, 2001, and 2011 censuses, respectively. Surprisingly, the percentage difference between Bihar and the second highest contributor, West Bengal for the two reasons (Business and employment purposes) of in-migrant populations in Assam was very substantial. In the 1991 census, for example, West Bengal provided 12.34 per cent and 11.74 per cent in-migrant populations to Assam for employment and business purposes, respectively, which is one-fourth to one-fifth the share of Bihar. The pattern is almost identical in the 2001 and 2011 censuses as well.

In terms of categories such as 'marriage' and 'moved with households,' the state of West Bengal was the largest contributor. For example, in the 1991 census, about 28 per cent of West Bengal's total in-migrant populations provided to Assam were for 'moved with households' reasons, the highest proportion of any state or census period included in this study. In the 2001 and 2011 censuses, around 33 per cent and 28 per cent of in-migrant populations arrived in Assam from West Bengal for 'marriage' reasons, respectively, the largest proportion of any state or census period considered in this study. Uttar Pradesh remained in third or fifth position throughout. Within the NER states, Meghalaya and Tripura were the forerunners, albeit they were nowhere near the states of Bihar and West Bengal, and the states of Arunachal Pradesh and Nagaland trailing behind. Mizoram, on the other hand, was absent from the list.

Table 9: Reasons for In-migration from the Top 10 States in 1991, 2001 and 2011 (in %)

Census	From the states	Employment	Business	Education	Marriage	Moved with household	Others*
Top 10 States in 1991	Bihar	41.69	53.76	19.23	27.65	25.04	38.58
	West Bengal	12.34	11.74	13.04	19.07	27.89	16.88
	Uttar Pradesh	10.93	11.25	6.19	9.54	8.04	8.21
	Tripura	3.76	3.79	5.00	8.67	9.54	7.31
	Meghalaya	5.23	1.33	10.79	7.76	7.96	6.22
	Rajasthan	4.17	11.55	5.44	4.63	4.57	4.43
	Nagaland	0.81	0.71	4.91	3.22	1.76	2.41
	Andhra Pradesh	3.48	0.36	1.41	1.90	1.57	1.34
	Orissa	3.69	0.34	0.85	1.77	1.40	2.09
	Arunachal Pradesh	0.92	0.30	14.16	2.03	1.54	1.74
	Other states	12.98	4.87	18.98	13.76	10.60	10.79
	Total	100	100	100	100	100	100
Top 10 states in 2001	Bihar	36.44	53.52	14.71	21.26	25.79	30.53
	West Bengal	15.46	14.22	8.51	33.02	16.96	17.44
	Uttar Pradesh	9.44	9.80	5.50	7.67	10.44	9.45
	Tripura	4.98	4.90	7.88	10.49	7.82	6.54
	Meghalaya	4.93	1.54	9.71	8.71	5.92	5.63
	Rajasthan	3.91	9.49	3.18	4.81	5.90	5.08
	Nagaland	1.53	0.66	9.07	2.22	5.25	5.15
	Jharkhand	5.70	0.80	1.80	2.42	2.92	3.22
	Arunachal Pradesh	1.22	0.31	13.63	1.66	2.21	2.66
	Other states	16.39	4.76	26.01	7.74	16.79	14.30
	Total	100	100	100	100	100	100
Top 10 States in 2011	Bihar	40.84	49.87	18.11	21.15	26.26	28.78
	West Bengal	13.78	13.88	7.36	28.10	14.85	15.75
	Meghalaya	5.89	1.94	11.19	11.73	8.33	7.41
	Tripura	6.07	6.14	5.77	11.16	7.27	6.69
	Uttar Pradesh	8.18	8.43	4.28	6.56	6.90	7.15
	Rajasthan	3.63	12.36	5.09	4.24	5.58	5.45
	Nagaland	2.68	1.34	11.33	3.80	8.73	5.37
	Arunachal Pradesh	2.08	0.66	13.20	3.99	6.27	4.13
	Manipur	2.10	1.02	8.12	2.21	3.69	2.40
	Jharkhand	4.11	0.50	1.61	1.69	2.36	2.57
	Odisha	1.99	0.39	0.86	0.72	1.07	1.14
	Other states	8.65	3.47	13.08	4.65	8.69	13.16
	Total	100	100	100	100	100	100

Note: *Others include unspecified reasons.

Source: Authors' estimation from RGCC 1991, 2001 and 2011.

Table 10: Reasons for Out-migration to Top 10 States in 1991, 2001 and 2011 (in %)

Census	To the states	Employment	Business	Education	Marriage	Moved with household	Others*
Top 10 states in 1991	West Bengal	18.91	14.81	27.03	34.59	31.69	38.82
	Arunachal Pradesh	29.46	20.22	8.89	10.26	18.67	14.23
	Meghalaya	12.15	16.23	14.84	13.87	8.71	8.87
	Tripura	3.45	2.85	3.88	8.87	5.21	5.88
	Nagaland	7.93	22.32	3.71	2.87	4.19	4.62
	Uttar Pradesh	3.11	1.68	7.95	5.53	3.50	3.21
	Bihar	1.77	1.16	2.38	8.47	1.64	1.39
	Maharashtra	3.82	2.50	4.43	1.40	2.82	3.29
	Delhi U. T	3.99	1.94	3.76	1.20	3.59	1.06
	Gujarat	1.56	4.88	1.48	2.00	2.35	2.84
	Other states	13.85	11.41	21.65	10.94	17.63	15.79
	Total	100	100	100	100	100	100
Top 10 states in 2001	West Bengal	13.04	22.44	18.01	16.55	33.22	27.83
	Bihar	2.25	1.43	3.81	51.22	3.08	16.93
	Arunachal Pradesh	26.34	21.96	4.14	4.66	14.52	12.81
	Meghalaya	7.82	12.34	7.32	5.20	4.76	10.51
	Nagaland	9.52	23.17	2.14	1.99	4.11	7.77
	Uttar Pradesh	4.12	1.02	10.88	7.67	5.31	2.36
	Delhi	8.32	1.99	12.20	1.57	6.98	2.57
	Tripura	1.72	2.34	1.12	3.51	2.46	3.09
	Maharashtra	4.90	1.12	13.65	0.66	3.51	1.96
	Mizoram	6.03	3.29	1.27	0.28	1.74	1.83
	Other states	15.94	8.90	25.46	6.69	20.31	12.34
	Total	100	100	100	100	100	100
Top 10 states in 2011	West Bengal	10.23	22.21	11.05	33.21	29.20	29.94
	Arunachal Pradesh	20.85	22.69	4.81	8.78	12.08	11.93
	Meghalaya	6.08	10.73	8.13	13.14	7.96	10.20
	Nagaland	10.77	23.04	3.71	5.22	6.06	8.16
	Maharashtra	8.26	1.56	13.62	1.66	3.94	4.13
	Uttar Pradesh	3.26	0.98	8.28	6.36	4.84	3.71
	Tripura	2.33	2.35	1.26	8.34	3.64	4.02
	Delhi	4.74	1.54	10.01	1.98	5.41	3.17
	Karnataka	7.90	1.27	14.61	0.73	2.27	2.82
	Bihar	0.74	0.39	0.46	6.04	0.96	1.82
	Other states	24.84	13.24	24.06	14.54	23.64	20.10
	Total	100	100	100	100	100	100

Note: *Others include unspecified reasons.

Source: Authors' estimation from RGCC 1991, 2001 and 2011.

Table 10 exhibits the top ten Indian states that received Assam's out-migrants for various reasons. In the 1991 census, Arunachal Pradesh became the destination for Assam's largest share of out-migrants for employment purposes, accounting for 29.46 per cent of the total. West Bengal came in second with 19 per cent during the same period. The order and magnitudes are more or the less same in the 2001 and 2011 census periods as well. The NER states of Nagaland, Arunachal Pradesh, Tripura and Meghalaya became the new destinations for out-migrants from Assam for business purposes as well. In 1991, the states of Nagaland, Arunachal Pradesh, and Meghalaya received 22.32 per cent, 20.22 per cent, and 16.23 per cent of Assam's out-migrants for business purposes, respectively. West Bengal received the highest proportion of Assam's out-migrants for educational purposes, with 27 per cent, followed by Meghalaya and Arunachal Pradesh in second and third place, with 14.84 per cent and nine per cent, respectively in 1991. Understandably, West Bengal received the highest proportion of out-migrants for marriage and moved with household purposes, with 35 per cent and 32 per cent, respectively in the same year due to their socio-cultural and geographical proximity.

In the 2001 census, Arunachal Pradesh received the highest share of Assam's out-migrants for employment purposes, with 26.34 per cent, followed by West Bengal in second place with 13 per cent. Surprisingly, in the same census statistics, the state of Bihar received only 2 per cent of Assam's out-migrants. In terms of Assam's out-migrants for business purposes, the NER states of Nagaland and Arunachal Pradesh received the largest and second-largest shares, with 23 per cent and 22 per cent, respectively. Due to a shortage of higher educational institutions in the state compared to the state's rising student population, the majority of Assam's out-migrants for educational purposes go to West Bengal, Maharashtra, Delhi, and Uttar Pradesh, which account for 18 per cent, 14 per cent, 12 per cent, and 11 per cent, respectively. The trend and magnitude of educational outflows remained largely unchanged in the 2011 census as well.

In the 2011 census, the NER states remained the top destinations for Assam's out-migrants. The largest and second-largest shares of out-migrants from Assam arriving in Arunachal Pradesh and Nagaland were for employment and business purposes, respectively. West Bengal was ranked third in terms of out-migration from Assam for business reasons, with 22 per cent. However, in terms of Assam's out-migrants for marriage and moving with household purposes, West Bengal retained its dominance, receiving 33 per cent and 29 per cent, respectively, in the 2011 census. In a nutshell, except for marriage, moved with households and educational reasons, the NER states became the preferred destinations for the majority of Assam's out-migrants.

Major Five Reasons for Immigrants Coming to Assam

In this sub-section, an effort has been made to comprehend the main reasons for immigration to Assam from foreign countries during the three census periods. The

explanations listed in Table 11 could not be given for each country independently, due to data limitations.

Table 11: Reasons for Immigration to Assam in 1991, 2001 and 2011 (% of the total)

Census Year	Employment	Business	Education	Marriage	Moved with household	Others*	Total (%)
1991	3.96	4.33	0.45	15.72	39.62	35.92	100
2001	4.83	4.03	0.35	12.78	42.28	35.73	100
2011	5.76	3.96	0.61	23.32	31.83	34.52	100

Note: *Others include unspecified reasons.

Source: Authors' estimation from RGCC 1991, 2001 and 2011.

Across the three census periods, 1991, 2001, and 2011, the share of immigrants arriving in Assam under the category of 'moved with households' was the highest of all. Nevertheless, its share has gone down from 42 per cent in 2001 to 32 per cent in the 2011 census. Understandably, the unspecified category known as 'others' has been extremely significant over census periods. The pattern and trend of immigration between the categories of employment and business purposes have been inversely acted upon, which means that immigration under the employment category has been gradually increasing over the census periods, while the business category has been gradually decreasing. The share of immigrants under the education category has been very negligible throughout the study periods. Though the share of immigration for marriage purposes appeared to be slightly declining in 2001, not was it only reasonably high but also quickly increased to 23.32 per cent of the total in 2011. This appears to be related to the socio-cultural factor, as a substantial number of the same ethnic communities, particularly Bengali and Nepali, live in Assam, Bangladesh, and Nepal.

VII Conclusion

Using the latest three population census data (1991, 2001 and 2011), the paper analysed the growth, direction, and patterns of migration in Assam. In the 1991 census, in-migrant populations outnumbered out-migrants. However, in later censuses, 2001 and 2011, out-migrations outweighed in-migration populations. Bihar sent the most in-migrant populations to Assam over the last three censuses, primarily for employment and business reasons, followed by West Bengal in second place. As for the outmigration, the NER states have been the preferred destinations for the majority of Assam's out-migrants, and their share has grown significantly in subsequent censuses. It is believed that the majority of these out-migrants who chose NER states as their preferred destination are not *Axomiyas* (indigenous Assamese), but rather economic migrants with roots either outside the country or in surrounding Indian states. In the 1991 and 2001 censuses, the share of out-migrant populations from Assam to other parts of the country for

employment purposes was only 16-17 per cent, but it increased to 24 per cent in 2011. It appeared to be caused by a rising scarcity of employment opportunities at home and the rise of economic activity in its bordering NER states, where lower-rung works and other technical and semi-technical jobs are not fully occupied by their native communities. The majority of migrant populations entering and exiting Assam tend to be geographically and culturally/ethnically linked. As a result, the states of Bihar and West Bengal provide the lion's share of migrants (in-migrants and out-migrants) to Assam for marital purposes.

Despite having a very small share of educational out-migrants (1-2 per cent of total out-migrants) and marginally decreasing educational out-migrants in subsequent censuses, its direction has gradually shifted away from West Bengal and towards other metropolitan cities in Karnataka, Maharashtra, Delhi, and Uttar Pradesh. Last but not least, even though out-migrant populations surpassed in-migrants in the recent past, the out-migrant proportion for educational reasons began to fall due to the emergence and development of educational institutions in Assam. In this way, locals/natives may be encouraged or enabled to take up petty jobs and economic operations, not only balancing migration issues but also improving the state's growth.

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Institutional Quality and Efficiency of Smallholdings: Inferences from India's Sectoral Innovation System of Natural Rubber

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The paper attempts to analyse the role of institutional quality at the micro level in determining efficiency outcome of the smallholdings in India's Sectoral Innovation System of Natural Rubber. The study used unit level data from Rubber Production Incentive Scheme of Government of Kerala, 2019 covering around 65,000 rubber growers. The study has found that efficiency outcome is not uniform across all Rubber Producers' Societies (RPS); with higher efficiency in high quality RPS operating villages as compared to low quality RPS operating villages. Hence, building institutions alone would not materialize intended result; and quality of institutions is to be maintained for better efficiency at the farm level.

Keywords: Innovation systems, Institutional quality, Efficiency

I Introduction and the Context

Despite comparatively low share of agriculture in Gross Value Added owing to the structural transformation (Kuznets and Murphy 1966); larger absorption of labour along with inextricable nexus between *"the commodity problem"*[1] and *"the poverty problem"* places agriculture as a key sector, especially in the developing world. Undoubtedly, technological progress, irrespective of the sectoral dimensions, has been a powerful alternative to address the larger question of *"economic prosperity"* and *"the global poverty problem"* (Schumpeter 1934, Acemoglu 2012, De Janvry and Sadoulet 2002, Mendola 2007); as it has been a source of efficiency and increased material welfare (Coxhead and War 1995, Edquist 1997). However, agricultural technology is far more complex and realization of its potential benefits depends not only upon technology by itself; but on farmers' efforts to cope up with the uncertainties associated with climate; and instability in price in the open and integrated market regime (Rangachary 2006). In the midst of these challenges, innovations: technological or institutional, have

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a key role to equip agriculture of developing economies in addressing their larger developmental questions (Spielman 2005).

In India, though agriculture contributes hardly 17 per cent to its Gross Value Added at Basic Prices (Government of India 2023)[2]; it remains as the primary livelihood opportunity for 55 per cent of its work force (Registrar General and Census Commissioner of India 2011)[3]. Within agriculture, plantation agriculture has been historically promoted as a foreign exchange earner in India with a few exceptions of import substituting crops like Natural Rubber (Joseph and George 2010). Along these lines, plantation sector has been able to attract attention of the state in terms of innovation policies. This resulted in a series of institutional innovations in the sphere of production and marketing mainly for raising international competitiveness (Joseph and George 2010). Setting up of Commodity Boards and the legislations for empowering them like Rubber Act in the case of Natural Rubber; and grassroots level institutional innovations like Rubber Producers' Society (hereafter RPS) have been the leading initiatives in this regard[4].

In the past, Natural Rubber sector was dominated by large estate owners; but currently majority of the cultivators belong to smallholders[5] (Joseph and George 2010, Rubber Board 2020). Hence, performance of the sector in general and fortunes of its smallholders in particular decisively depend upon how effectively they manage the crop subject to given market conditions. Highly unstable prices of natural rubber, along with augmenting cost of cultivation and cost of harvesting, owing to acute tapping labour shortage poses challenges to the sector which depends largely upon labour for harvesting (George and Chandy 2015). In this changed scenario, performance of the plantation sector, particularly the Natural Rubber sector, depends on how effectively smallholders are able to withstand the adverse consequences of instability in price and how innovative are they with respect to managing their crop and enhancing productive efficiency at the farm level, especially during adverse movements in prices. Thus, it comes out that as price is exogenous to the system and decided by the invisible hands in the deregulated open market regime, livelihood outcome of the smallholders needs to be addressed by ensuring efficiency in the overall management of the crop, in which innovations of different kinds: both technical and institutional, are expected to play a key role.

Hence, institutional innovations are expected to create significant impact upon efficiency outcome at the farm level as institutions[6] primarily aim to promote co-operative behaviour and networking; thereby incentivize all the actors in the innovation system (Edquist and Johnson 1997). It follows that when the sector is faced with exogenous disincentive factors like adverse prices, institutions have to play the key role of incentivizing the famers to maintain the operation of the crop intact. In this backdrop, the paper aims to address the question how the efficiency outcome of smallholders is effectively addressed by the institutional domain at the grassroots level of the sectoral innovation system of the respective crop under consideration, namely Natural Rubber. While significant theoretical and empirical

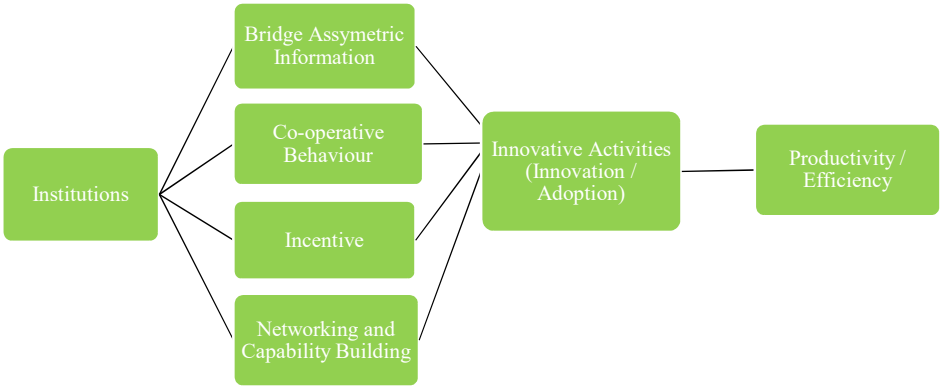
works have already been done incorporating institutional factors at the national level within the national and sectoral system of innovation perspective, empirical studies at the micro level focusing grassroots level institutions are found to be less in the literature, especially in the developing country context like India. The paper aims to fill this gap in the literature. The paper is structured in five sections including the introduction and context. The second section provides the theoretical framework for setting the analytical background for the paper. The third section details the methodology of the study. The fourth section deals with institutional quality and efficiency outcome at the farm level and the final section concludes the entire discussion with a note on a few policy concerns.

II Theoretical Framework

Innovation System framework[7]; national, regional, sectoral or technological; is useful in the empirical study of innovations in their larger or specific local context (Edquist 1997). The conceptual trajectory of the innovation system framework can be tracked as contributions in National System of Innovations (Lundvall 1992, Freeman 1995) to the Sectoral System of Innovation and Production, which is restricted to one sector of production (Nelson and Rosenberg 1993, Malerba 2002); say agriculture or a crop like Natural Rubber. Analysis of system of innovation at the sectoral level could incorporate the sector specific as well as national institutions affecting the outcome of the given sector under analysis (Edquist 1997), which could enhance the utility and strength of the framework (Lundvall 1992). These developments throw light on the fact that the innovation system has been conceptualized as an institutional economics construct (Edquist 1997, Nelson and Nelson 2002).

Institutions are assigned a greater role in promoting cooperative behaviour; and facilitating the flow of information within the system (Clark 2002, Lundvall 2007). When the system has a large amount of raw information, the system becomes chaotic and internal organizations or institutions should give its components their intended meaning and maintain economically productive information (Clark 2002). The underlying organizational or institutional set up is expected to fill the knowledge gap between the sender and the receiver (Clark 2002). Nonetheless, productive information flow depends crucially upon the actions on the part of recipients in terms of its investment in knowledge as well. In the manufacturing sector, since firms have better in-house R & D, utilization of knowledge could be better possible. When it comes to agriculture, farmers' utilization of knowledge is severely constrained by this large requirement of knowledge investment, which needs to be supported by the organizational or institutional set up of the system (Spielman 2005). This necessitates the formation of well-organized and co-operative knowledge transfer mechanisms. This interactive nature of knowledge provides the foundation for innovation system perspective which decides whether the system is effective or ineffective in terms of its outcome (Clark 2002).

Figure 1: Framework of Innovation, Institutions and Efficiency



Source: Adapted from *Edquist and Johnson, 1997.*

Institutions are expected to reduce uncertainty involved in the innovative activities by providing information and thereby managing the possibility of asymmetric information between the developer and the user of an innovation (Edquist and Johnson 1997, Johnson Edquist and Lundvall 2004); and reduce the informational and computational burden of the so called rational economic man (Williamson 2000, North 1990). Institutions also enable the actors to efficiently address transaction cost, thereby bringing productive or technical efficiency and distributive efficiency (North 1990 which incentivizes the actors in the system. Better institutions create better efficiency outcome in the innovation system by bridging asymmetric information among actors, promoting co-operative behaviour and interactive learning while incentivizing the actors especially during crisis times (refer figure 1). Hence, institutional quality would be a significant variable which is expected to impact the efficiency outcome at the farm level. The paper addresses this broader theoretical question whether institutional quality matters for efficiency outcome at the micro level keeping "institutions as organizations" at the backdrop, in the sectoral agricultural innovation system perspective.

III Methodology of the Study

Choice of the Sectoral System of Innovation and Fixing the Boundary

The study takes sectoral innovation system of Natural Rubber as the case for investigation. The innovation system of Natural Rubber had been acclaimed as one of the best performing innovation systems having a strong institutional architecture with R&D driven output and productivity enhancement (Mani and Santhakumar 2011). Apart from that, Natural Rubber being a strategic industrial raw material (Cornish 2017) assumes a lot to the developmental requirements of an economy like India (Joseph Thapa and Wicken 2018). In the changed scenario

of heightened price instability, the way in which the system behaves is a question of interest, and explores the nuances of which is of both academic and policy interest. For analytical purpose, boundary of the innovation system is fixed within the limits of interactions in the production sector, by keeping smallholders at the centre of innovation system.

Classification of Agro-climatic Regions

We use the latest classification of agro-climatic regions of Natural Rubber cultivation in Kerala based on districts by the Rubber Research Institute of India (Veeraputhran Siju Joseph and George 2013). The information on the district available in RPIS data is used for classification. The state of Kerala is renowned to be the dominant traditional region of natural rubber cultivation in the country; and has been classified into 4 agro-climatic regions using districts having similar climatic conditions for rubber cultivation by the Rubber Research Institute of India – North, North central, Central and Southern zone (Veeraputhran, *et. al.* 2013).[8]

Data Source and Variable Construction

The study relies on the unit level data generated from the Rubber Production Incentive Scheme (i.e., RPIS) by the Govt. of Kerala[9] for the period of 2018-2019 at the farm level covering around 65000 farmers in the state of Kerala, probably the largest unit level data in the Natural Rubber sector. In the RPIS data, information has been available at three-digit disaggregated level – District, Taluk and Village. Tapped area applied for the benefit of subsidy is approximated to actual tapped area, which is the best proxy from the RPIS data for the actual tapped area; since the whole of the area tapped might have been applied for the subsidy benefit, as majority of the rubber growers are smallholders (Rubber Board 2020). Sale of Natural Rubber for the period is approximated as production for the period as majority of the producers are smallholders; and hence stock holding behaviour at the farm level would be negligible. Since area under cultivation is not available from the data at the unit level, tappable area is approximated as the size of holdings. Untapped area is derived by deducting tapped area from the tappable area.

Productivity is used as a proxy variable for efficiency outcome at the farm level. Since we have no data on capital and labour, technical efficiency measures are not possible from the data. Since approximate tapped area is available from the data, per hectare productivity would serve our purpose of efficiency estimation. Apart from that cultivation of a crop like Natural Rubber involving larger opportunity cost in terms of allocation of land for a longer period of time necessitates representation of efficiency with respect to land from the farmer's point of view. Hence, our definition of efficiency is productivity per hectare of land. Productivity is measured as output per hectare at the unit level using the usual methodology of measurement, notwithstanding the possible limitations due to the

proxies. Data on sales, which is approximated as production for the period of the farming unit, is divided by the tapped area applied for subsidy, which is approximated as actual tapped area for the same year.

Density of plants is an important variable influencing the efficiency outcome at the farm level, since it has significant impact upon growth of the plants, incidence of panel diseases and yield (Veeraputhran, *et. al.* 2013). Since only data on matured trees is available from RPIS data, density of matured plants is worked out as a ratio of number of matured trees to the tappable area, which would serve our purpose. This variable can indirectly capture the destruction of trees after planting and the farms where planting is done more than the optimum limit suggested by the Rubber Board.[10]

Model RPS scheme was launched in 1999-2000, with an objective of overall efficiency improvement in the production sector; and around 35 Model RPS were formed at the national level, out of which 29 Model RPS were formed in Kerala. Operational village of all of them were identified from the list of Model RPS as of now, except one in Ernakulam district. The operational village of the model RPS was gathered from the RPIS website of Government of Kerala using the RPS locater option. Using the details of village in the RPIS data, a model RPS dummy has been created with 1 for model RPS functioning villages and 0 for other RPS villages.

Institutional quality variables are identified by using the details of grading of RPS (A, B, C and D grade) by the Rubber Board available from the RPS Database of the Rubber Board. This grading could be taken as a proxy for the quality of the operation of RPS as it could be inferred from the table A1.1 in Appendix I. The classification criterion by the Rubber Board satisfies some of the innovation system dimensions in the domain of (1) infrastructure, (Smith 1997, Klerkx Mierlo and Leeuwis 2012) (2) innovation capability building, (Hall 2005) (3) knowledge, information and networking (Klerkx, *et. al.* 2012) and (4) bridging institution (Spielman and Birner 2008). A grade RPS seems to be high quality RPS having activities in all the innovation system dimensions as compared to B, C and D Grade. In the infrastructure dimension, A grade RPS will have facilities like Group Processing Centre (GPC) with computer and other accessories, latex collection centre, input depots with rubber procurement and an own office building. RPS with B grade will have latex collection centre and input depots and the office building will be either rented or own. RPS with C and D grade will not have any of these infrastructure facilities.

In the innovation capability building domain, while A grade RPS conducts agro-management training, SHG activities, capacity building programmes for tappers and growers and apiculture, B, C and D grade RPS have no such activities. In the Knowledge, Information and networking Domain, A grade RPS members normally sit together in 4 general body meetings including 1 annual general body meeting and 8 to 12 executive committee meetings. In addition to the mandatory meetings, A grade RPS also conducts seminars and workshops on innovative themes of farming interest. The RPS conducting around 2 to 3 general body

meeting and 5 to 8 executive committee meetings are categorized as B grade RPS. The RPS conducting only 1 general body meeting and 4 executive committee meetings are classified as C grade RPS and the RPS with no meeting at all, are categorized as D grade RPS. In the bridging institutions domain, only A grade RPS has linkage with the Rubber Board, knowledge infrastructure and RPS promoted companies as compared to all other categories. A grade RPS submits up to date audit report to the Rubber Board, while B grade RPS audit report is pending for one year. If the audit report is pending for two years it becomes C grade RPS and if it is unduly pending for indefinite period, it falls into D grade RPS.

RPS institutions, mostly defunct and not performing any of the listed activities and functioning only for having subsidy under RPIS scheme are classified as D grade RPS. Based on the parameters cited in table A1.1 in Appendix I, A grade RPS could be considered as high quality RPS followed by B, C and D. It could also be identified that no significant difference could be identified between C and D grade RPS in features. Hence a three-fold classification as high quality (A grade RPS), medium quality (B grade RPS) and low quality RPS institution (C and D grade RPS) would make our analysis more meaningful. In the RPS database, along with grade of RPS, details of their village of operation are also available and the same is used for giving grades for villages in the RPIS data. Hence, we could identify the quality dimension of RPS at the village level and three dummy variables for capturing the effect of three groups of RPS institutions upon farm level efficiency have been created for our estimation purpose.

As categories of adopters would also have implications on efficiency, outcome at the farm level, dummy variables representing the category of adopters are also included in the analysis. Using the year of adoption in the data, adopters of high yielding variety clones are grouped into different categories using the standard methodology suggested by Roger, 1961.[11] The analysis has been done by considering high yielding variety clones as one group and not separately for RRII 105 and RRII 400 series, as number of observations of RRII 400 series has been found to be not sufficient for adopting the classification as compared to RRII 105.

Cost of harvesting is also incorporated in the analysis as it would impact the efficiency outcome at the farm level. This has been constructed as an agro-climatic region based dummy variable, using the information available from the census report of rubber tappers published in 2016 by the Rubber Research Institute of India. The average cost of harvesting is available across 4 agro-climatic regions, which is the piece rate of harvesting for male tappers (rupees per hundred trees). Central had the highest cost of harvesting (₹157.3 per 100 trees) followed by north (₹154.4 per 100 trees), north central (₹134.4 per 100 trees) and the south (₹131.2 per 100 trees). The difference seems to be significant across all regions as well. Hence, we could think of four dummy variables for cost of harvesting and we use high-cost dummy for our estimation purpose.

Estimation Procedure

Testing the overall significance of average productivity differences across the quality dimension of RPS institution is carried out with One-way ANOVA and the individual mean differences across all possible groups have been performed with Post-hoc test (Multiple Comparison Test), using Games-Howell methodology, which does not require equal variance assumption. Regression model has been estimated using OLS procedure with productivity of natural rubber as dependent variable and two institutional quality dummy variables, one representing low quality institutions (IQ _ Dummy _ Low) and the other representing high-quality institutions (IQ _ Dummy _ High), along with other variables identified from the existing studies as explanatory variables. The model would be specified as follows;

$$Yi = \alpha 1 + \beta 1\ X1 + \beta 2\ X2 + \beta 3\ X3 + \beta 4\ X4 + \beta 5\ X5 + \beta 6\ X\ 6 + \beta 7\ X7 + \beta 8\ X8 + \beta 9\ X9 + \beta 10\ X10 + Ui;$$

Where;
Yi = Ln _ Productivity of Natural Rubber
X1 = IQ _ Dummy _ Low
X2 = IQ _ Dummy _ High
X3 = Model RPS _ Dummy
X4 = Ln _ Density of Matured Plants
X5 = Agro _ Dummy _ North-South
X6 = HYV Clone _ Dummy
X7 = Ln _ Untapped Area
X8 = Cost of Harvesting _ Dummy
X9 = Laggards _ Dummy_1
X10 = Late Majority _ Dummy_2

IV Institutional Quality and Efficiency Outcome: Micro Level Inferences

Before entering into the modelling exercise, average productivity is estimated across quality of RPS at the aggregate and disaggregated level; across agro-climatic regions; and reported in table 1. Average productivity is found to be higher in the high quality RPS operating villages as compared to medium and low quality RPS operating villages at the aggregate level. This is in conformity with our theoretical expectation that higher the institutional quality, higher is the efficiency outcome in terms of productivity at the farm level. While the average productivity in the high quality RPS operating villages is to the extent of 1002.2 kg / hectare, average productivity in the medium quality RPS operating villages is lower than the high quality RPS operating villages (961.1 kg per hectare). Productivity further declines to 892.6 kg / hectare in the low quality RPS operating

villages. Hence, productivity or efficiency outcome augments with improvement in the quality of the institution at the grass root level. The results of one-way ANOVA and post-hoc test in table 2 indicate that all possible mean differences at the aggregate level are statistically significant at one per cent level.

The same pattern could be observed at the disaggregated level as well. In the northern zone, average productivity is found to be the highest in the high quality RPS operating villages (1010.7 kg / hectare); followed by median quality RPS (938.4 kg / hectare) and low quality RPS operating villages (886.8 kg / hectare). All possible mean differences in the northern zone are also significant at 1 per cent level as it could be inferred from the results of one-way ANOVA and post-hoc test in Table 2. In the north central zone, in high quality RPS operating villages, average productivity is to the tune of 1040.9 kg / hectare followed by medium quality RPS operating villages (1015.2 kg / hectare) and low quality RPS operating villages (988.8 kg / hectare). Difference in average productivity between low quality and high quality RPS operating villages has been found to be statistically significant; however, statistically insignificant between low quality RPS operating villages and medium quality RPS operating villages. Similarly, average productivity between medium quality RPS operating villages and high quality RPS villages is also not statistically significant (refer to Table 2). This would be probably because of the reason that north central region currently is one of the highly productive regions (refer to Table 1) and hence medium quality RPS operating villages would be irrelevant and only the high and low quality RPS operating villages operate. Hence the experience of the north central region would go along with our theoretical expectation regarding the quality of the institution and efficiency outcome at the grassroots level.

Table 1: Average Productivity of Natural Rubber across Quality of RPS Institutions

Quality of RPS	Number	Mean	Median	SD	CV
Northern Zone					
Low Quality RPS	7483	886.8	800.0	541.7	61.1
Medium Quality RPS	11527	938.4	858.0	567.1	60.4
High Quality RPS	4795	1010.7	911.4	631.1	62.4
Total	23805	936.8	851.1	574.5	61.3
North Central Zone					
Low Quality RPS	2300	988.8	903.7	610.1	61.7
Medium Quality RPS	3303	1015.2	918.6	629.0	62.0
High Quality RPS	2593	1040.9	933.3	647.9	62.2
Total	8196	1015.9	920.1	630.1	62.0
Central Zone					
Low Quality RPS	5997	801.4	687.7	549.6	68.6
Medium Quality RPS	5643	833.8	729.7	552.1	66.2
High Quality RPS	3193	836.6	750.0	541.4	64.7
Total	14833	821.3	715.0	549.0	66.9

Quality of RPS	Number	Mean	Median	SD	CV
Southern Zone					
Low Quality RPS	3021	1015.5	864.7	713.1	70.2
Medium Quality RPS	5270	1112.1	1000.0	698.6	62.8
High Quality RPS	3428	1115.8	982.6	748.6	67.1
Total	11719	1088.3	962.0	718.5	66.0
All Kerala					
Low Quality RPS	18795	892.6	781.3	588.6	65.9
Medium Quality RPS	25761	961.1	864.4	608.5	63.3
High Quality RPS	13997	1002.2	897.5	654.1	65.3
Total	58553	948.9	846.3	614.9	64.8

Source: Estimated from Rubber Production Incentive Scheme Data, 2019.

The general pattern of higher productivity in the high quality RPS operating villages and lower productivity in the low quality RPS operating villages could also be observed in the central and southern region as well. In the central region average productivity is found to be the highest in the high quality RPS operating villages (836.6 kg / hectare), as compared to the medium quality (833.8 kg / hectare) and low quality RPS operating villages (801.4 kg / hectare). All mean differences are statistically significant except the difference between medium quality RPS operating villages and high quality RPS operating villages (refer to Table 2).

Table 2: One-way ANOVA and Post-hoc Test (Games – Howell) for Significance of Group Mean Differences

(I) Quality of RPS	(J) Quality of RPS	Mean Difference (I-J)	Std. Error	Sig.
Northern Zone				
Low Quality RPS	Medium Quality RPS	-51.6	8.2	0.000 ***
Low Quality RPS	High Quality RPS	-123.9	11.1	0.000 ***
Medium Quality RPS	High Quality RPS	-72.3	10.5	0.000 ***
F Value			68.4	0.000 ***
North Central Zone				
Low Quality RPS	Medium Quality RPS	-26.4	16.7	0.258
Low Quality RPS	High Quality RPS	-52.1	17.9	0.011 **
Medium Quality RPS	High Quality RPS	-25.7	16.7	0.276
F Value			4.17	0.015 **
Central Zone				
Low Quality RPS	Medium Quality RPS	-32.4	10.2	0.004 ***
Low Quality RPS	High Quality RPS	-35.2	11.9	0.009 ***
Medium Quality RPS	High Quality RPS	-2.8	12.1	0.971
F Value			6.63	0.001 ***

(I) Quality of RPS	(J) Quality of RPS	Mean Difference (I-J)	Std. Error	Sig.
Southern Zone				
Low Quality RPS	Medium Quality RPS	-96.7	16.2	0.000 ***
Low Quality RPS	High Quality RPS	-100.3	18.2	0.000 ***
Medium Quality RPS	High Quality RPS	-3.6	16.0	0.972
F Value			21.0	0.000 ***
All Kerala				
Low Quality RPS	Medium Quality RPS	-68.5	5.7	0.000 ***
Low Quality RPS	High Quality RPS	-109.6	6.9	0.000 ***
Medium Quality RPS	High Quality RPS	-41.1	6.7	0.000 ***
F Value			137.1	0.000 ***

Source: Estimated from Rubber Production Incentive Scheme Data, 2019.

As it has been observed in the case of the central region, all mean differences are statistically significant in the southern region as well, except the difference in average productivity between medium quality RPS operating villages and high quality RPS operating villages (refer to Table 2). Hence, the experience of southern zone also reveals that institutional quality matters for efficiency outcome at the farm level as in the case of other three agro-climatic regions.

This has been followed by estimation using OLS regression model[12] with institutional quality variables along with other possible determinants at the aggregate level and reported in Table 3 (refer to Table A1.2 in Appendix I for Summary Statistics); after converting all ratio variables in logs to deal with possible outliers. The estimated overall model is found to be statistically significant at one per cent level as t could be inferred from the F statistic and adjusted R-squared value has been found to be close to 0.125. The model has no issue of serial correlation as Durbin-Watson statistic is close to 2. Residuals are also found to be approximately normal as it could be seen from the histogram of regression standardised residuals and the normal p-p plot of regression standardised residuals (refer to Figure A1.1 in Appendix I). No issue of multi-collinearity is found as Variance Inflation Factors for all variables are within the admissible limit (refer to Table A1.3 in Appendix I).

Farms with higher density of matured plants are found to be having better productivity as compared to farms with lesser density of matured plants. This throws light on the need for maintaining the farm intact with optimal density of matured plants. Though this result seems to be quite expected, it leads us to the inference that destruction of plants would be a serious issue in many fields, which needs to be addressed. It has also been found that fields with more untapped area have comparatively lesser productivity, which necessitates that untapped area is a serious concern and to be controlled for raising the productivity of natural rubber. This would probably be caused by the reason that larger holdings leave their area more untapped than the smaller holdings because of the adverse cost conditions

and the uncertainties owing to instability in prices. This throws light on two things: firstly, policy initiatives should be made to harness the untapped area with larger holdings, by incentivizing the farmers to tap the trees at the optimum level through institutional interventions. Alternatively, institutions should also do a pro-active role in harnessing the untapped area by taking a lead role. It comes out from the fact that inactive RPS[13] in many regions could also be a reason for higher untapped area in larger holdings; and energizing RPS by converting medium quality RPS into high quality RPS, could solve the issue to some extent.

Table 3: Heteroskedasticity-Corrected Model. Dependent Variable: Ln _ Productivity

Variables	*Coefficient*	*t-ratio*	*p-value*
Constant	4.548	65.70	0.000 ***
	(0.069)		
IQ _ Dummy _ Low	-0.061	-9.34	0.000 ***
	(0.007)		
IQ _ Dummy _ High	0.050	7.02	0.000 ***
	(0.007)		
Model RPS _ Dummy	-0.040	-4.15	0.000 ***
	(0.010)		
Ln _ Density of Matured Plants	0.599	54.63	0.000 ***
	(0.011)		
Ln _ Untapped Area	-0.163	-35.71	0.000 ***
	(0.005)		
HYV Clone _ Dummy	0.041	1.58	0.113
	(0.026)		
Agro _ Dummy _ North-South	-0.096	-12.66	0.000 ***
	(0.008)		
Cost of Harvesting _ Dummy	-0.050	-5.48	0.000 ***
	(0.009)		
Laggards _ Dummy_1	0.019	2.39	0.016 **
	(0.008)		
Late Majority _ Dummy_2	0.022	3.39	0.001 ***
	(0.007)		
	Statistic	P Value	
F (10, 55500)	784.58	0.000	***
Adj. R-Squared	0.125		
D.W	1.894		
N[14]	55511		

Note: Figures in parenthesis are standard errors.

Source: Estimated from Rubber Production Incentive Scheme Data, 2019.

Dummy variable for north and south is found to be significant with north having comparatively better productivity than the south. This would be probably because of much lower productivity in the central region as compared to all other regions, though southern region has better productivity (refer to Table 1). Cost of harvesting is found to be having negative impact upon productivity at the farm level as expected. Hence, productivity is higher in agro-climatic regions with lower cost of harvesting and vice versa. This throws light on the issue of tapping labour shortage in the natural rubber sector, which is very acute in some of the agro-climatic regions like central region. It gives the impression that policy interventions to address tapping labour shortage seems to be one area where innovation has to take place; notwithstanding the fact that there were initiatives in the past like Rubber Tappers Bank to address the issue. HYV clone dummy variable is found to be statistically insignificant in the model implying that there is no significant difference in productivity between RRII 105 and RRII 400 series at the aggregate level. This fact is against the claim that RRII 400 series is more highly productive than RRII 105. This matter requires detailed investigation which is beyond the scope of the present paper. Laggards and late majority adopters are found to be having higher productivity as compared to other category of adopters, including early adopters and innovators as against our theoretical expectations. However, the age of the plant is an interacting factor and the result is not concrete; hence requiring detailed enquiry. Productivity in model RPS villages is found to be less than that of the ordinary RPS villages, which leads us to the inference that the Model RPS scheme once successful, could not later sustain by itself and poses the question on the sustainability of the sponsored institutions, requiring detailed investigation within the sectoral innovation system of natural rubber.

Finally, Institutional quality dummy variables for low quality RPS operating villages and high quality RPS operating villages, are the variables of our interest in the model with respect to institutions. Both the dummies are found to be statistically significant at one per cent level. The parameter values for low quality RPS operating villages and high quality RPS operating villages are found to be -0.061 and 0.050 respectively, which leads us to the inference that in low quality RPS operating villages, productivity is lower, as compared to medium and high quality RPS operating villages. Similarly, productivity is higher in high quality RPS operating villages, as compared to both medium and low quality RPS operating villages. Hence, higher productivity is associated with high quality institution and vice versa, which leads us to the conclusion that institutional quality does matter for efficiency outcome at the farm level.

V Discussion of the Results and Policy Concerns

The present enquiry aimed to look at the role of institutional factors at the grassroots level in determining the efficiency outcome at the farm level within the framework of sectoral agricultural innovation system of natural rubber. The study has been guided by the hypothesis that institutional innovation enhances efficiency

outcome of the smallholders at the micro level. It leads us to the inference that institutional factors have unclenching influence upon the efficiency outcome at the farm level. It has been observed that villages with high quality RPS have better productivity than the medium and low quality RPS operating villages, both at the aggregate and disaggregated level. However, higher productivity is observed in ordinary RPS operating villages as compared to model RPS operating villages. It implies that model RPS once successful, could not sustain over time and poses the question about the sustainability of sponsored institutions in the long run.

Estimation results confirm that farms with higher density of matured plants are with higher productivity and vice versa. It leads us to the observation that the majority of the farms are with less than optimum size of matured plants and plant destruction at the farm level needs to be properly addressed through appropriate institutional interventions. Untapped area is also a serious concern and policy initiatives are required to harness the untapped area with larger holdings, by incentivizing the farmers to tap the trees at the optimum level through appropriate institutional interventions. Hence, micro level planning is required to address the issue, for which institutions at the grass root level, like RPS, should be empowered to perform a proactive role. Apart from that, the schemes implemented to reduce the untapped area like adoption of farms, needs to be timely evaluated for addressing the issue. Larger size of holdings needs to be targeted to reduce the gravity of the issue, as the size of untapped areas will be probably higher for larger size of holdings.

No significant difference in productivity between RRII 105 and RRII 400 series could be found from the estimation results; and efficiency outcome is found to be better for laggards and later adopters, as compared to innovators and early adopters, which would be probably because of higher aged plants in the innovators' and early adopters' field; and also due to larger size of holdings for the early adopters, as compared to the later adopters. Productivity is found to be lower in the agro-climatic regions having high cost of harvesting, that throws light on the need to address the issue of tapping labour shortage in the natural rubber sector, which is acute in all regions, especially in the central region. This would be an area where innovation has yet to take place; though there were initiatives in the past like Rubber Tappers Bank to address the issue.

Policy Concerns

In lieu of conclusion, the story of natural rubber in the Indian context reveals that institutional quality matters for efficiency outcome at the micro level. It leads us to the inference that building institutions at the grass root level alone will not lead to the intended outcome; rather efforts to maintain quality of institutions needs to be given thrust in the policies. It has also been observed that potentiality of raising efficiency at the farm level is immense in the natural rubber sector by upgrading low quality to medium quality and from medium quality to high quality RPS at the aggregate as well as at the disaggregated level. The study would also suggest a few

areas where proactive institutional interventions could create positive changes. Larger untapped area along with less than optimal density of matured plants in many holdings owing to destruction of plants or less care at farm level especially during adverse prices; and low productivity in agro-climatic regions with higher cost of harvesting are a few areas came out explicitly from the study, where grassroots level institutions can play a proactive role in addressing the issue.

Endnotes

1. The issue of heightened price instability of primary commodity prices in general and agricultural commodity price instability in particular at the global level and the decline in terms of trade vis-a-vis manufactured goods affecting the life of the mass in the developing world is "the commodity problem" quoted here (Maizels 2003).
2. The figures reported for share of agriculture in GVA at basic prices are drawn based on the advanced estimates in the economic survey, 2022-23.
3. As per the Census Report of 2011 around 25 per cent are cultivators; and 30 per cent are agricultural labourers of the total work force together constituting 55 per cent of the total work force.
4. The Rubber Board was formed through passing the Rubber Act of 1947. The Coffee Board was set up by an act of parliament in 1942, The Tea Board in 1954 as a result of the parliament act in 1953 and the Cardamom Board in 1964. In 1986, Spices Board was formed by amalgamating Cardamom Board with Spices Export Promotion Council with around 52 major and minor spices under its surveillance.
5. In the case of Natural Rubber, more than 90 per cent of the growers as of now are smallholders holding less than 5 hectares (Rubber Board, 2020).
6. There are two views of institutions- "institutions as organizations" and "institutions as rules of the game" (Edquist and Johnson 1997). The study takes the view that institutions are organizations with underlying rules of the game governing its activities.
7. Innovation system approach is disaggregated into different 'spatially' and 'sectorally' delimited innovation system approaches like national, regional or local (spatial) and sectoral or technological systems (sectorally) based on the object of the study. All these approaches complement each other rather than exclude each other (Johnson, *et. al.* 2004)
8. Districts namely Kasaragod, Kannur, Kozhikode, Wayanad and Malappuram constitute Northern Zone. North central zone covers Palakkad and Thrissur District. Ernakulam, Idukki and Kottayam fall in the central region and Alappuzha, Kollam, Pathanamthitta and Thiruvananthapuram in the southern region (Veeraputhran, *et. al.* 2013)
9. The data has been made available from the Rubber Board
10. The Rubber Board's latest recommendation for planting density has been in the range of 420 to 500 plants per hectare. However, there are significant divergences between the recommended planting density and the actual at the farm level (Veeraputhran, *et. al.* 2013)
11. Following this methodology, farmers who are quickly responding to new knowledge / technological developments in the sector (high yielding variety clones in the present study) are treated as innovative farmers (2.5 per cent of the total adopters). The next 13.5 per cent of the farmers who adopted the technology are treated as the early adopters. The early majority (34 per cent) and late majority (34 per cent) are the farmers who adopted the technology in the middle phase of the adoption. The next 16 per cent who came to the technology use in the last phase are the laggards, who are the least experienced in dealing with the technology.

12. As the initial model has been suffering from Heteroskedasticity when White test and Breusch-Pagan test are performed, the study has gone for Heteroskedasticity corrected model with Gretl.

13. It could be noted at this juncture that majority of the RPS members in the data were found to be of B grade or less than A grade RPS (refer to Table 1).

14. As there are missing observations in some of the variables and some of the villages could not be located from the RPS data base, the number of observations in the model varies from the actual, which could be inferred from the summary statistics table A1.3 in Appendix I.

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Appendix I

Table A1.1: Criteria for Classification of RPS

IS Domains	Category A	Category B	Category C	Category D
Infrastructure	Group Processing Centre with Computer and Other Accessories	-	-	-
	Latex Collection Centre	Latex Collection Centre	-	-
	Input Depots with Rubber Procurement	Input Depots	-	-
	Own Office	Office (Rented/Own)	No office	No office
Innovation Capability Building	Agro-management Training	-	-	-
	SHG Formation & SHG Activities	-	-	-
	Capacity Building Programmes – for Tappers and Growers	-	-	-
	Apiculture	-	-	-
Knowledge, Information and Networking	4 General Body Meetings including 1 Annual General Body	2 – 3 General Body Meeting	1 General Body Meeting	No General Body Meetings
	Seminars / Workshops	-	-	-
	8 to 12 Executive Committee Meetings	5 – 8 Executive Committee Meetings	4 Executive Committee Meetings	< 4 Executive Committee Meetings
Bridging Institution	Linkage with Rubber Board, Knowledge Infrastructure & RPS Promoted Companies	-	-	-
	Up to Date Audit Report	Audit Report Pending for 1 Year	Audit Report Pending for 2 years	No audit report submitted

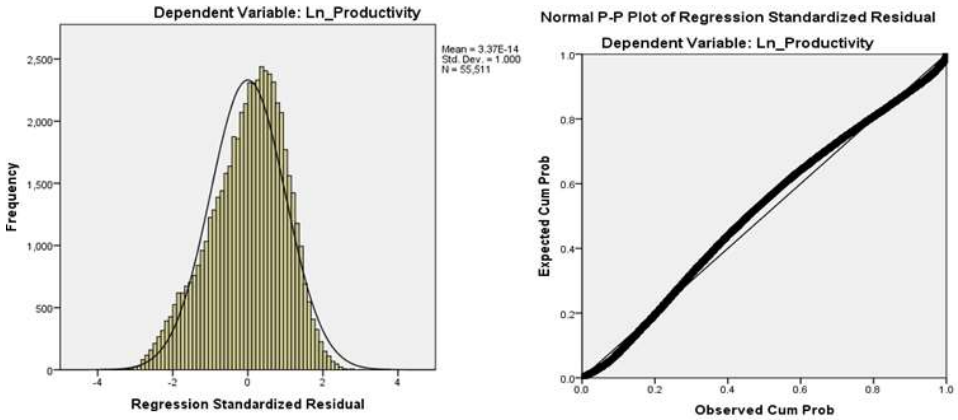
Source: Rubber Board, 2020.

Table A1.2: Summary Statistics

Variables	Number	Mean	Median	SD	Mini.	Maxi.
Ln _ Productivity	62140	6.71	6.78	0.60	5.20	8.20
Ln _ Untapped Area	65350	5.36	5.38	0.70	2.00	7.69
Ln _ Density of Matured Plants	65225	5.21	5.26	0.29	3.71	7.26
HYV Clone _ Dummy	65149	0.01	0.00	0.12	0.00	1.00
Agro-Dummy _ North-South	65534	1.47	1.00	0.50	0.00	1.00
Model RPS _ Dummy	65534	0.09	0.00	0.28	0.00	1.00
IQ Dummy _ Low	58776	0.32	0.00	0.47	0.00	1.00
IQ Dummy _ Medium	58776	0.44	0.00	0.50	0.00	1.00
IQ Dummy _ High	58776	0.24	0.00	0.43	0.00	1.00
Laggards _ Dummy 1	65534	0.17	0.00	0.38	0.00	1.00
Late Majority _ Dummy 2	65534	0.25	0.00	0.43	0.00	1.00
Cost of Harvesting _ Dummy	65534	0.22	0.00	0.42	0.00	1.00

Source: Estimated from Rubber Production Incentive Scheme Data, 2019.

Figure A1.1: Histogram and Normal PP Plot of Regression Standardized Residuals



Source: Estimated from Rubber Production Incentive Scheme Data, 2019.

Table A1.3: Collinearity Diagnostics

Independent Variable	VIF
IQ _ Dummy_1	1.190
IQ _ Dummy_3	1.238
Model RPS _ Dummy	1.083
Ln _ Density of Matured Plants	1.260
Agro _ Dummy _ North-South	1.907
HYV Clone _ Dummy	1.041
Ln _ Untapped Area	1.245
Cost of Harvesting _ Dummy	1.922
Laggards _ Dummy_1	1.132
Late Majority _ Dummy_2	1.107

Source: Estimated from Rubber Production Incentive Scheme Data, 2019.

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Estimates of Acreage Response Towards Farm Prices in the North Western Zone of Tamil Nadu

B. Gandhimathy

The purpose of the paper is to analyze the acreage response with respect to farm prices in the North western zone of Tamil Nadu. Paddy is one of the prominent food crops in this State and paddy alone shares more than 90 per cent in food crops. Numerous empirical studies have so far been conducted since 1900 till date, across the globe in the agricultural field, to explore the acreage response with respect to price and non-price factors. Despite many studies devoted to explain short run and long run elasticities by selecting different variable combinations, none of these studies explained the short run and long run elasticities diagrammatically. After 1950's, many studies followed Marc Nerlove's Partial adjustment mechanism. Also, there is a lacuna in pictorial representation of price elasticities in the acreage response and the present study fills this research gap. Hypothetical data set was created with the assumed prices and used to find various level of price and acreage response. We follow Marshall's law of supply function in the diagrammatic format, viz., price in the vertical axis and supply in the horizontal axis. To explain the causal factors, cause – effect, a change has been made in this analysis by drawing price in horizontal axis and Elasticity of Supply in the vertical axis.

Keywords: Acreage response, Short run and long run elasticities, Pictorial representation

I Introduction

In the domain of agricultural research, acreage estimation with respect to price, occupied significant place and the present paper also deals with acreage response towards the farm prices in the North western zones of Tamil Nadu (includes the districts of Salem, Namakkal, Dharmapuri and Krishnagiri). Price is an instrument for providing a boost to stagnant agriculture. Schultz (1964) states" *the requirements of an efficient system of prices should have been high on the agenda"*. Major cereal crops in the state are Paddy*, Cholam* (Jowar), Ragi, *Cumbu* (Bajra) and Maize. Paddy occupied more than 90 per cent of the cultivation hence, due to which it is selected for study. The short run and long run elasticities of paddy crops in Tamil Nadu are estimated by using Nerlove's partial price adjustment mechanism. The paper is divided into five sections: the first section

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gives the introduction, the second section compiles the review of literature, the third section deals with methodology, the fourth section contains the discussion and final section concludes the study.

II Reviews

Numerous studies are available to pinpoint the acreage response/supply response of agricultural commodities with respect to price and non-price factors. The excerpts of these studies are compiled chronologically and put in tabular form.

Author	Year	Location	Major Findings
Smith, B. Bradford	1928	United States, Washington DC	The study was released in the technical bulletin 50, U S Department of Agriculture, titled, "Factors affecting price of cotton". Acreage response was studied over a period of 20 years. The study noted that the price of cotton is an important factor in acreage plantations of the next year and "acreage is in a large part at the root of profits to the producers and proper control of acreage would do better to stabilize the prosperity in the cotton belt" and estimated changes made from 1903 to 2026 were very close to the actual raise or decrease, which explains that more than 90 per cent of the actual changes are made by the cultivator. This study used percentages, averages and regression analysis to infer the results.
Bean, L.H.	1929	United States, Washington DC	Multiple curvilinear correlations were used by the researcher. The study observed that yield, weather conditions and availability of credit had influenced the acreages. How the individual producers adjust acreages and also livestocks was explained. The same author conducted different studies and experiments with varied crops like potatoes, cotton, apples, and oranges and in different time periods. U S Department of Agriculture compiled the author's studies as Historic document.
Bean Louis, Walsh Robert	1944	United States Washington DC	Absolute first differenced regression analysis was employed by the researcher for cotton acreage response with prices of cotton lint and cotton seed.
Kohls, R.L. and Don Paarlberg	1950	United States Washington DC	The study reported that farmers with very low price in planning their acreage. They used correlation analysis for wheat planted and changes in prices and other factors. They obtained the elasticities ranging from 0.07 to 0.2
Nerlove Marc	1956	United States, Washington D C	A remarkable study was made by the researcher under the title of Estimates of the Elasticities of Supply of selected Agricultural Commodities. Future relative price expectations played a vital role in determining the plantation of crops. His log linear partial adjustment model has been followed by many researchers to estimate the supply response.
Nowshirvani	1962	India	This study was undertaken in Bihar and Eastern Utter Pradesh. Nerlovian model was used in this approach, and found acreage response with price expectations for rice, wheat and barley was very little.
Rao, M.S., and Jai Krishna	1965	India	They studied the price expectation of wheat and acreage responses in Uttar Pradesh the crops barley, grams, sugarcane, rape and mustard. The researchers used price expectation models. During a later period of their studies they used traditional and adjustment lag models to derive the results.

Author	Year	Location	Major Findings
Narain, Dharm	1965	India	His work related to total market surplus in total agricultural produce. Price changes that influenced the plantations of the cash and food crops have been analyzed.
Wipf L.S. and D.L. Bawden	1969	United States,	They attempted to evaluate descriptive and predictive reliability of the derived supply approach. These researchers observed that general comparison between the derived regional disparities and elasticities estimated by regression analysis, range from 15 per cent to 800 per cent.
Raj Krishna	1963 and 1965	India	Two studies were made in Punjab and Uttar Pradesh which pointed out the price-factor versus non-price factors examination. Results of this study showed that price alone was the important factor identified in the case of maize and sugar cane. In cotton irrigation was important. In earlier studies the researcher used the price data for a period of 1914-1945 and latter study covered the period of 1951-52 t 1962-63 for wheat response.
Bardhan, Kalpana	1970	India	Village level cross sectional data was used in this analysis. Regression tool was employed to estimate short run price elasticity of marketed surplus.
Askari H. and Cummings J.T.	1977	United States of America	Estimated agricultural supply response with Nerlove model across the countries are have been surveyed by these researchers.
Bailey and Womack	1985	United States	They observed wheat acreage response and revealed regional divergence occurred in Corn Belt and south east soft red winter areas. The researchers selected five district production regions of United States by using the variables weather conditions, production cost risk factors and market prices.
Bewley Ronald and Trevor young and David Cloman	1987	London	This study recommended the multinomial logit models for the allocation of fixed resources between alternative uses. A system approach to Modelling Supply Equation in Agriculture was evolved.
Duffy, Paricia A. and Richard James W. and Wohlgenant Michael K.	1987	USA	They developed the OLS estimates for four distinct regions and concluded Regional similarity in response to own prices but having differences with respect to the prices of alternative enterprises.
Rao Mohan J.	1989	India	The researcher wrote the paper on “Agricultural supply response: A survey which evaluated the literature surveys and pointed out that crop specific acreage elasticities range between zero and 0.8 in the SR and in the long run between 0.3 and 1.2. The researcher explored the supply response to output prices at the aggregate and at the crop levels. He compared cross-country studies also and concluded that the empirical estimates depend on methodology and country specific factors.
Thiele Rainer	2000	Germany	The researchers analyzed across countries by using regression analysis, Nerlovian models, co-integration analysis, and dynamic general equilibrium models. This study compiled the different techniques used in developing countries to estimate acreage response.
Chandrasekhara Rao	2004	India	Agricultural supply response to changes in agricultural terms of trade was analyzed. Nerlovian Partial Adjustment model was employed in this study. The framework of the model assumed aggregate output was the function of lagged net barter tems of trade, state average rainfalls and irrigation ratio.

Author	Year	Location	Major Findings
Ballard Grant J., and Thomsen R. Michael	2008	Unites States of America	This study revealed that short run and long run own price acreages are estimated to be 0.69 and 1.19 respectively. These researchers used the input costs and crop prices to develop the acreage response model.
Mythili G.	2008	India	The researcher studied acreage response for selecting rice, wheat, cotton, sugarcane rapeseed and mustard by using pooled cross section and time series data to analyse the food grains and non-food grains.
Shafiul Azam, Katsushi Simai and Raghav Gaitha	2012	South East Asia	This paper brings the causal factors behind the supply response and farmers' market participation decisions and farmers market participation decision in Cambodia.
Muhammad Sadiq and others	2014	Khyber Pakhtunkhwa	The Researcher used Nerlovian partial adjustment model in agricultural responses. Panel data analysis for wheat, rice, corn and soyabeans was applied to study the acreage response and yield responses; and employed multi country and multi crops, seasonally disaggregated model with price volatility.
Kumar, P.	2017	India	This study explores the supply response in terms of area and yield of food grain crops at all India level during the period of 1980-81 to 2013-2014. Price of own crop and competition crops, rainfalls, irrigation, yield rates, and fertilizers are taken into account.
Vikas,	2018	India	In this study, the estimation of acreage response of major crops in Haryana district using co integration approach was analysed.
Edison and Dharia Renate	2021	Indonesia	Production response and acreage response in soyabean crop was studied. The researchers used the price expectation model in measuring acreage response in Jambi, Indonesia. The results revealed that short run price elasticity was lower than long run price elasticity.
Ibrahimasall and Russell Tronstad	2021	Tanzania	Simultaneous system of two equations was used for insurance participation and acreage response to subsidized crop insurance for cotton.

Research Gap

Across the globe, a vast literature survey has been available in the context of acreage responses with respect to prices and non-prices which has different locations, time periods and methodologies. These studies are developed statistically from percentage changes, averages, correlation analysis, regression analysis, and ordinary lease square methods, logit models, behavioural equations, co integration methods, panel data analysis to two stage and three stage simultaneous equation models. The results of acreage response function from the estimates showed that the long run elasticities are relatively more than short run elasticities and in very few studies it was *vice versa*. None of these studies exhibit the results diagrammatically. So far, no attempt has been made in this context; the present study has been undertaken to full fill the research gap.

Objectives

1. To estimate acreage response of paddy crop in North western Zone of Tamil Nadu

2. To find the short run and long run price elasticity of supply of paddy crop in North western Zone of Tamil Nadu
3. To exhibit diagrammatically, the short run and long run elasticities of paddy crop in North western Zone of Tamil Nadu.

III Methodology

Secondary data has been collected from the Seasonal and Crop report of Tamil Nadu from 2005-2006 to 2020-2021 in varying year's book. Based on agro climatic conditions, soil fertility and cropping pattern, Agricultural zones in Tamil Nadu have been classified into seven; among the seven zones, North western zone of Tamil Nadu has been selected as a case study, which covered the districts of Salem, Namakkal, Dharmapuri and Krishnagiri. In this zone, growth rate of acreages under cultivation was decreased but the yield rates are much higher than the state averages. Paddy crop was selected as it is the principal food crop in Tamil Nadu and covered more than 90 per cent of gross area sown (Gandhimathy 2023).

Nerlovian partial adjustment model has been widely used in the empirical studies to find supply behaviour (acreage response). To examine the elasticity of supply of agricultural commodities (corn, cotton and wheat) Nerlovian constructed this model. Supply responses are influenced by the price factors, last year's supply of acreages and also exogenous factors (non-Price factor) like rainfalls. In this study, Area, Lagged Area, Price, Lagged Price, Rainfall and Trend was used to construct the multiple regression model. Log linear supply function is computed by using first differenced.

The specification of log linear supply function for a crop will be as follows,

$$\text{Log } At^{*} = b_{0\ \text{Intercept}} + b_1 \log A_{\ t\text{-}1\text{Lagged area}} + b_2 \log P_{t\text{-}1\ \text{Lagged price}} + b_{3\ \text{Rainfall}} + b_{4\ \text{Trend}} + \text{Error Term}$$

According to Ubendar (2003), the value of coefficient of partial adjustment is less than unity showing the difference between actual change and desired change in the area. The regression co-efficient of the price in the lagged year, gives directly the value of the short run elasticity of the acreage under the crop, with respect to changes in price in that lag year. Since the desired level of area A_t^* is not observable, the partial adjustment mechanism will be adopted to estimate the function. Magnitudes of the elasticities of acreage to expected price and the percentage of the variance of acreages are explained. Microsoft excel and SPSS packages were used to draw the inferences.

IV Results and Discussion

Good estimates of acreage response to price can be attained only from comprehensive supply functions. The derivation of short run and long run

elasticities with assumed price was given for the four districts, viz., Salem, Namakkal, Dharmapuri and Krishnagiri.

i) Salem District

Multiple regression model built for Salem district was statistically significant (given in Appendix 1). The Anova table implies overall fitness of the model. It shows F (4,9) = 8.789, P <0.00 and DW = 2.272. The coefficient of determination R^2 value is (0.796), hence the independent variables explained the dependent variable at 80 per cent. The model satisfied goodness of fit to run the model. The individual predicators showed the following output.

Table1: Acreage Response in Salem District

EA =Estimated Acreage	- 6.120	- 0.489	+ 0.361	+ 2.262	+0.328	+0.379
	Constant	Lagged Area	Lagged Price	Rainfall	(Trend)	(Error Term)
T value	-4.351	-3.124	0.637	4.286	0.328	
P value	0.002	0.012	0.540	0.002	0.051	
R20.796DW 2.272						
Ftest 8.789 Sig 0.004						

Source: Author's own Computation.

The regression coefficient of the lagged prices is known as short run price elasticity; one unit increases in the lagged price would increase the area under the crop in the current year by 0.361 units per annum all else equal. The co-efficient of partial adjustment is 1.489 (1- (-0.489). The discrepancy between the desired change and actual change in the area under the crop can be eliminated by 1.489 units every year. The long run price elasticity is short run price elasticity /co-efficient of partial adjustment (0.361/1.489) 0.242 showing that the cumulative effect of the changes in the prices of the crop over a period time on the acreage is such, that if the price of paddy crop is increased by one per cent in the lagged year, the area under the crop will be increased by 0.242 units in the current year. Long run price elasticity is relatively lower than the short run price elasticity. Earlier estimates, and numerous studies found that long run price elasticities are more than short run price elasticity. Here, long run price elasticities are less than short run elasticities. During the study period, the compound growth rate of acreage under cultivation decreased at 5.5 per cent; hence, it shows the lower level of price elasticity. Normally essential and basic commodities are less elastic than other commodities. In this context, as years go on. the long run elasticity must be lower than short run price elasticity. It is important to note that even the price increases, cumulatively the area under cultivation of the crop will gradually decrease. Hence, this needs the attention of the policy makers to increase the area under cultivation of crops. As an extension over the earlier studies, this study explored the derivation of supply curves by putting different assumed values for price. With this assumed

price, the short run and long run elasticity's values are manipulated. The following hypothetical data illustrates for short run and long run, price elasticity of supply of acreages in Salem district. It reveals that if the price per unit increased at 0.20, the short run elasticity would be 0.07 and long run elasticity would be 0.05 and so on.

Table 2: Short Run and Long Run Price Elasticities in Assumed Prices

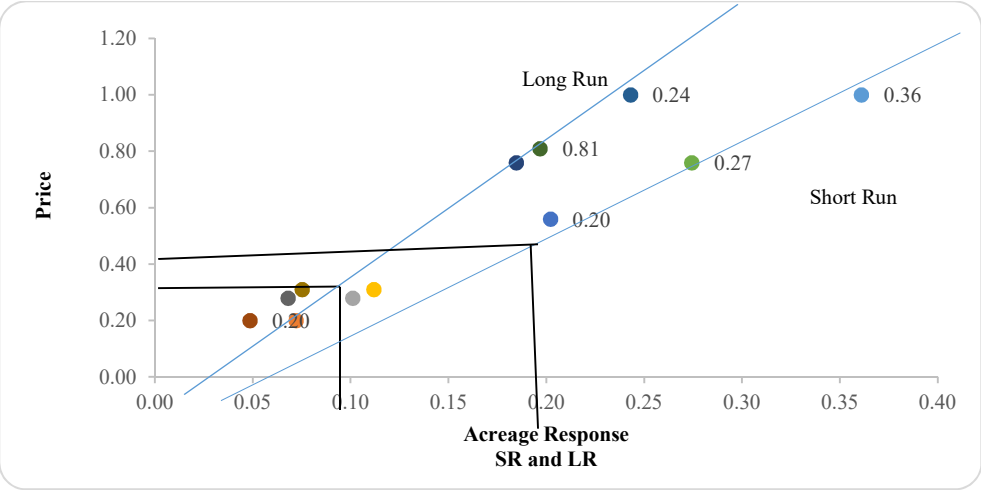
Assumed Price (Units)	0.20	0.28	0.31	0.56	0.76	0.81
SR E.S (Units)	0.07	0.10	0.11	0.20	0.27	0.29
LR E.S(Units)	0.05	0.07	0.08	0.14	0.18	0.20

Source: Author's own computation.

From the above table, the following diagram clearly shows the derivation of short run and long run price elasticities at different price levels. The father of Micro economics and founder of neo-classical economics propounded the law of supply function in economic theory. His pictorial representation shows that quantity of supply (we can say it as dependent variable, output variable and effects variable) in X axis known as horizontal axis and price (we can name it as independent variable/input variable/ Causal factor) in Y axis, known as vertical axis. Logical ordering of the X and Y axis should be price and quantity of supply. As, price increases (causal factor), the quantity supply (effect factor) increases or vice versa. Hence, price in this study is placed in horizontal axis and supply (in terms of Acreage) in vertical axis. The present study exhibits both Marshallian version of supply function and Author's version of the supply function. The interpretation in terms of axis point differs, but the values yield the same results. Derivation of Short and Long Run Price Salem District.

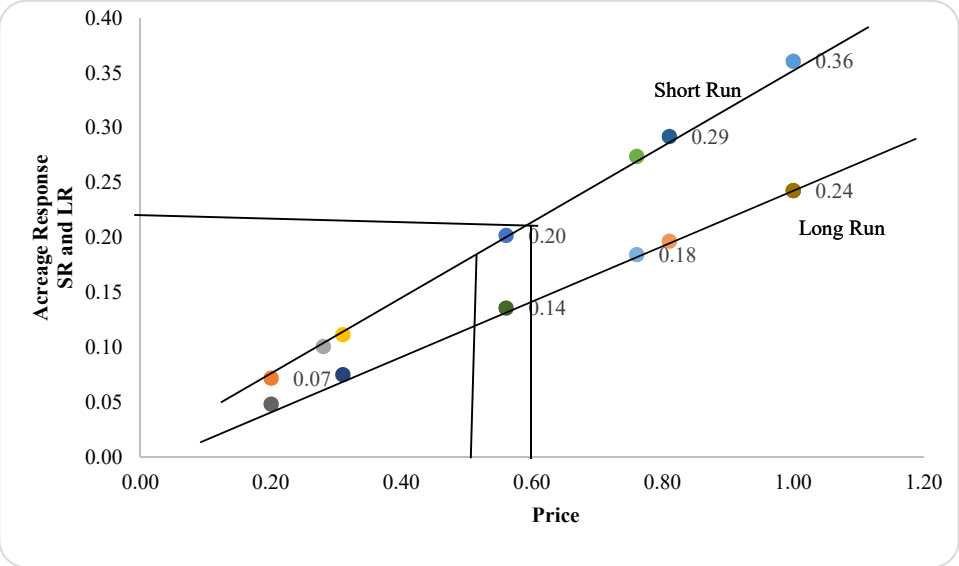
Alfred Marshall's Version

Chart 1: SR and LR Price Elasticities in Salem District



Author's Version

Chart 1(A): SR and LR Price Elasticities in Salem District



Source: Author's own computation.

The above chart 1 and 1(A) shows the price and acreage response. If the price level is known, the acreage response for short run and long run can be calculated as shown in the above diagram.

ii) Namakkal District

The details of multiple regression model built for Namakkal district was given in Appendix. The Anova table implies overall fitness of the model. It shows F (4, 9) = 1.884, P <0.198 and DW = 1.937. The coefficient of determination R^2 value is 46 per cent. Hence, in this model along with the selected variables, other significant variables also influence in the supply function. The individual predicators showed the following output.

Table 3: Acreage Response in Namakkal District

EA =	-10.559	-0.337	+ 0.711	1.456	0.272	0.563
	Constant	Lagged Area	Lagged Price	Rainfall	(Trend)	(Error Term)
t value	-1.943	-1.341	0.710	1.867	1.262	
P value	.084	0.213	1.867	0.095	0.239	
R20.456DW1.937						
F test 1.884Sig 0.198						

Source: Author's own computation.

The short run price elasticity in Namakkal district has shown that every unit increase in the lagged price would increase the area under the crop in the current year by 0.711 unit per annum, all else being equal. The co-efficient of partial adjustment is 1.337 (1-(-0.337)) showing that the disequilibrium between the desired change and actual change in the area under the crop, can be eliminated by 1.337unit every year. The long run price elasticity is short run price elasticity /co-efficient of partial adjustment (0.711/1.337) 0.532 showing that the cumulative effect of the changes in the prices of the crop, over a period time on the acreage, is such that if the price of paddy crop is increased by one per cent in the lagged year, then the area under the crop will be increased by 0.532 per cent in the current year. Long run price elasticity is relatively lower than the short run price elasticity. During the study period, the compound growth rate of acreage under cultivation decreased at 5.354 per cent; hence, it shows the lower level of price elasticity. Normally essential and basic commodities are less elastic than other commodities. In this context, as years go on, the long run elasticity must be lower than short run price elasticity. It is important to note that even as the price increases, cumulatively the area under cultivation of the crop will gradually decrease. The following hypothetical data illustrates for short run and long run price elasticity of supply of acreages in Namakkal district. It reveals that if the price per unit is 0.20, the short run elasticity would be 0.14and long run elasticity would be 0.11 and so on. The following hypothetical data shows varying price levels and short run and long run price elasticities.

Table 4: Short Run and Long Run Price Elasticities in Assumed Prices

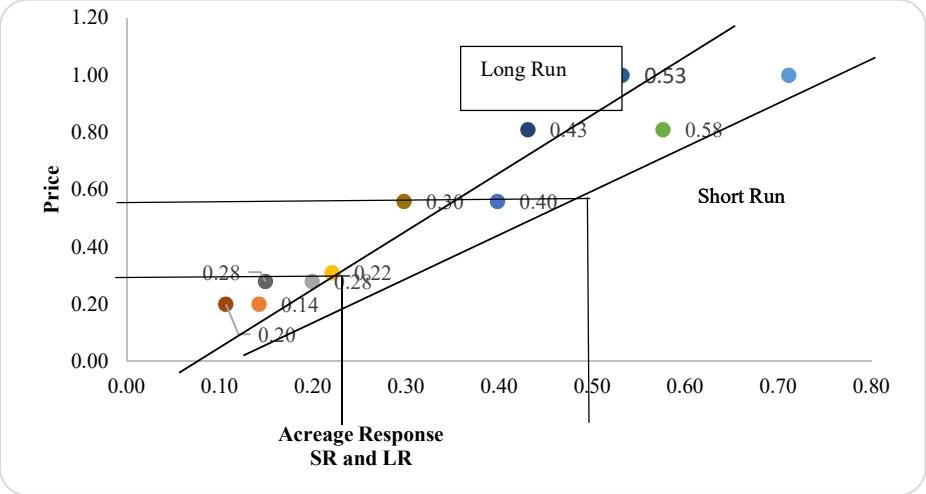
Price	0.20	0.28	0.31	0.56	0.76	0.81
SR E.S	0.14	0.20	0.22	0.40	0.54	0.58
LR E.S	0.11	0.15	0.16	0.30	0.40	0.43

Source: Author's own computation.

The following chart 2 and 2(A) shows derivation of Short and Long Run Price in Namakkal District. At different level of prices, price and acreage responses are plotted.

Alfred Marshall's Version

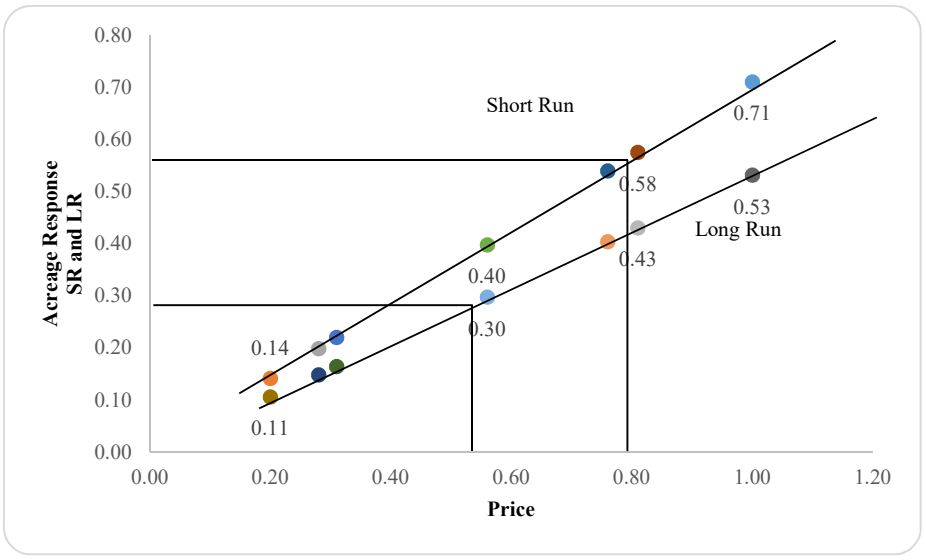
Chart 2: SR and LR Price Elasticities in Namakkal District



Source: Author's own computation.

Author's Version

Chart 2(A): SR and LR Price Elasticities in Namakkal District



Source: Author's own computation.

iii) Dharmapuri District

Over all, the model constructed for Dharmapuri District satisfied goodness of fit, indicated in F test, F (4, 9) = 10.258, P < 0.02. Independent variables explained the dependent variable at 82 per cent. The individual predicators showed the following output.

Table 5: Acreage Response in Dharmapuri District

EA =	-16.224	-0.714	-0.739	2.413	-1.330	0.412
	Constant	Lagged Area	Lagged Price	Rainfall	(Trend)	(Error Term)
T value	-4.151	-4.160	0.952	4.169	-1.886	
P value	0.002	0.002	-0.777	0.002	0.092	
R20.820DW 1.925						
F test 10.258 Sig 0.002						

Source: Author's own computation.

Short run price elasticity is estimated at - 0.739 units, implying that for every unit increase of price, the area under cultivation decreased at 0.739 units. A rational farmer usually increases the acreage response if the price increases; here the situation needs attention in the perspective of whether increase in the price is enough to meet the cultivation practices of paddy. Increase in price of other input factors is more than the increase in the price of paddy. Fertilizer costs, pesticide costs, human labour and imputed cost and other costs incurred in the production of paddy may be more than the increase in the price level. Hence, the farmers gradually decrease the area under cultivation. During the study period, compound growth rate of acreage under cultivation had decreased -4.07 per cent. Every unit increase of acreage, decreased the current year at 0.714 units. Every unit increase of rainfall increases the paddy crop in Dharmapuri district at 2.413 units. The partial adjustment mechanism is [1- (-0.714)] 1.714 and long run price elasticity has been calculated at short run elasticity/ partial adjustment, which is equal to -0.739/1.714 units, i.e., -0.431 units. In Dharmapuri district, long run price elasticities are higher than short run price elasticities. The following hypothetical data illustrates for short run and long run price elasticity of supply of acreages in Dharmapuri district.

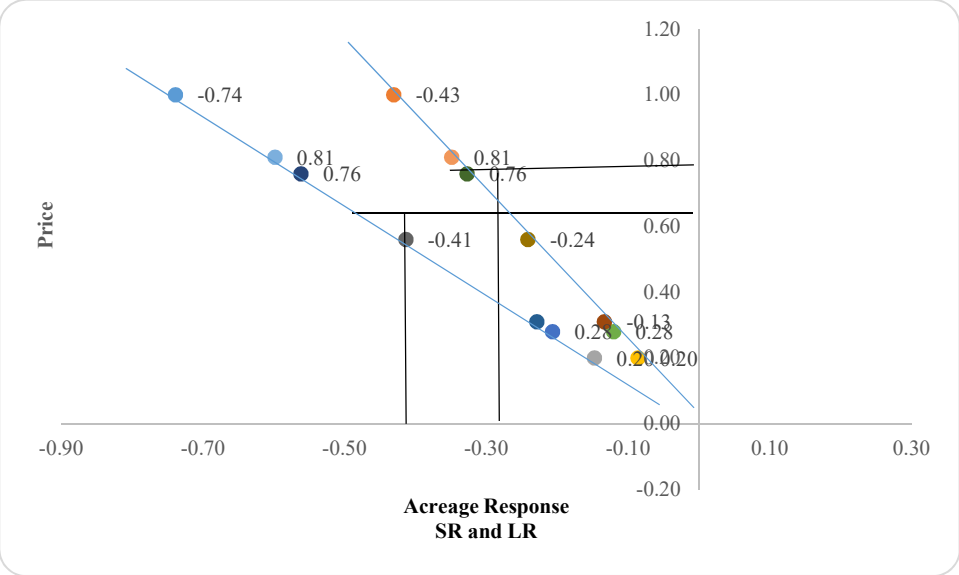
Table 6: Short Run and Long Run Price Elasticities in Assumed Prices

Assumed Price	0.20	0.28	0.31	0.56	0.76	0.81
SR E.S	-0.15	-0.21	-0.23	-0.41	-0.56	-0.60
LR E.S	-0.09	-0.12	-0.13	-0.24	-0.33	-0.35

Source: Author's own computation.

Alfred Marshall's Version

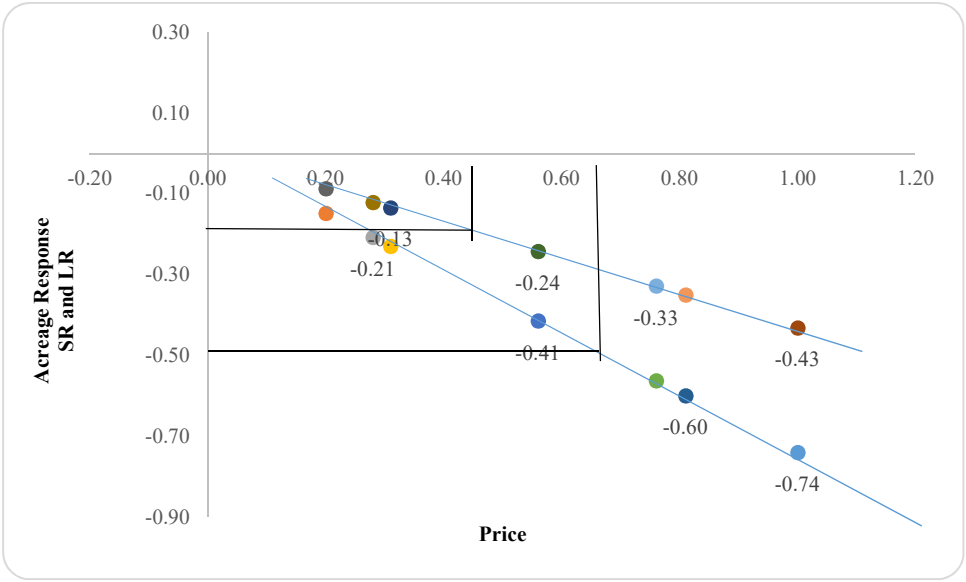
Chart 3: SR and LR Price Elasticities in Dharmapuri District



Source: Author's own Computation.

Author's Version

Chart 3 (A): SR and LR Price Elasticities in Dharmapuri District



Source: Author's own Computation.

Chart 3 and 3 (A) explore the different levels of prices and acreage response. Supply line in Dharmapuri District is backward sloping and perverse supply lines are drawn in the diagram. Assumed prices and Short run and long run price elasticities are derived from the hypothetical data. Negative price elasticities are depicted in the above diagram. Despite increase in prices, acreage responses decreased. Hence, apart from price, some other variables influence the acreage response.

IV) Krishnagiri District

In Krishnagiri district, the construction of model was good to run the multiple regressions (given in Appendix). Overall, estimation of the model is viewed by ANOVA table, 7(4,9) = 2.789, P< 0.093 as shown below. 55 per cent of the dependent variables are explained by independent variables. Individual predicator shows the following results.

Table 7: Acreage Response in Krishnagiri District

EA =	1.153	-0.721	0.461	-0.197	0.101	0.214
	Constant	Lagged Area	Lagged Price	Rainfall	(Trend)	(Error Term)
T value	0.484	-2.956	0.886	-0.569	1.242	
P value	0.640	0.016	0.398	0.583	0.246	
R20.553DW 1.830						
F test2.789Sig 0.093						
Short run Elasticity = 0.461;Partial Adjustment Mechanism =1.721; Long run Elasticity = 0.267						

Source: Author's own computation.

Short run price elasticity in Krishnagiri district reveals, one unit increase in the lagged price would increase the area under the crop in the current year by 0.461 per cent per annum, all else being equal. The co-efficient of partial adjustment is 1.721 (1- (-0.721) disequilibrium between the desired change and actual change in the area under the crop can be eliminated by 1.721 units.The long run price elasticity is short run price elasticity /co-efficient of partial adjustment (0.461/1.721) 0.267, showing that the cumulative effect of the changes in the prices of the crop over a period time on the acreage is such that if the price of paddy crop is increased by one per cent in the lagged year, then the area under the crop will be increased by 0.267 per cent in the current year. Long run price elasticity is relatively lower than the short run price elasticity. Krishnagiri district, long run price elasticities are less than short run elasticities. During the study period, the compound growth rate of acreage under cultivation increased at 2.495 per cent, With the following assumed price, the short run and long run elasticities values are manipulated. Hypothetical data illustrates for short run and long run price elasticity of supply of acreages in Salem district. It reveals that if the price

per unit increased at 0.28, the short run elasticity would be 0.13 and long run elasticity would be 0.07 and so on.

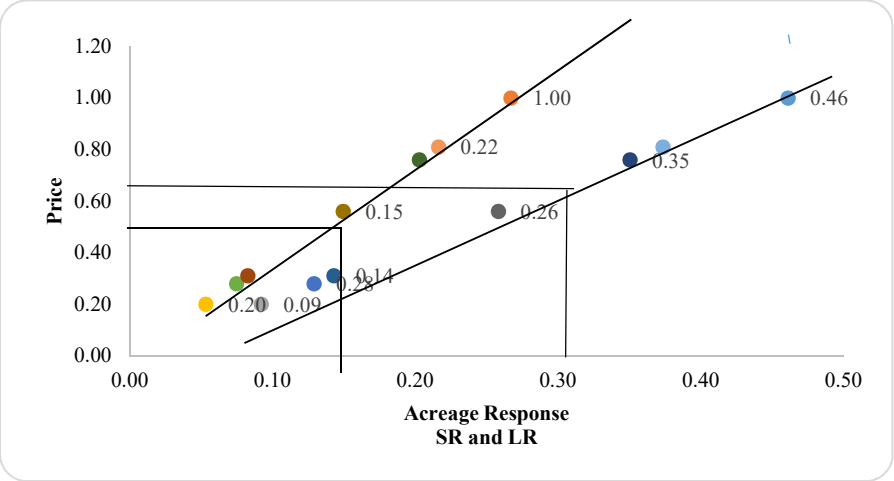
Table 8: Short Run and Long Run Price Elasticities in Assumed Prices

Assumed Price	0.20	0.28	0.31	0.56	0.76	0.81
SR E.S	0.09	0.13	0.14	0.26	0.35	0.37
LR E.S	0.05	0.07	0.08	0.15	0.20	0.22

Source: Author's own Computation

Prof. Alfred Marshall's Version

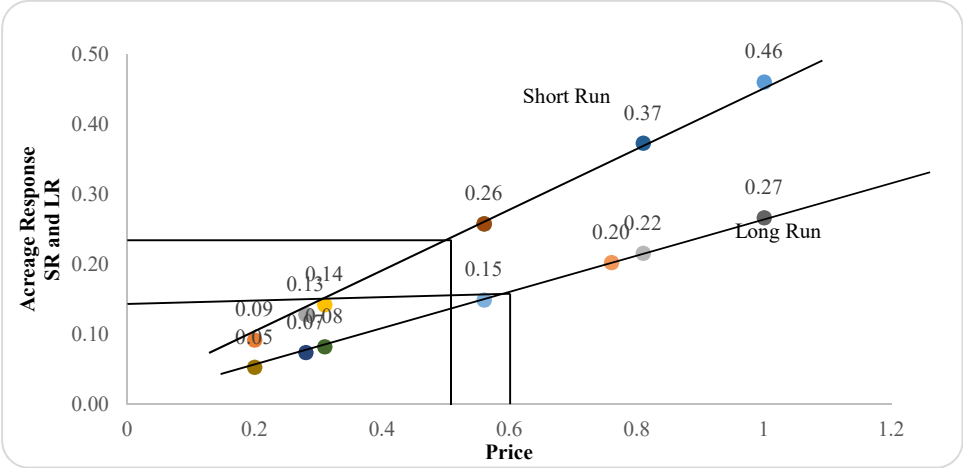
Chart 4: SR and LR Price Elasticities in Krishnagiri District



Source: Author's own computation.

Author's Version

Chart 4(A): SR and LR Price Elasticities in Krishnagiri District



Source: Author's own Computation.

The above diagram exhibits the price and acreage response of paddy crop in Krishagiri district. The short run price elasticity is more than short run price elasticity. If the price level is 0.31 units, then acreage response in the short run would be 0.14 units and in the long run 0.08 units.

V Conclusion

The present study explores the acreage function with respect to prices. Price is an important component in the profit margin of the farmers and acreage response with respect to price is put to verify in this study. Whether last year's price has an impact in the current year's acreage was empirically studied. A rational farmer increases the area under cultivation if the price increases, here despite price increase, the acreage under cultivation decreases year by year, as indicated by the compound growth rate of area in these districts (Salem, Namakkal and Krishnagiri). Hence, other than price, some of other factors influence the acreage response. The study warrants further research in the context of cultivation cost, transaction cost and real cost of paddy cultivation. If these costs are higher than the increased price level, the farmer obviously reduces the cultivation practices. This study gives varying results from the earlier studies and concluded that short run price elasticity is more than long run price elasticity in the selected districts Salem, Namakkal and Krishnagiri. In Dharmapuri district, the long run price elasticity is more than short run price elasticity and gives negative elasticity. Backward supply lines and perverse supply line has been found in this district. Keeping in mind, the growing population and demand for agricultural commodities it is essential to ensure paddy crop cultivation. To cope with the expected demand in future, it is essential to

accelerate the paddy crop cultivation practices to avoid shortages of food grains in future.

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Appendix

Supply Response Function

Acreage Response Function in Salem District

Summary Output

Regression Statistics	
Multiple R	0.892
R Square	0.796
Adjusted R Square	0.706
Standard Error	0.379
Observations	14

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4.000	5.059	1.265	8.789	0.004
Residual	9.000	1.295	0.144		
Total	13	6.354			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-16.120	3.705	-4.351	0.002	-24.501	-7.739	-24.501	-7.739
Lagged area	-0.489	0.157	-3.124	0.012	-0.843	-0.135	-0.843	-0.135
Lagged Price	0.361	0.567	0.637	0.540	-0.922	1.645	-0.922	1.645
Rainfall	2.262	0.528	4.286	0.002	1.068	3.455	1.068	3.455
Trend	0.328	0.146	2.251	0.051	-0.002	0.658	-0.002	0.658

Acreage Response Function in Namakkal District

Summary Output

Regression Statistics	
Multiple R	0.675
R Square	0.456
Adjusted R Square	0.214
Standard Error	0.563
Observations	14

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4.000	2.391	0.598	1.884	0.198
Residual	9.000	2.855	0.317		
Total	13	5.246			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-10.559	5.435	-1.943	0.084	-22.854	1.737	-22.854	1.737
Lagged area	-0.337	0.251	-1.341	0.213	-0.906	0.231	-0.906	0.231
Lagged Price	0.711	1.002	0.710	0.496	-1.556	2.978	-1.556	2.978
Rainfall	1.456	0.780	1.867	0.095	-0.308	3.220	-0.308	3.220
Trend	0.272	0.215	1.262	0.239	-0.215	0.759	-0.215	0.759

Acreage Response Function in Dharmapuri District

Summary Output

Regression Statistics	
Multiple R	0.906
R Square	0.820
Adjusted R Square	0.740
Standard Error	0.412
Observations	14

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4.000	6.969	1.742	10.258	0.002
Residual	9.000	1.529	0.170		
Total	13	8.497			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-16.224	3.909	-4.151	0.002	-25.066	-7.382	-25.066	-7.382
Lagged area	-0.714	0.172	-4.160	0.002	-1.102	-0.326	-1.102	-0.326
Lagged Price	-0.739	0.952	-0.777	0.457	-2.892	1.413	-2.892	1.413
Rainfall	2.413	0.579	4.169	0.002	1.104	3.722	1.104	3.722
Trend	-1.330	0.705	-1.886	0.092	-2.925	0.266	-2.925	0.266

Acreage Response Function in Krishnagiri District

Summary Output

Regression Statistics	
Multiple R	0.744
R Square	0.553
Adjusted R Square	0.355
Standard Error	0.214
Observations	14

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4.000	0.512	0.128	2.786	0.093
Residual	9.000	0.414	0.046		
Total	13	0.926			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.153	2.380	0.484	0.640	-4.231	6.536	-4.231	6.536
LaggedArea	-0.721	0.244	-2.956	0.016	-1.272	-0.169	-1.272	-0.169
Lagged Price	0.461	0.520	0.886	0.398	-0.715	1.636	-0.715	1.636
Rainfall	-0.197	0.346	-0.569	0.583	-0.979	0.585	-0.979	0.585
Trend	0.101	0.081	1.242	0.246	-0.083	0.284	-0.083	0.284

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Gender Aspect of Global Value Chains: Empirical Evidence from Low and Lower Middle-Income Nations

Sakshi Bhayana and Biswajit Nag

This paper investigates whether the stylized fact of "feminization of labour" still holds in the global value chain (GVC) system. We analyse the association between the various indicators of female participation as workers and owners with value chain linkages at the firm level for the manufacturing sector. Our sample consists of seventy low and lower-middle-income countries from South Asia, Sub-Saharan Africa, Latin America, and South East Asia. We use World Bank enterprise survey data aggregated at a country level spanning the period 2006-2018. Using principal component analysis and fractional logistic regression we demonstrate how GVC linkages impact women's participation in the labour force. Our results show that the proportion of firms engaged in backward value chain integration is positively related to the proportion of firms with female owners and negatively related to the proportion of firms with female workers, with innovation contributing towards the fall in female labour supply. We draw policy implications from the study.

Keywords: Female Labour Force Participation Rate (FLFPR), Global Value Chain (GVC), Female owners, Female workers, World Bank Enterprise Survey (WBES)

I Introduction

GVC has become a critical segment of the 21st-century economy with its feature of distinctly decreased costs of transportation and correspondence, coupled with long periods of exchange advancement. The improvement and extended advancement of GVCs have accorded importance to the trade-growth nexus and the new wave of "trade development" amalgamation.

Embedding gender equality into global value chains (GVC) would help facilitate progress towards SDG5 by providing more accessible and equitable income possibilities for women, improving labour conditions, and focusing on

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gender gaps in access to resources, positions of decision-making, and leadership. Understanding women's economic restrictions is essential for maximizing the benefits of GVC integration for both women and the economy. GVC can promote sustainable socio-economic development, aligning with development goals. Gender equality in GVC has the potential to boost effectiveness to promote development in the economy and contribute towards more inclusive and long-term growth. The primary goal of this article is to evaluate how female workforce participation is affected in GVCs by low and lower-middle-income nations. Secondly, it accords importance to the relationship between firm-related factors like obstacles, size, ownership, and innovation with gender-based outcomes.

We evaluate the effect of value chain integration on the female labour market. The hypothesis recommends a few explanations behind such a relationship. For instance, escalating competition connected with worldwide exchange expands the expense of businesses oppressing female labourers, which thus builds the work for women. Admittance to outsider innovation with advances in automation connected with exchange exercises has moved the interest in work, from those with fewer skills to those with more skilled, leaning towards women over men. Evidence from the study of a US-based firm, women are responsible for growth of enterprises with support, in terms of finance and right mentorship. (Liautaud M. (2016)).

Experimental legitimacy of the connection between GVC participation and women's employment has not yet been made as expected, particularly in lower-middle and low-income nations. Current work is attempting to fill this gap in the writing. This is based on utilizing firm-level exploration data from emerging nations to gauge their relationship between a proportion of firms with female representatives and associated GVC participation. Female workforce participation and exchange are viewed as two significant fields in worldwide financial aspects and advancement writing (Sauré and Zoabi 2009). Exchange receptiveness may bring greater business openings, particularly trade-arranged endeavours. They favoured cheap female workers, while exchange receptiveness may debilitate the female works' intensity, because they have lower education attainment, by expanding competition.

Several research including Wood (1991), Standing (1989), Cagatay and Ozler (1995), and Ozler (2000 and 2001) support the link between the rise of export-driven business and female employment. Research also suggests that GVC integration and economic upgrading may not always result in beneficial social consequences, (Barrientos, *et. al.* 2011, Milberg and Winkler 2013, Rossi 2013).

GVCs offer opportunities for workers, producers, and entrepreneurs in devel oping countries to increase sales, exports, and wages, learn new skills and techno logies, and gain exposure to successful business practices.

However, women are mainly involved in low-value added activities and low-wage tasks with poor working conditions (ILO 2015). Addressing gender issues is not just a concern for gender equality, but also for economic and social development, for the potential effectiveness of initiatives. Gender equality is not only a social justice issue (Fontana 2014).

In this background, the current study establishes a conceptual framework for including gender in global value chain analysis. Further, we conduct empirical research to analyse how GVC-related variables affect gender roles and assess whether innovation helps or hinders defeminization in emerging economies' labour supply.

II Review of Literature

The Heckscher-Ohlin-Samuelson (H-O-S) model, as the presentative of neoclassical exchange hypothesis shows that when nations engage in international trade, countries specialize in a good which requires the factor that they have in abundance. Developing nations where less-skilled female labourers are in abundance, will export labour-intensive products to developed nations, leveraging their abundant female labour force. Females in advanced nations ought to lose as these nations tend to focus more on their capital abundance.

The opposition and segregation model (Becker 1957) uncovers rivalry powers segregating firms from the market. In explicit, firms that present a "preference for segregation" that signify a negative valuation on recruiting females, have greater expenses and lower benefits than less segregating partners. Discrimination can lead to the segregation of labour markets. For example, if certain firms refuse to hire women or minorities, those groups may become concentrated in specific industries or roles that are less valued or lower-paying. This segregation can perpetuate economic disparities and limit opportunities for affected groups. This model suggests that in the long run, firms that discriminate may be driven out of the market due to their inability to compete effectively. As non-discriminating firms gain a competitive edge, the overall market may become more efficient, leading to better allocation of resources and talent.

Gaddis and Pieters (2012) offer evidence that trade liberalization may raise female employment and labour market participation, especially in the service industry due to push and pull factors. These factors included increased job insecurity in the labour market, male unemployment, and the flow of employment opportunities between sectors, particularly a faster move from manufacturing and agriculture to commerce and other services. Fofana, *et. al.* (2005) studied the gender aspects of GVCs and their effects on female labour force participation. Women are over-represented in the informal work arrangements and are concentrated in particular GVCs, which are low-skilled and labour-intensive occupations

Ouedraogo and Marlet (2018) uncover evidence from developing nations and find that FDI inflows increase female well-being and reduce gender inequality. Sauré and Zoabi (2014) trade-related sector expansion can disproportionately benefit male workers, resulting in a rising gender wage gap. This is especially true in industries where men are predominant. Gaddiswhat's (2017) shows that exchange progression pushes down FLFPR in tradable areas, especially for low-skilled workers

Fontana and Woods (2000) and Fontana (2001 and 2002) developed CGE models for Bangladesh and Zambia, revealing that trade liberalization increases female employment and income, but may have negative effects on female leisure and family dependency. Autor, *et. al.* (2013) point out that import competition has significantly increased unemployment in the United States, which can disproportionately impact female workers in industries that are susceptible to offshore.

Nathan and Sarkar (2011), state that low-skilled workers, especially women, who are frequently the ones to be laid off during restructuring, may suffer as a result of the unequal power distribution in GVCs. Milberg and Winkler's (2010) research highlights that social and economic advancement in GVCs does not always translate into better working conditions for all employees, especially women, who may experience more job instability.

Among the Asian districts, Fontana (2009) further clarifies that exchange progression results in feminization in the area of assembling. The more prominent the portion of garments, textiles, and gadgets in trades areas, the more noteworthy the business making an effect of exchange has been for female. Hyder and Behrman (2012) explains the critical increment female workforce comparative with male workforce cooperation in Pakistan, with the improvement of global exchange transparency. Asian Trade Agreements of clothing enterprises in Bangladesh and Sri Lanka have recorded a huge expansion in female work. Tejani and Kucera (2014) make use of accounting decomposition techniques to investigate adjustments in female shares of manufacturing employment for 36 international locations at unique ranges of improvement from 1981 to 2008, for the entire manufacturing zone and inside a collection of labour-in-depth production industries for pre-decided international locations. For the bulk of international locations, feminizing and defeminizing, labour-in depth industries contributed the maximum to adjustments in women's share of general production employment, and inside-enterprise outcomes had been more essential than employment reallocation outcomes. Within labour-in depth industries, textiles, and clothing had been the biggest drivers of adjustments in women's share of employment, and technological upgrading become related to defeminization.

Purna and Veeramani C. (2015) uses unbalanced panel for 125 manufacturing industries from 1998-2008, that import tax rates apply an adverse consequence on female employment, supporting the theory that organizations, when presented with global rivalry, will more often than not decrease costs by subbing male with female specialists. Further, the overall interest in female specialists' increments to the degree that exchange progression prompts asset redistribution in favour of incompetent work concentrated ventures where India holds similar benefits. On the other hand, a more noteworthy utilization of new innovation and capital serious creation predispositions was the orientation structure of labour force against females. Advancement has not prompted enormous development of female work in India's coordinated assembling area because the asset redistribution impact has not been sufficiently able to balance the negative impact.

The firm-based evidence by Ben Shephard (2018) for 138 countries, shows that there exists a robust evidence that participation in GVC's is positively correlated to absolute demand for women production and non-production workers, as well as relative demand for women production workers. Female workers gain through GVC participation. For instance, charcoal value chains exhibit male domination in Sub-Saharan Africa, notwithstanding, while elements change between various settings, women's interest will, in general, be fundamentally higher in retail, while they will generally establish a minority in different segments of the GVC's - regularly joining the area without elective vocation open doors. The audit additionally finds that distinctions in gender orientation exist across different hubs as far as the degree, nature, and results of cooperation, (Ebia, B. 2023).

Globalization has had a substantial impact on labour market dynamics, increasing female employment in export-oriented sectors. This tendency is especially noticeable in emerging countries, where women are increasingly joining the labour force. The continuous wage disparity between male and female workers is aggravated by the feminization of labour in commerce. Women usually earn less than males, even while performing equivalent duties, Cagatay, N. (2007). Amin, M., and Islam, A.M. (2023) expounds that the effect of exports (as a percentage of sales) on the proportion of female manufacturers in 141 developing and emerging nations using firm-level survey data for 29,962 manufacturing enterprises is statistically significant, substantial, and positive.

Worldwide defeminization research by Tejani and Milb (2009) portrays patterns in the female power of work in assembling areas over the New World Bank undertaking studies for an example of low income and lower middle income nations. The two regions that show differentiating patterns and observe that the defeminization of work evident in South Asia as well as the continuous feminization in Latin America are driven by shifts in capital force and assembling usefulness. One potential justification behind this connection is the counter-female predisposition in labour request changes that outcome from yield shifts in non-industrial nations that are effective in redesigning their industry out of low-tech serious fabricates and into higher-tech creation.

Li, Z.Z., C.W. Su, R. Tao and L.N. Hao (2019), consider information for nine Asian nations from 1990 to 2016 period and use regression techniques. The study indicates that trade openness has a complex relationship with female labour participation in Asian nations, revealing an inverted U-shaped correlation. This suggests that while initial increases in trade can enhance female employment, beyond a certain point, the benefits may diminish.

Figure 1: Obstacles Faced by Manufacturing Firms across Different Regions

SOUTH EAST ASIA
Access to finance
Access to land
Inadequately Educated workforce

LATIN AMERICA
Labour Regulation
Choosing Courts
Inadequately Educated workforce

SOUTH ASIA
Access to land
Access to business permits
Access to Finance

Sub Saharan Africa
Labour Regulation
Business Licensing and Permits
Access to Land

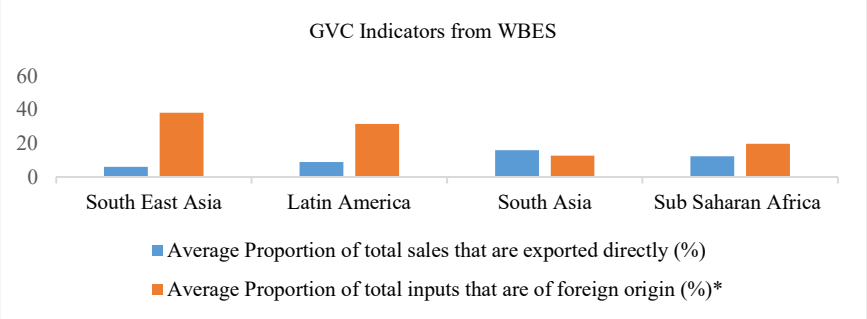
Source: Authors' Calculations based on WBES data.

The below given figures 2 and 3 provide representation of gender and global value chain statistics used for low income and lower middle income regions of the world. Sub Saharan Africa has the highest proportion of firms with female workers and South Asia has the highest proportion of firms with female owners. South East Asia has the highest average proportion of sales that are exported directly and South Asia uses highest average proportion of inputs of foreign origin.

Figure 2: Firms Proportion of Female Workers and Owners across Different Regions

Source: Authors Calculations based on WBES Data.

Figure 3: Indicators of GVC's



Source: Authors Calculations based on WBES Data.

II Data Descriptions

The list of variables used in our model with their description is given in the table 1 below:

Table 1: Variable Description

Variable name	Description	Source
Obstacles	Percent of firms choosing access to land, finance, court, theft, customs , regulations, tax administration, labour regulations	WBES
Infrastructure	Percent of firms with power outages , water insufficiencies	WBES
Finance	Percent of firms with line of credit, using finance for working capital and investment purposes	WBES
Performance	Assessed on growth of employment annually, Capacity utilization , sales growth per annum and growth of labour productivity	WBES
Vital Characteristics	Age, ownership status of firms, percent of firms whose annual financial statements are audited externally	WBES
Innovation	Percent of firms that discover a new method, introduce a process innovation Spend on their R & D	WBES
Female Population	per cent of total population	World bank
Female Literacy Rate	per cent of females ages 15 and above	World bank
Growth rate of GDP	Annual per cent	World bank
Female Fertility Rate	Total births per woman	World bank

Dependent Variable

Our dependent variables for female LFPR are the proportion of firms with female workers and proportion of firms with female owners. About 25 percent of manufacturing firms on average constitutes female owners and 35per cent female workers.

Main Explanatory Variable

Our variable of interest is the component of Forward GVC participation which is proxied as percent of firms exporting directly or indirectly that is when a nation is perceived as a seller and for Backward GVC Participation is proxied as percent of firms using material inputs and/or supplies of foreign origin, that is when a nation is perceived as a buyer.

Baseline Controls

To deal with the problem of omitted variable bias, we control for various firm level and country level characteristics. Country level characteristics include variables related to economic growth, female education and demographic based factors include like female population and fertility rate.

III Material and Methods

Our Models are defined in the following way with gender related variables as a function of firm based variables and country related controls:

Model 1: Proportion of Firms with Female Owners= f(Obstacles, Infrastructural bottlenecks ,Finance ,Performance, Innovation, Value Chain Participation, Controls)

Model 2: Proportion of Firms with Female Workers= f(Obstacles, Infrastructural bottlenecks, Finance ,Performance, Innovation, Value Chain Participation, Controls)

The technique of principal component analysis with varimax rotation is used to construct a representative factor(s) for each domain. Each indicator of the questionnaire has a no. of questions attached to it. The various indicators associated with the WBES questionnaire are the following: Biggest obstacles, Performance of the firm its characteristics, Finance, Trade, Innovation and technology and Infrastructure. The application of Kaiser's rule (eigenvalue >1) for selecting the number of components to be retained, led to the retention of the first or the first and second component. The three indicators are significantly loaded (factor loading greater than 0.9 on average) on the first component or first and second components explaining more than 70 percent of the variance. The factor loadings and variance explained are reported in a table of the Appendix. Once the components are derived from PCA, then we conduct fractional logit, and probit regression with the dependent variable as a proportion of firms with female owners for our two models. The use of Fractional Logit and Probit Models is because both dependent and independent variables are in proportion. The coefficients derived are taken as dy/dx which represent the "elasticity "Fractional Logistic Models which are viewed as an appealing examination because it doesn't accept normality, linearity, or homoscedasticity and suit our survey.

IV Results and Discussion

Log Likelihood describes the fit of the model, the higher this value thereby the better is the fit. Our results from Table 2 indicate that the proportion of firms engaged in backward value chain participation is negatively related to the proportion of firms with Female workers, with a marginal effect of -0.0123 as mainly women in developing economies hold a disproportionate share of lower-skill job. This happens as they can be vulnerable to supply chain disruptions or trade-related shocks that directly exposes female-dominated industries to foreign competition or layoffs due to the introduction of new technologies. Women, especially in the textile and food processing sector, are especially vulnerable to imports because they are perceived to be engaged in less productive tasks. As

workers and business owners, women are participants in the productive sector of economies that are affected by GVCs. It directly affects their employment, wages, and productivity through job opportunities. This has significant monetary and social ramifications as admittance to paid business remains one of the main roads toward greater monetary autonomy for women. By and large, developing nations tend to show comparable examples of section into GVCs to begin with, entering lower esteem, and precarious work conditions in fundamental assembling. The inflow of foreign technology and raised imports of capital goods creates a bias against female workers in Developing economies as these technologies are primarily developed in advanced nations which are mainly skill based. (Krusell, P., L.E. Ohanian, J.V. Ríos-Rull and G.L. Violante 2000) This would ultimately result in a fall in relative employment of female workers as an average male worker has a greater degree of skill than the average female worker.

Our results from Table 3 also show that the proportion of firms engaged in Backward Value Chain Integration is positively related to the proportion of firms with Female owners, with a marginal effect of 0.0213. This effect denotes Elasticity (proportionate change in the component of gender by proportionate change in the indicator of Backward Value Chain Linkage). One plausible reason could be that with the rise of vertical specialization, firms' female owners are keener on importing inputs and components via backward linkages as it would have a bigger effect on their organization's performance by raising the quality, diversity, and scale of further commodities produced.

Forward value chain Integration is not a significant variable that captures the effect on the firms' female labour force of workers and owners, this could be because export penetration involves processes that require complex technology, so it becomes difficult for traditional labour intensive sectors to realize any gain in a great extent. (Banerjee, P. and C. Veeramani 2015). Women's roles are often portrayed as unskilled, with limited pay, and with higher value opportunities being taken advantage of, it is related to gender perceptions of what is entitled and what is not. Given the pervasive gender pay gap in most economies, designating certain skills and functions as "female" allows GVCs to recruit women at a lower total cost of labour. (Barrientos 2001). Notwithstanding issues about land privileges, monetary incorporation and ignorance, the absence of orientation disaggregated information and undetectable work end up being significant issues which women workers faces. Orientation strengthened imperatives limit women capacities to break these examples of feminization of the lower value segments of chains and defeminisation of exchange higher value jobs. Women share comparable orientation heightened requirements to partake and update in GVCs. These incorporate the inconsistent admittance to useful assets. Female entrepreneurs face extra difficulties of orientation obliged admittance to land, finance, actual foundation, and backing administrations. Use of Innovatory techniques and abilities improvement and organizations and data, as well as being additional time obliged than their male partners because of conceptive work liabilities. Orientation disparity may likewise restrict exchange. Access to finance and Innovation are

inversely related to our gender-based outcome variable as GVCs, through its adverse consequence on the cycle of ability advancement and development in higher value added and innovation areas (Fontana 2011, Seguino 2000). This can influence females in their jobs as labourers, managers, makers and entrepreneurs. By and large, female restricted admittance to assets obliges their exercises as business visionaries and results in female business visionaries being gathered in small firms and casual exchange (ODI 2009).

Controls like fertility rate, and the growth rate of a country's GDP are negatively related to Gender based dependent variables (proportion of firms with female workers) as a firm's share of females is not sufficient enough to contribute towards positive growth of GDP. As women in these countries lack social and economic upgrading due to constraints such as limited access to finance and skills which further inhibits their ability to contribute towards the growth of the nation. However, Female education is highly significant and positively related to our gender differenced dependent variable, as it can be used as a proxy for their skills and could contribute directly towards their active participation in the labour market. Innovation and access to technology is biased towards skills and other capabilities This tendency lessens the developing nations' comparative advantage in historically labour-intensive manufacturing (and other) activities, which thus lessens their trade benefits. Second, by limiting their capacity to replace unskilled labour with other production inputs, GVCs make it more difficult for low-income countries to leverage their advantage in labour costs to overcome their technological demerit.

Table 2: Regression Results

Model	Fractional Logistic Regression	Fractional Probit Regression
Dependent variable Proportion of Firms with female Workers	Log pseudolikelihood = -71.29 Marginal Effects (dy/dx) Fractional Logistic Regression	Log pseudolikelihood = -71.29 Marginal Effects (dy/dx) Fractional Probit Regression
Explanatory Variables		
Component for proportion of firms facing obstacles	-0.0134	0.0002
Component for proportion of firms facing Infrastructural bottlenecks	-0.0115	-0.0132
Component for proportion of firms with access to finance	-0.0141 **	-0.0141 **
Component for proportion of firms with performance indicators	0.0278 **	0.0287 **
Component for proportion of firms with vital characteristics	-0.0121	-0.0193
Component of proportion firms using Innovation	-0.0356 *	-0.0376 *
Component for proportion of firms with Forward Value Chain Participation	0.0521	0.0621
Component for proportion of firms with Backward Value Chain Participation	-0.0123 **	-0.0284 **
Female Population	1.0254 *	0.9933 *

Model	Fractional Logistic Regression	Fractional Probit Regression
Female Literacy Rate	0.2567 *	0.2593 *
Growth rate of GDP	-0.4637	-0.4983
Female Fertility Rate	-1.1521	-1.0949 **

Note: * denotes significance at 5 per cent level of significance and ** denotes significance at 10per cent level of significance.
Source: Authors' Calculations.

Table 3: Regression Results

Dependent variable Proportion of Firms with female Owners	Log pseudolikelihood = -69.29 Marginal Effects (dy/dx) Fractional Logistic Regression	Log pseudolikelihood = -69.29 Marginal Effects Fractional Probit Regression
Explanatory Variables		
Component for proportion of firms facing obstacles	-0.0132	-0.0147
Component for proportion of firms facing Infrastructural bottlenecks	-0.0228 **	-0.0295 **
Component for proportion of firms with access to finance	-0.0239 **	-0.0327 **
Component for proportion of firms with performance indicators	0.0216	0.0269 **
Component for proportion of firms with vital characteristics	-0.0126	-0.0176
Component of proportion firms using Innovation	-0.0647 *	-0.0587 *
Component for proportion of firms with Forward Value Chain Participation	0.0436	0.0076
Component for proportion of firms with Backward Value Chain Participation	0.0213 *	0.0256 *
Female Population	-0.3226	-0.2618
Female Literacy Rate	0.3643 *	0.3638 *
Growth rate of GDP	-0.9127 *	-0.8915 *
Female Fertility Rate	1.5632	1.5563

Note: * denotes significance at five per cent level of significance and ** denotes significance at 10 per cent level of significance
Source: Authors' Calculations.

V Conclusion and Policy Recommendations

We have analysed the association between firm-based indicators of female participation as workers and owners with GVC participation for seventy lower-middle and low-income countries from South Asia, Sub-Saharan Africa, Latin America, and South East Asia. We have used World Bank enterprise survey data that is aggregated at a country level spanning over the period 2006 -2018. We have used principal component analysis to reduce the dimension of our data and define the firm-related variables clearly under various categories like: obstacles, firm characteristics performance, infrastructure finance, innovation, GVC participation

and country-based controls. Factional logistic regression results exhibit that for developing and underdeveloped nations, the proportion of firms engaged in backward value chain integration (*via* importation activities in the manufacturing sector) is positively related to the proportion of firms with female owners and negatively related to proportion of firms with female workers, with innovation contributing towards the fall in female labour supply.

Gender mainstreaming is a need in all value chains with social and economic upgrading. Orientation equality in different phases of a Value chain is needed in the business environment which starts with recognizing existing loopholes in significant exercises across the chain - innovative work, natural substance creation, assembling, activity and administrations, circulation lastly, the final consumers and the product end of life. Exceptionally, emerging nations like India have different segments of significant value chain like manufacturing has for some time been viewed as a male-overwhelmed portion, yet changes like innovation, mechanization and engaging government arrangements are preparing to incorporate more prominent quantities of the female labour force and conquering orientation based generalizations in this fragment. Activities and administrations: Elevated degrees of orientation focusing for work jobs have constantly brought about sluggish profession development for women. Our discoveries talk about methodologies that can be utilized in this female-predominant fragment to beat - the hindrances to approach vocation amazing open doors. There exists issues of the shortfall of moral exchange and layouts the actions to guarantee providers have moral work regulations encompassing practices that advance orientation balance in the store network and dissemination channels.

Various other suggestions can be like access to credits and monetary benefits to women so that women are empowered enough to break the social norms. Incentivize female project workers by utilizing female specialists to utilize them with formal systems and benefits that upskill women from start to finish parts of value chains. Women should be encouraged to market their activities through self-improvement gatherings that provide safe channels for females to manage land legacy regulations with proper access to medical services, also facilitating women's access to support services is necessary.

Improvement of women's capacity to access markets and commercialize their produce to enhance women's opportunity to upgrade in a value chain, mainly in organizational, management, and governance issues. One more top proposal for women entrepreneurs is to work on a legitimate and administrative climate, specifically in a business-regulated setting.

Engaging women and conceding them equivalent freedom in regions, for example, business ventures and advancement has likewise, certain overflow impacts on other results, like favourable to the development and the accomplishment of the Sustainable Development Goals (SDGs).

A gender-separated examination should be prioritized since it features the effect of GVC combination and overhauling on female labourers, makers, and business visionaries, and in this way, the more extensive socio-economic impacts

of such cycles. Furthermore, it is essential since it permits comprehension of orientation explicit open doors and limitations concerning seriousness and overhauling, thus working on the viability of intercessions and arrangements. Especially as women represent an enormous part of the labour force in numerous GVCs, neglecting to comprehend and address their particular imperatives can sabotage nations' capacity to be cutthroat and grow in GVCs.

VI Limitations and Further Research

Gender differenced studies hold importance in today's era of globalization. As the world is heading towards sustainability and inclusiveness, it's all the more imperative to consider the gendered structure of GVC. There have been very few studies under the Gender-Value Chain nexus due to the paucity of data based on female participation across different segments of the value chain. Also, the role of females in value chains have been confined to some specific sectors like textiles and agriculture in many developing countries, each country exhibits different dynamics concerning their culture and ethnicity. Therefore, these challenges offer scope for future study and can be utilized in a better way to expound the gender dimension of global GVC.

Ethical Statement

Hereby, I Author consciously assure that for the manuscript titled "Gender Aspect of Global Value Chains: Empirical Evidence from Low and Lower Middle-Income Nations", the following is fulfilled:

1) This material is the authors' own original work, which has not been previously published elsewhere.
2) The paper is not currently being considered for publication elsewhere.
3) The paper reflects the authors' own research and analysis in a truthful and complete manner.
4) The paper properly credits the meaningful contributions of co-authors and co-researchers.
5) The results are appropriately placed in the context of prior and existing research.

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Appendix

Additional Cross Country Literature review

GVC initiative	Assessment Method	Upgrading Technique	Gender based Results
Women embroiderers in Pakistan (USAID, 2007)	Action is directed towards women. Changes in gender roles and decision-making are among both qualitative and quantitative effects covered by the internal impact analysis.	By connecting remote female embroiderers to local value chains and offering a full range of services, the programme is building a network of female intermediates who can assist them in meeting the demands of modern local markets. Additionally, the programme connects the middlemen with urban clothing manufacturers and design services.	The average income has more than quadrupled. Females reported being more involved in household decision-making, feeling more confident, and being more mobile.
Community maize procurement in India ((Subrahmanyam, *et. al.* 2006)	The study uses data from focus groups and surveys to assess the overall effects of the maize component's first year. The six focus group talks and the structured questionnaire that was given to the village procurement committees are the primary sources of the findings that are pertinent to this study.	Putting the market in the village, localization of the value chain, and offering a "one-stop shop";	The study discovered that women's engagement, leadership, and technical abilities had all grown as a result of The intervention. Women were assuming responsibilities in the value chain that were previously held by males.

GVC initiative	Assessment Method	Upgrading Technique	Gender based Results
Women Entrepreneurship Development in the Food Processing Sector in Tanzania (UNIDO, 1999)	The project is only aimed at women. The project's ability to achieve its goals and provide the anticipated results is assessed at the external halfway review. Conversations with trainers and participants are the technique used.	For the purpose of producing essential oils and sun-dried fruits, veggies, and spices, new methods, equipment, and processes have been developed. Techniques related to marketing were introduced	Seventy percent of female entrepreneurs who received training were able to launch their own businesses. Advent of better technology is another successful trait.
Nike foundation, Value chain Project, Kenya (Felton 2009)	The objective is to enhance the ability of girls to engage in value chains in Kenya. In order to begin the project, a scenario study of the sociocultural setting and the present economic prospects for girls and young women was conducted, along with a girl-centered value chain Assessment	The programme decided to increase the ability, Negotiating skills, and bargaining power of girls currently working in these networks rather than integrating new girls into these value chains	This experience shows how crucial it is to do a gendered value chain study prior to project execution and how crucial it is to include a gender (in this case, female) perspective in the value chain study.
Enhancing Women's Access to Markets Gammage, *et. al.* (2005)	Examination of initiatives aimed at giving female wage workers and entrepreneurs in developing nations better access to markets.	The bulk of initiatives and programs follow entitlements strategy, focusing on direct inputs like loans, storage, and transportation, according to the research based on interviews. Very few project were based on women capability enhancement, which would raise their position in the value chain.	Suggestions for best practices: Create, execute, and assess initiatives and programs using gender analysis techniques. Conduct a value chain study to find avenues for women to be more involved in markets. Enhance the individual- group community connections. Adopt a livelihoods or life cycle strategy. Encourage entitlement and skill-building initiatives.
Upgrading the coffee and domestic animals sector in Nicaragua (Fajardo, *et. al.* 2005)	Modes were field visits, workshops, group interviews, and use of questionnaires.	The subsequent have been the upgrade strategies: - assistance with organizational procedures, such as bolstering cooperatives -Aid the process of transition of production to increase -Aid in the producers' introduction of goods into both domestic and global markets	Women possess new skills for managing land, have added new foods to their diets, and have increased their revenue sources.

Principal Component Analysis Results

Eigenvalues of the Correlation Matrix: Obstacles

Eigenvalue	Difference	Proportion	Cumulative
2.031	1.06148889	0.76	0.760
0.970	0.02	0.082	0.842
0.950	0.12	0.08	0.922
0.830	0.06	0.062	0.984
0.770	0.02	0.008	0.992
0.750	0.07	0.006	0.998
0.680	0.03	0.001	0.999
0.650	0.65	0.001	1.000

Eigenvalues of the Correlation Matrix: Finance

Eigenvalue	Difference	Proportion	Cumulative
5.2191051	4.300	0.870	0.87
0.9100000	0.070	0.070	0.94
0.8317665	0.120	0.020	0.96
0.7080147	0.143	0.010	0.97
0.5649225	0.186	0.031	0.97
0.3785671		0.002	1.00

Eigenvalues of the Correlation Matrix: Characteristics

Eigenvalue	Difference	Proportion	Cumulative
2.247	0.374	0.321	0.321
1.873	1.015	0.268	0.589
0.858	0.201	0.123	0.711
0.657	0.022	0.094	0.805
0.635	0.062	0.091	0.896
0.573	0.414	0.082	0.977
0.158		0.023	1.00

Eigenvalues of the Correlation Matrix: Infrastructure

Eigenvalue	Difference	Proportion	Cumulative
3.247	2.2674409	0.800	0.80
0.980	0.1100000	0.110	0.91
0.870	0.0888612	0.070	0.98
0.781	0.1272625	0.008	0.99
0.654	0.2250092	0.006	0.99
0.429	0.036578	0.004	1.00
0.392	0.3922892	0.003	1.00

Eigenvalues of the Correlation Matrix: Innovation

Eigenvalue	Difference	Proportion	Cumulative
1.791	1.583	0.896	0.896
0.209		0.104	1.000

Eigenvalues of the Correlation Matrix: Forward GVC

Eigenvalue	Difference	Proportion	Cumulative
2.808	2.659	0.936	0.936
0.150	0.108	0.050	0.986
0.042		0.014	1.000

Eigenvalues of the Correlation Matrix: Backward GVC

Eigenvalue	Difference	Proportion	Cumulative
1.920	1.740	0.927	0.93
0.180	0.133	0.056	0.98
0.047		0.020	1.00

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Public Health Sector in India with Reference to Covid-19 Pandemic

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The Covid Pandemic has put a spotlight on the existing health care system of the world. The importance of the public health system has also been focused on during the crisis and priorities have also been shifted to improve the resilience of economic, social and fiscal system addressing the risk of vulnerabilities. It also provides opportunities to the states for some structural changes to improve the public health system. The developing countries of the world were remarkably shaken by the hit of the Covid-19. Like them, India also witnessed an onslaught of Covid-19. This paper tries to address the public health system of India with reference to Covid-19 pandemic and also tries to describe with reference to pre Covid and post Covid situation. The study uses secondary sources of data where descriptive methodology has been adopted by carrying out literature review.

Keywords: Covid-19, Healthcare, India, Health outcome, Health expenditure.

I Introduction

Covid-19 pandemic has created havoc upon the existing healthcare system of India, despite being one of the extensive healthcare systems around the world. The needs of essential healthcare services and the supply side deficiencies in healthcare services have been clearly highlighted by the Covid-19 pandemic. Covid-19 is a viral disease, reported in China for the first time and subsequently spread throughout the world. It is considered a global challenge due to the complexity of the transmission and the absence of proven treatment (Abate, Checkol, Mantedafro, Bam and Ethopia 2020)[1]. Covid-19 pandemic in India has brought out the importance of health care provisioning in a vivid and precise way. The meaning of health care which was previously understood merely as medical care is now widened to cover all the preventive care and the current aspects of biomedical understanding about health & illness. India has been a prominent pioneer in Health care services, but the country's healthcare sector was not prepared for such a crisis as of Covid-19. Covid-19 pandemic has highlighted the weak part of public infrastructure to the fore-front. India is not sufficiently equipped with basic public health infrastructures to deal with the pandemics like the Covid-19. In the absence of proper medical beds, ventilators, many people had

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to seek health care at the private hospitals, which were very costly. The availability of hospital beds per 1000 population was only 8.5 and physicians for per 10,000 populations were limited to eight (The Hindu 2021)[2]. The existing capacity of hospital beds particularly in government hospital is mostly saturated. Public hospitals in India have been suffering from lack of autonomy, inadequate budget and poorly maintained care. Before the pandemic, the proportion of public spending was very low, which is not only a cause for concern but also a factor responsible for the insufficient healthcare facilities and their lack of good quality in the country (Rajan and Saisidaran 2020). During the pandemic, acute shortages of healthcare services, deficiencies, inefficiencies and dissatisfaction was observed, as the sector was not able to cope with the growing demands of the masses (Bauchner, Fontanarosa and Livingston, 2020). India is in the list of those countries, where the coverage of health insurance is the lowest among many countries of the world**.** NSSO Survey of 2014 revealed that 80 per cent of the Indians still are not covered in any significant health insurance and 68 per cent of the population of the country has little or almost no access to the essential medicines (Mahapatra 2020). With this backdrop, this paper seeks to analyze the public health in India with reference to the Covid-19 pandemic.

II Objectives

The broad objective of the study is to analyze the public health in India with reference to the Covid-19 pandemic.
Following are some specific objectives:

(1) To analyse the impact of Covid-19 on Indian Health System.
(2) To discuss the linkage between health infrastructure and health outcome.
(3) To understand the pattern of public health expenditure in the light of Covid-19 pandemic.

III Methodology

This descriptive study has been carried out after doing extensive and systematic review on the impact of Covid-19 in the Indian health system with the help of various secondary data sources including government websites, reports, published sources, journals and electronic media.

IV Findings and Discussions

Findings are discussed under three important parts. The first part deals with the impact of Covid-19 on the Indian health system, which has been analyzed after a careful review. The second part discusses the linkage between health infrastructure and health outcomes. The third part discusses public expenditure in health in the light of Covid-19 pandemic.

Impact of Covid-19 in Indian Health System

Healthcare sector is one of the prominent sectors in India in terms of both employment and revenue generation. But the health sector of the country like other sectors such as the economy, education, and tourism has been severely impacted by the Covid-19 pandemic since its emergence. Kapoor, Kaur, Saeed, Shahnawaz and Chandra (2023) did a systematic review and tried to determine the impact of Covid-19 pandemic on the healthcare system of India. Their study found that Covid-19 pandemic had created severe challenges in the health system of the country. The serious patients with some other non-Covid cases such as Cancer, and other heart diseases had been affected significantly. Conclusion of their study revealed that Covid-19 pandemic had significantly impacted the health system of India. Nimavat (2022), tried to highlight the challenges faced by the healthcare system in India during the Covid-19 pandemic with the help of systematic review on healthcare system of India and effects of Covid-19 pandemic on Indian health system. Their study revealed that the healthcare system of the country had been suffering even before the advent of the Covid-19 pandemic and the pandemic has further stretched the healthcare services in India. Rising disease burden is one of the major challenges of the health system of the country. The pandemic strengthened the need for establishing different healthcare institutions and provisioning of healthcare services at different levels (rural and urban) in India. Since the emergence of the disease of Covid-19, public expenditure, which was growing steadily over the years, has been increased towards the goal to achieve universal health coverage. Siddiqui, Wiederkehr and Antoine (2020) tried to analyze the impact of Covid-19 for the period from 30, January 2020 to 12 June 2020 with the help of screening and surveillance methods. The study revealed that the infections peaked during mid-July with cases of two million people affected by it. The study also reported that the increase in death due to Covid-19 was caused due to low public expenditure along with a lack of management.

The health sector in India had been continuously facing inequality due to unequal access, income, poverty, and undistributed resources, and the Covid pandemic has enlarged the inequality. There is a variation in deaths due to Covid-19 among and within the states in India (Balakrishnan and Namboodhiry 2021). There is a difference between rural and urban health indicators within a state. The differences can also be found among different districts within the same state. In India, demography plays a vital role in defining the vulnerabilities due to Covid-19. The latter is to a large extent defined by the epidemiological and demographic character of a nation (Ortiz-Prado, Simbaña-Rivera, Gómez-Barreno, Rubio-Neira, Guaman, Kyriakidis, Muslin, Jaramillo, Barba-Ostria, Cevallos-Robalino, Sanches-SanMiguel, Unigarro, Zalakeviciute, Gadian, and López-Cortés, 2019). India's overall demographic and epidemiological indicators are significantly better than the global average. The Covid-19fatality rate across all states in India remains below the global average. However, there exists a regional variation in the fatality due to Covid-19 in India. As of August 30th, 2023, fatality rate due to Covid-19 in

India is 0.012. The highest fatality in Covid-19 was marked for the state Punjab (0.025) and the lowest was recorded for the north-eastern state Mizoram (0.003). The states like Arunachal Pradesh, Telangana, Andhra Pradesh, Odisha, Rajasthan, Gujarat, Tripura, Jammu & Kashmir, Haryana, West Bengal, Madhya Pradesh, Kerala, Assam, Sikkim, Uttar Pradesh, etc., were having a lower fatality rate in Covid-19 than the national average. On the other hand, the states like Himachal Pradesh, Bihar, Goa, Manipur, Meghalaya, Uttarakhand, Maharashtra, Nagaland and Punjab were having a higher fatality rate than the national average. However, the states like Chhattisgarh and Jharkhand have same level of fatality rate due to Covid-19 as national average (Table 1).

Table 1: Covid-19 Death Ratio Across Indian States (as on 30th Aug, 2023)

States/UTs	Total Deaths	Total Discharged	Fatality Rate
(1)	(2)	(3)	4 = (2 / 3)
Andaman & Nicobar	129	10637	0.0121
Andhra Pradesh	14733	2325943	0.0063
Arunachal Pradesh	296	66753	0.0044
Assam	8035	738115	0.0109
Bihar	12314	830637	0.0148
Chandigarh	1185	99508	0.0119
Chhattisgarh	14190	1173504	0.0121
Dadra & Nagar Haveli & Daman and Diu	4	11588	0.0003
Delhi	26666	2014209	0.0132
Goa	4014	259326	0.0155
Gujarat	11079	1280296	0.0087
Haryana	10755	1068138	0.0101
Himachal Pradesh	4241	318655	0.0133
Jammu & Kashmir	4792	477231	0.0100
Jharkhand	5334	438491	0.0122
Karnataka	40357	4048390	0.0100
Kerala	71949	6835265	0.0105
Ladakh	231	29371	0.0079
Lakshadweep	52	11363	0.0046
Madhya Pradesh	10786	1045565	0.0103
Maharashtra	148557	8022127	0.0185
Manipur	2149	137885	0.0156
Meghalaya	1628	95351	0.0171
Mizoram	734	238825	0.0031
Nagaland	782	35251	0.0222
Odisha	9215	1339187	0.0069
Puducherry	1981	175565	0.0113
Punjab	19338	774302	0.0250

States/UTs	Total Deaths	Total Discharged	Fatality Rate
(1)	(2)	(3)	4 = (2 / 3)
Rajasthan	9736	1316727	0.0074
Sikkim	500	44418	0.0113
Tamil Nadu	38081	3572565	0.0107
Telangana	4111	840309	0.0049
Tripura	942	107548	0.0088
Uttar Pradesh	23710	2121707	0.0112
Uttarakhand	7768	444794	0.0175
West Bengal	21555	2104604	0.0102
PAN India	531929	44463666	0.012

Sources: Ministry of Health and Family Welfare, Government of India, COVID-19 Dashboard, Available at: https://www.mygov.in/covid-19/ (Accessed: October 13, 2023).

No doubt, the sudden outbreak of Covid-19 adversely impacted the healthcare industry of India during the financial year 2020-2021. A sudden drop of 70 per cent of footfall and test volume had occurred in the health sector. Despite such a blow, the robust nature of the Indian health system leads the sector to adapt with rapid transformation.

Linking Health Infrastructure and Health Outcomes

Health infrastructure plays a vital role as a policy response to any vulnerabilities related to health sector. There is a long tradition of inequality in the health sector in terms of available health infrastructure. India has a pluralistic kind of health system which involves both: the public and the private health sector. Studies have already shown that India has approximately 19 lakh hospitals, 95 thousand ICU beds and 48,000 ventilators at present (Kapoor, *et. al.* 2020). Most of the hospital beds in India are limited to seven states, viz., Uttar Pradesh (14.8 per cent), Karnataka (13.8 per cent), Maharashtra (12.2 per cent), Tamil Nadu (8.1 per cent), West Bengal (5.9 per cent), Telangana (5.2 per cent) and Kerala (5.2 per cent). The southern states of India hold a better position in availability of medical doctors except Telangana. The low-income states of India like Uttar Pradesh, Bihar and Jharkhand have the lowest coverage by doctors. The number of hospital bed availability is also an important measure to determine the health dimension of a nation or state. Table 2 reveals that the numbers of hospital beds per 10,000 population is the highest in Kerala followed by Madhya Pradesh, Uttar Pradesh, Jammu and Kashmir, Telangana, Gujarat, and so on. On the other hand, the states like Bihar, Punjab, Assam, Chhattisgarh, Haryana, Jharkhand, Karnataka and Maharashtra, have a smaller number of hospitals beds than the national average. The data on availability of ventilators per 10,000 populations also shows that the states like Andhra Pradesh, Gujarat, Jammu and Kashmir, Kerala, Odisha, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh, Uttarakhand, West Bengal, etc.,

have more ventilators than the national average, while those like Assam, Bihar, Chhattisgarh, Haryana, Jharkhand, Karnataka, Maharashtra and Punjab have a smaller number of ventilators than the national average. The availability of registered doctor per 10,000 population data shows that in the states Andhra Pradesh, Gujarat, Jammu & Kashmir, Karnataka, Kerala, Maharashtra, Punjab, Tamil Nadu, the registered doctors are more than the national average, while the states like Assam, Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Odisha, Rajasthan, Telangana, Uttar Pradesh, Uttarakhand, West Bengal, etc., have a smaller number of registered doctors per 10,000 populations than the national average.

Table 2: Existing Hospital Beds, Ventilators and Registered Doctors in the States of India

States/Ut's (1)	Total (Public+ Private) hospital beds (per 10,000 Populations) (2)	Total (public + private) ventilators (per 10,000 Populations) (3)	Registered Doctors (per 10,000 Populations) (4)
Andhra Pradesh	15.4	0.39	11.2
Assam	7.3	0.18	7.2
Bihar	2.9	0.07	3.8
Chhattisgarh	6.6	0.16	3.3
Delhi	17.5	0.44	9.5
Gujarat	22.2	0.56	10.4
Haryana	10.1	0.25	2.0
Himachal Pradesh	12.8	0.32	4.2
Jammu & Kashmir	22.3	0.56	11.9
Jharkhand	6.3	0.16	1.7
Karnataka	7.7	0.19	19.0
Kerala	41.3	1.03	16.5
Madhya Pradesh	27.5	0.69	4.8
Maharashtra	8.1	0.20	14.1
NE states excluding Assam	18.9	0.47	3.2
Odisha	13.6	0.34	5.2
Punjab	5.9	0.15	16.3
Rajasthan	20.6	0.51	5.8
Tamil Nadu	12.4	0.31	19.1
Telangana	22.2	0.55	1.3
Uttar Pradesh	25.4	0.63	3.4
Uttarakhand	12.5	0.31	7.6
West Bengal	21.9	0.55	7.6
India	11.4	0.28	8.9

Source: National Health Profile 2019.

In Assam, there is an uneven distribution of the healthcare workforce between the states and between the rural and urban areas. The health workforce is typically less concentrated in the least developed areas of Assam, and the workers who are employed there are also of poorer quality in terms of training and experience (Hazarika 2013). In contrast to Southern states, which had a higher doctor density, Rao, Bhatnagar and Bermam (2012) found that Central and Northern India had a lower doctor density. They add that there is greater concentration of health personnel in urban areas, with 42 per 1,000 people, about four times as many as the 10.8 per 1,000 people in rural areas. In Assam, the health industry has been suffering from a significant labour shortage, particularly in rural areas. In their 2015 research "Healthcare and Health Workforce," Saikia and Barman (2015) attempted to assess the sufficiency of the health workers working in Assam's rural public sector. They noted that Assam's status in terms of rural health workforce is better than the national average, but that it still falls short of both international and national standards. Their work was based on the state's supply and demand for health care workers. They also placed a strong emphasis on educating the current employees in order to maintain the system in a more modern and uniform manner.

Table 3: State-wise Number of Government Hospitals (2019-20)

	Number of Government Hospitals			Number of Beds		
	Rural	Urban	Total	Rural	Urban	Total
Andaman & Nicobar Islands	27	3	30	617	585	1202
Andhra Pradesh	791	5443	6234	9687	77034	86721
Arunachal Pradesh*	208	10	218	2136	268	2404
Assam*	1178	61	1239	20620	7419	28039
Bihar	1946	186	2132	11747	17592	29339
Chandigarh	0	49	49	0	3758	3758
Chhattisgarh	198	49	247	9200	410	9610
Delhi	0	107	107	0	27154	27154
Goa*	18	25	43	1485	1601	3086
Gujarat	1825	420	2245	19917	9485	29402
Haryana*	592	86	678	7015	5575	12590
Himachal Pradesh*	727	95	822	7114	7668	14782
Jammu & Kashmir and Ladakh	1108	167	1275	2433	1985	4418
Jharkhand	4371	92	4463	9197	5694	14891
Karnataka*	2467	375	2842	21146	49328	70474
Kerala	1075	209	1284	16123	21974	38097
Madhya Pradesh	330	135	465	9900	21206	31106
Maharashtra	365	149	514	10950	22078	33028
Manipur	110	9	119	1759	9	1768
Meghalaya*	140	14	154	2000	2467	4467
Mizoram*	56	43	99	574	1448	2022

	Number of Government Hospitals			Number of Beds		
	Rural	Urban	Total	Rural	Urban	Total
Nagaland	164	13	177	1286	1175	2461
Lakshadweep	12	-	12	250	-	250
Odisha*	1655	151	1806	6339	12180	18519
Puducherry	21	23	44	94	4674	4768
Punjab*	511	305	816	5801	15440	21241
Rajasthan*	2094	755	2849	12564	34214	46778
Sikkim*	24	9	33	260	2000	2260
Tamil Nadu*	1880	627	2507	28460	70975	99435
Telangana*	677	-	677	5094	-	5094
Tripura*	132	23	155	1946	2397	4343
Uttar Pradesh*	4475	208	4683	40130	26570	66700
Uttarakhand	502	116	618	2972	5134	8106

Source: Reserve Bank of India accessed on 14th January, 2023, Available at https://m.rbi.org.in/scripts/AnnualPublications.aspx?head=Handbook per cent20of per cent20Statistics per cent20on per cent20Indian per cent20States.

Table 4: State-wise Health Infrastructure - Doctors and Specialists

State/Union Territory	2021					2021				
	Surgeons, OB&GY, Physicians & Pediatricians					Doctors at PHCs				
	Required[1] [R]	Sanctioned [S]	In Position [P]	Vacant [S-P]	Shortfall [R-P]	Required[1] [R]	Sanctioned [S]	In Position [P]	Vacant [S-P]	Shortfall [R-P]
Andhra Pradesh	564	473	322	151	242	1142	2146	2001	145	*
Arunachal Pradesh	228	17	19	*	209	122	114	135	*	*
Assam	788	300	174	126	614	948	1677	1383	294	*
Bihar	1224	836	106	730	1118	1932	4317	2902	1415	*
Chhattisgarh	664	606	104	502	560	769	874	498	376	271
Goa	24	16	5	11	19	23	96	87	9	*
Gujarat	1332	366	135	231	1197	1477	1903	1679	224	*
Haryana	496	0	22	*	474	384	812	655	157	*
Himachal Pradesh	392	-	8	-	384	553	618	517	101	36
Jharkhand	684	684	186	498	498	291	291	278	13	13
Karnataka	728	462	219	243	509	2141	2406	1801	605	340
Kerala	852	54	54	0	798	782	1500	1431	69	*
Madhya Pradesh	1180	945	43	902	1137	1234	1887	1307	580	*
Maharashtra	1080	483	337	146	743	1839	4021	3252	769	*
Manipur	68	26	15	11	53	86	337	308	29	*
Meghalaya	112	3	3	0	109	121	175	162	13	*
Mizoram	36	0	0	0	36	62	0	58	*	4
Nagaland	84	10	7	3	77	131	97	123	*	8
Odisha	1508	1511	309	1202	1199	1288	1331	926	405	362

State/Union Territory	2021 Surgeons, OB&GY, Physicians & Pediatricians					2021 Doctors at PHCs				
	Required[1] [R]	Sanctioned [S]	In Position [P]	Vacant [S-P]	Shortfall [R-P]	Required[1] [R]	Sanctioned [S]	In Position [P]	Vacant [S-P]	Shortfall [R-P]
Punjab	600	562	153	409	447	422	610	401	209	21
Rajasthan	2356	1473	479	994	1877	2130	2463	2101	362	29
Sikkim	8	24	0	24	8	24	39	38	1	*
Tamil Nadu	1540	326	251	75	1289	1422	2991	2725	266	*
Telangana	340	625	258	367	82	636	1254	1213	41	*
Tripura	88	-	4	-	84	108	-	230	-	*
Uttarakhand	212	236	52	184	160	245	416	301	115	*
Uttar Pradesh	3012	2902	872	2030	2140	2923	4448	3093	1355	*
West Bengal	1392	328	67	261	1325	915	1533	955	578	*
Andaman & Nicobar Islands	16	16	4	12	12	22	53	50	3	*
Chandigarh	0	NA	NA	NA	NA	0	NA	NA	NA	NA
Dadra & Nagar Haveli and Daman & Diu	12	0	0	0	12	12	22	22	0	*
Delhi	0	NA	NA	NA	NA	5	19	16	3	*
Jammu & Kashmir	252	308	181	127	71	891	1542	965	577	*
Ladakh	28	36	8	28	20	32	93	45	48	*
Lakshadweep	12	8	8	0	4	4	13	13	0	*
Puducherry	12	1	0	1	12	24	45	45	0	*
All India Total	21924	13637	4405	9268	17519	25140	40143	31716	8762	1084

Source: Reserve Bank of India accessed on 14th January, 2023, Available at https://m.rbi.org.in/scripts/AnnualPublications.aspx?head=Handbook per cent20of per cent20Statistics per cent20on per cent20Indian per cent20States.

The conditions of public health indicators like Infant Mortality Rate (IMR), Under Five Mortality Rate (U5MR) and maternal mortality rate is the worst in India. The population's health has a significant impact on the productivity and efficiency of the labour force. The performance of basic health indicators varies from state to state. Ninety-nine per cent of the world's developing nations are responsible for maternal mortality.

Table 5: Infant Mortality among Indian States (From 2000 to 2019)

YEAR	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Andhra Pradesh	65	66	62	59	59	57	56	54	52	49	46
Arunachal Pradesh	40.1	39	37.9	34	38	37	40	37	32	32	31
Assam	75	74	70	67	66	68	67	66	64	61	58
Bihar	62	62	61	60	61	61	60	58	56	52	48
Chhattisgarh	79	77	73	69.5	60	63	61	59	57	54	51
Goa	21	19	16.3	16	17	16	15	13	10	11	10
Gujarat	62	60	60	57	53	54	53	52	50	48	44

YEAR	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Haryana	67	66	62	59	61	60	57	55	54	51	48
Himachal Pradesh	51	43	61	42	51	49	50	47	44	45	40
Jammu and Kashmir	50	48	47	44	49	50	52	51	49	45	43
Jharkhand	70	62	58	50.82	49	50	49	48	46	44	42
Karnataka	57	58	55	52	49	50	48	47	45	41	38
Kerala	14	11	10	11	12	14	15	13	12	12	13
Madhya Pradesh	87	86	85	82	79	76	74	72	70	67	62
Maharashtra	48	45	45	42	36	36	35	34	33	31	28
Manipur	22.2	20	9.69	16	14	13	11	12	14	16	14
Meghalaya	66.2	56	66.2	57	54	49	53	56	58	59	55
Mizoram	17.5	19	5.5	16	19	20	25	23	37	36	37
Nagaland					17	18	20	21	26	26	23
Odisha	95	91	87	83	77	75	73	71	69	65	61
Punjab	52	52	51	49	45	44	44	43	41	38	34
Rajasthan	79	80	78	75	67	68	67	65	63	59	55
Sikkim	47	42	25.03	33	32	30	33	34	33	34	30
Tamil Nadu	51	49	44	43	41	37	37	35	31	28	24
Tripura	34.8	39	33.38	32	32	31	36	39	34	31	27
Uttarakhand	50	48	44	40.82	42.08	42.16	43.29	47.59	44.25	41.27	37.92
Uttar Pradesh	83	83	80	76	72	73	71	69	67	63	61
West Bengal	51	51	49	46	40	38	38	37	35	33	31
Andaman & Nicobar Islands	16.4	18	22.78	18	19	27	31	34	31	27	25
Chandigarh	26.7	24	22.07	19	21	19	23	27	28	25	22
Dadra and Nagar Haveli	56.8	58	51.09	54	48	42	35	34	34	37	38
Daman and Diu	54.2	40	30.39	39	37	28	28	27	31	24	23
Delhi	*	25	33	26	32	35	37	36	35	33	30
Lakshadweep	22.3	33	15.13	26	30	22	25	24	31	25	25
Puducherry	19.7	22	24.72	24	24	28	28	25	25	22	22
All-India	68	66	63	60	58	58	57	55	53	50	47

YEAR	2000	2011	2012	2013	2014	2015	2016	2017	2018	2019
Andhra Pradesh	65	43	41	39	39	37	34	32	29	25
Arunachal Pradesh	40.1	32	33	32	30	30	36	42	37	29
Assam	75	55	55	54	49	47	44	44	41	40
Bihar	62	44	43	42	42	42	38	35	32	29
Chhattisgarh	79	48	47	46	43	41	39	38	41	40
Goa	21	11	10	9	10	9	8	9	7	8
Gujarat	62	41	38	36	35	33	30	30	28	25
Haryana	67	44	42	41	36	36	33	30	30	27
Himachal Pradesh	51	38	36	35	32	28	25	23	19	19
Jammu and Kashmir	50	41	39	37	34	26	24	23	22	20

YEAR	2000	2011	2012	2013	2014	2015	2016	2017	2018	2019
Jharkhand	70	39	38	37	34	32	29	29	30	27
Karnataka	57	35	32	31	29	28	24	25	23	21
Kerala	14	12	12	12	12	12	10	10	7	6
Madhya Pradesh	87	59	56	54	52	50	47	47	48	46
Maharashtra	48	25	25	24	22	21	19	19	19	17
Manipur	22.2	11	10	10	11	9	11	12	11	10
Meghalaya	66.2	52	49	47	46	42	39	39	33	33
Mizoram	17.5	34	35	35	32	32	27	15	5	3
Nagaland	-	21	18	18	14	12	12	7	4	3
Odisha	95	57	53	51	49	46	44	41	40	38
Punjab	52	30	28	26	24	23	21	21	20	19
Rajasthan	79	52	49	47	46	43	41	38	37	35
Sikkim	47	26	24	22	19	18	16	12	7	5
Tamil Nadu	51	22	21	21	20	19	17	16	15	15
Tripura	34.8	29	28	26	21	20	24	29	27	21
Uttarakhand	50	35.91	33.8	31.58	33	34	38	32	31	27
Uttar Pradesh	83	57	53	50	48	46	43	41	43	41
West Bengal	51	32	32	31	28	26	25	24	22	20
Andaman & Nicobar Islands	16.4	23	24	24	22	20	16	14	9	7
Chandigarh	26.7	20	20	21	23	21	14	14	13	13
Dadra and Nagar Haveli	56.8	35	33	31	26	21	17	13	13	11
Daman and Diu	54.2	22	22	20	18	18	19	17	16	17
Delhi	*	28	25	24	20	18	18	16	13	11
Lakshadweep	22.3	24	24	24	20	20	19	20	14	8
Puducherry	19.7	19	17	17	14	11	10	11	11	9
All-India	68	44	42	40	39	37	34	33	32	30

Source: EPW Research Foundation (EPWRF). Infant Mortality in India. Retrieved from EPWRF database: https://www.epwrfits.in (Accessed: December 13, 2023).

Table 6: Maternal Mortality among Indian States (From 2001-03 to 2019)

Year	2001 - 03	2004 - 06	2007 - 09	2010 - 12	2011 - 13	2014 - 16	2015 - 17	2016 - 18
Andhra Pradesh	195	154	134	110	92	74	74	65
Assam	490	480	390	328	300	237	229	215
Bihar	371	312	261	219	208	165	165	149
Gujarat	172	160	148	122	112	91	87	75
Haryana	162	186	153	146	127	101	98	91
Karnataka	228	213	178	144	133	108	97	92
Kerala	110	95	81	66	61	46	42	43
Madhya Pradesh	379	335	269	230	221	173	188	173
Maharashtra	149	130	104	87	68	61	55	46
Odisha	358	303	258	235	222	180	168	150
Punjab	178	192	172	155	141	122	122	129

Year	2001 - 03	2004 - 06	2007 - 09	2010 - 12	2011 - 13	2014 - 16	2015 - 17	2016 - 18
Rajasthan	445	388	318	255	244	199	186	164
Tamil Nadu	134	111	97	90	79	66	63	60
Uttar Pradesh	517	440	359	292	285	201	216	197
West Bengal	194	141	145	117	113	101	94	98
Other	235	206	160	136	126	97	96	85
All-India	301	254	212	178	167	130	122	113

Source: EPW Research Foundation (EPWRF). Maternal Mortality in India. Retrieved from EPWRF database: https://www.epwrfits.in (Accessed: December 13, 2023).

Public Expenditure in the Light Covid-19

The way money is spent on health care, varies from how it is spent on other consumer items (Arrow). Health spending is unpredictable and unplanned, unlike spending on other consumer goods, which may be anticipated or planned for. Moreover, many forms of health expenditure (like vaccinations) are linked to positive externality. Therefore, it is anticipated that the government will pay for this form of health expense. In several nations, including Norway, Denmark, Sweden, and Iceland, the government pays directly for more than 80 per cent of health-related expenses. In India, both the public and private sectors offer healthcare services. According to research, the Indian government has not consistently spent enough on health care (Tigga and Mishra 2015). Government spending on welfare programmes has a tendency to decline in the post-reform era (Singh, Singh, Sharma, Gupta, Vaidehi, and Maharana, 2016). Additionally, there is no option for publicly financed universal health insurance. People must, therefore, pay out of pocket, in order to get healthcare treatments. According to figures from the National Health Account published in 2018, about 60.06 per cent of health expenses in India are paid for out-of-pocket.

According to Akca, Sonmez and Yilmaz (2017), spending on health is seen as an investment in human capital. One of the reasons for the decline in poverty has been improvements in healthcare. Health expenditures are a good sign of health. According to the National Health Profile (NHP) Data released in October 2019, India's public health spending accounts for just 1.28 per cent of the GDP (2017–2018). Surprisingly, lower income nations like Nepal, Sri Lanka, Indonesia, and even the small island nation of Timor-Leste have a higher proportion of public health spending as a percentage of GDP. From ₹629 in 2009–10 to ₹1,657 in 2017–2018, the public expenditure per person has increased double-fold. As compared to other nations, it is still incredibly low.

The Health sector gets a prominent place and is in the top among the six pillars of the Indian Budget 2021 It was allocated a massive outlay of $ 31,030 million, which is 137 per cent more than the previous year’s budget (Bhatia and Singh 2021). The current huge allocation is made to tackle India’s chronic under investment in health and to improve the health indicators, which are lagging. Due to chronic under investment in health sector, there has been a huge shortage of

community hospitals and sub centres in many states in India. The government expenditure in health for the year 2020 is 1.8 per cent of GDP, which is extremely low, when compared with the countries Sri Lanka, China, Thailand, the United Kingdom and the USA. It is even lower than the target envisaged by National Health Policy, i.e., setting of 2.5 per cent of GDP on healthcare by the year 2025 (Ministry of Health & Family Welfare, 2017). This year for the first-time health budget allocation included grants to the states for various health and welfare related amenities like water and sanitation. US $4850 million is allocated for Covid-19 vaccination. US $8,898 million is allocated to the new program 'Prime Minister's Atmanirbhar Swasth Bharat Yojana' in 2021 Budget.

Table 7: Health and Well-being Expenditure

Allocation/ years (1)	2020-21(in Cr) (2)	2021-22(in Cr) (3)	Change (in %) (4)
Health and Family Welfare	78,866	71269	10
Health & Research	4,062	2663	34
MoAYUSH	2,322	2,970	28
Nutrition	600	2,700	350
Drinking Water and Sanitation	17,023	60,030	253

Source: ndtv.com/Swasthya India.

The pandemic provided opportunities to bring required structural change to improve quality, accessibility and affordability of health care. The pandemic of Covid-19 reminded the policy makers to revisit and strengthen the neglected public health sector. Before the pandemic, health was one of the most unfunded sectors. Most of the budget of the state governments of India mainly focus on the sectors like power, transport, irrigation, etc., ignoring the social sector, which includes expenditure in health and education. If we analyze the state budget of Uttar Pradesh, we can find that the share of the budget (2018-2019) in the education and health sector was lower than the share of both sectors in the budget of 2017-2018; while the share of other sectors like transport, power, irrigation, etc., was increased from 11.94 per cent in 2017-2018 budget to 15.6 per cent in the year 2018-2019 budget (Singh, 2018). Public spending on health has been continuously declining at the post liberalization period from 1.3 per cent of GDP in 1990 to 0.9 per cent of GDP in 1999 (Ghosh, 2014). Public expenditure on health, medical and family welfare was all most stagnant at 5.0 per cent before Covid-19 for all the states and Uts but after the pandemic, a sharp increase in public spending on health has been seen for most of the states and Uts. The drastically affected states like Maharashtra, Telangana and Punjab had a very poor share in public expenditure in health, medicine and family welfare. The public expenditure in the medical, and health, social and developmental expenditure of the Government of India at different periods is shown in the table below.

Table 8: Expenditure on Public Health, Medical & Family Welfare as Ratio to Aggregate Expenditure

State/UT	2018-19	2019-20	2020-21 (RE)	2021-22(BE)
1	2	3	4	5
Andhra Pradesh	4.5	4.3	5.2	6.1
Arunachal Pradesh	6.0	6.1	4.8	5.1
Assam	6.5	6.5	7.2	6.9
Bihar	4.7	5.3	5.0	6.0
Chhattisgarh	5.0	5.1	6.8	5.8
Goa	6.7	7.7	7.3	6.8
Gujarat	5.6	5.6	5.9	5.1
Haryana	4.1	4.5	5.2	5.2
Himachal Pradesh	5.9	5.8	6.6	6.2
Jharkhand	5.2	4.4	5.4	4.9
Karnataka	4.4	4.1	5.2	5.0
Kerala	5.5	6.1	5.8	5.9
Madhya Pradesh	4.2	5.0	4.7	5.0
Maharashtra	4.0	4.0	4.5	3.9
Manipur	5.1	5.5	5.0	4.2
Meghalaya	8.8	7.9	7.1	7.3
Mizoram	6.0	5.2	6.5	5.6
Nagaland	4.7	4.9	5.5	6.2
Odisha	5.0	4.9	6.5	5.5
Punjab	3.7	3.3	3.6	3.4
Rajasthan	5.8	5.7	6.0	6.5
Sikkim	5.9	5.8	8.0	6.1
Tamil Nadu	5.1	4.8	5.9	5.7
Telangana	4.0	4.3	3.4	2.5
Tripura	6.7	6.0	5.5	6.3
Uttar Pradesh	4.6	5.2	5.0	5.9
Uttarakhand	5.2	5.2	4.7	6.1
West Bengal	4.8	5.3	5.9	5.9
Jammu and Kashmir	6.6	6.5	6.5	6.5
NCT Delhi	11.9	11.2	12.6	14.4
Puducherry	7.9	9.2	8.1	8.0
All States and UTs	5.0	5.1	5.5	5.5

Source: RBI, State Budget, 2021-2022.

V Conclusion

Covid-19 pandemic has focused on the importance of long-term health policies in different health aspects. Earlier, health was a subject of a concurrent list but at

present the seventh schedule of the constitution has put it in the state list. Covid-19 pandemic has also brought the wave of digitization in the health sector. The variations in the spread or the impact of Covid-19 very significantly depends on the policy response. Therefore, an uneven pattern of fatality due to Covid-19 has been observed among the states in India. Fatality due to Covid-19 in India was found the highest for Punjab and the lowest for Mizoram.

In all the policy discussions, health care has been at centre after Covid-19 hit the country. The health care budget has drastically increased to 137 per cent in 2021. The polices like Atmanirbhar Bharat Yojana have been occupying tremendous place during and after the Covid-19. Around 17,000 rural and 11,000 urban health and wellness centres have been proposed to be set up.

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Determinants of Non-Life Insurer Profitability in India: Evidence from Dynamic Panel Analysis

Ravindra Muley and G. Bharathi Kamath

India happens to be among one of the top emerging economies of the world today. The contribution of the non-life insurance sector lies in providing a fillip to the growth aspiration of the country. The vitality of the insurance sector for a growing economy can best be gauged by ascertaining the profitability performance. Using a panel dataset for a period from the year 2005 to 2020 and by employing the GMM model, the study finds that Expenses Ratio, Reinsurance and Fixed Assets are significant variables impacting the Return on Assets (ROA) of insurance companies. It is also found that GDP growth and Inflation have significant impact on the ROA. The use of dynamic panel method in this study makes unique contribution to insurance research in India.

Keywords: Non-Life Insurance, Penetration, Reinsurance, India, Profitability.

I Introduction and Background of the Study

Organizations such as insurance companies have a highly important role in the economy by offering risk management products that makes economic activities efficient. This is because of the resilience that businesses and individuals can have by purchasing protection for their lives, goods, property, and assets. The insureds get requisite compensation in the form of claims, in case of losses/damages suffered due to incidents affecting the assets covered under such contracts or policies. According to Heiss and Sumegi (2008), the role and contribution of the insurance sector in providing stimulus to economic growth is immense. Insurance also allows for the optimal as well as efficient allocation of resources, reduction in cost of transaction, boosting and creation of liquidity in the economic system, achieving of scale factor in investment function, along with helping the spread of financial losses over many shoulders.

The non-life/property-liability/general/casualty insurance companies as they are known, conduct business in widespread areas except life insurance. They play a vital role in the economy as they provide resilience in the form of insurance protection to cover assets ranging from marine, automobile, aviation, and infrastructure such as ports, bridges, and buildings. Liedtke (2007) analysed that

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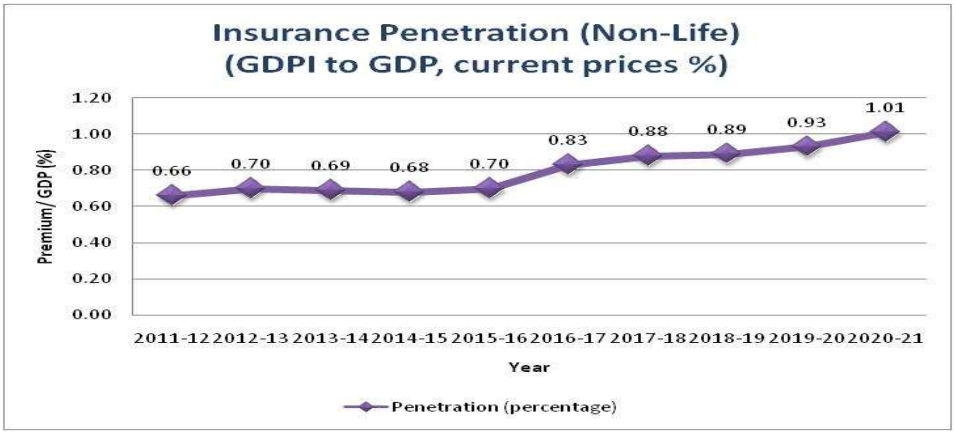
in the modern form of economy, with the protection of insurance, the economic entities are better encouraged for utilization of their capital. Without insurance they would need to hold and finance larger cash reserves to help cover such losses arising out of risky events and uncertainties.

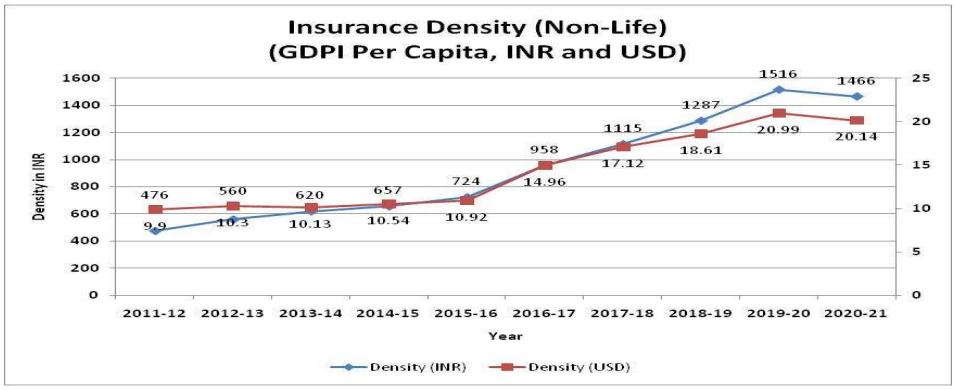
Although, given the larger benefits of insurance, India is still an underpenetrated country with large gaps in protection. The two main gauges of the insurance sector performance are the insurance penetration (the ratio of Gross Direct Premium Income to GDP) and insurance density (the ratio of Gross Direct Premium Income per Capita) and India's penetration and density levels are very low. The Indian insurance scenario is still not on a comparable basis with other advanced nations in the Asia-Pacific, Europe, or the USA. Figure 1 below, highlights the penetration trend of non-life insurance in India. It can be observed that for almost a decade and half, after the liberalization of the sector, the penetration rate has struggled to break the one percent barrier.

Figure 1: Non-Life Insurance Penetration in India



Data Courtesy: Year Book 2020-21, GI Council, India.

Figure 2: Density of Non-Life Insurance in India



Data Courtesy: Year Book 2020-21, GI Council, India.

Figure 2 above exhibits the trends in insurance density for the sector in India. After 2015-2016 the density has been gaining traction, however, *vis-à-vis* the BRICS[1] countries India still lags on the parameter.

Table 1 provides the comparative data of the penetration as well as density levels of non-life insurance sector for the BRICS countries. The data reveals that India is still far behind the curve on both the pillars. Therefore, a concerted action by addressing the important value drivers and identification of such variables becomes crucial.

Table 1: Comparative Data of BRICS Countries

Country	Sector: Non-Life Insurance	
	Penetration	Density
India	0.94 %	$ 19
Brazil	1.78 %	$ 155
Russia	0.97 %	$ 113
China	2.01 %	$ 201
South Africa	2.67 %	$ 160

Source: Swiss Re – Sigma 04/2020.

Since profitability is an important source of vitality for financial institutions, we need to delve on this aspect in consideration to the functioning of insurance companies. Profit is also a parameter of importance to investors and all stakeholders. Important to investors from the viewpoint of it being a source of dividend and important to stakeholders as it signifies and ensures growth. For the policyholders and regulators, the company profits mean an additional cushion against insolvency. Information on rate-of-return is also an important driving factor to a prospective investor and is a means to choose and compare alternatives in investments. Profits to an economist are an assessment of financial efficiency and economic efficacy of the company (Mclenahan Charles 1987).

The Insurance companies have two major sources of profits - One of the sources is when they have a favourable claims experience arising out of the underwriting activities known as *underwriting profit* and another source is from the income generated by *investment of the float*[2]. The underwriting income is the profit generated by an insurer from the underwriting activity over a period. However, the profits on investment depend on various factors such as avenues of investments available to insurers, regulatory guidelines, and macroeconomic factors such as the interest rate cycle, etc.

Apart from the avenues of profit as discussed, the insurance companies also face uncertainty of risks' getting materialized and causing huge claim pay-outs, especially in the event of catastrophes. One of the central mechanisms that primary insurers avail for protection of their balance sheet and staying financially viable is through the mechanism of 'reinsurance.' There is evidence that reinsurance solutions have helped the companies to avoid disruption (OECD, 2018).

Reinsurance is thus seen to be a boon for the insurers in managing capital to increase the underwriting business capacity to a greater extent and to have lesser strain on capital and price competitively (Swiss Re 2010). The reinsurance utilization factor therefore becomes a significant variable in gauging insurer performance.

II Financial Performance Overview

During the year 2017, few companies including one PSU insurer got listed (through Initial Public Offer) on the Indian stock exchange. The company from the PSU group was - The New India Assurance Co. Ltd. A company belonging to a private conglomerate known as ICICI Lombard General Insurance was also listed in the same year. Initially when the sector was opened, the foreign direct investments allowed was up to 24 per cent which was further increased to 49 per cent during the year 2015. Recently the government has passed a notification about FDI investments in non-life insurance and stands increased to 74 per cent.

A study by Oktiani, Priarsono and Andati (2015) found that the insurance company profitability is influenced by both the internal, i.e., firm specific and external, i.e., macroeconomic factors. Whereas, factors that comprise insurer specific characteristics are internal, the external factors according to Dorofti and Jakubik (2015) are those that impact the company and industry through various macroeconomic effects. Also, in previous studies by several authors on this subject, both the firm specific and macroeconomic variables have been found to affect insurer profitability in varying degree.

An overview of line of business performance as per Table 2, reveals that the incurred claims percentage was high at 80.47 per cent on average. The percentage premium ceded to reinsurance was the highest in the Fire Insurance segment (87.57 per cent) while it was the least in Motor (16.15 per cent) and Health (20.69 per cent) segment. On average the primary insurance companies ceded 52.60 per cent premium to reinsurers. The other bigger outgoes for insurance companies are the operating expenses and commission expenses. It is obvious from the statistics that the sector needs to concentrate on value creating activities. Balancing the activities becomes even more important for companies in the competitive scenario.

Table 2: Performance on Major Parameters of Non-Life Insurance Companies

Segment	Premium Underwritten (₹ Cr)	Commission Expenses (₹ Cr)	Operating Expenses (₹ Cr)	Incurred claims ratio (%)	Premium ceded to reinsurance (₹ Cr)	% Premium Ceded	Reinsurer's incurred claims ratio (%)
Fire	15729	1533		78.07	13775	87.57	88.79
Marine	3532	351		71.27	2245	63.74	71.13
Motor	68951	5967		85.61	11138	16.15	86.12
Health	42392	3030		74.00	8772	20.69	91.49
Other	34018	1150		93.40	25230	73.73	108.41
Total	164622	12031	31673	80.47	51160	52.60	89.18

Data Source: IRDAI Annual Report – 2020.

III Literature Review

Several studies based on the non-life /general/P&C insurance companies try to investigate their performance by choosing ROA as a measure of performance (Hamadan 2008, Lee 2014, Curak, Pepur and Poposki 2011). The Underwriting risk or loss ratio is also an indicator of importance of an insurance company's performance (Adams and Buckle 2000). The underwriting risk reflects the company's efficiency performance of the underwriting area (Mehari and Ameiro 2013). The losses or cost of claims summarizes the insurer's financial health in the underwriting domain. The ratio with numerator of claims costs represents claims or losses of the company. The loss ratio is calculated as claims as a percentage to earned premiums. According to Kaya (2015) the loss ratio measures a company's underwriting risk. The results of regression analysis by Mehari and Ameiro (2013), while analysing the performance of insurance companies, state that loss ratio has statistical significance and is related negatively with profitability. A study by Ana-Maria and Ghiorghe (2014) reveals that the loss ratio had negative influence on insurers financial position.

The expense ratio also known as input cost, measures the expenses of the insurer. A lower expense ratio contributes to a higher ROA. In a study conducted by Nino Datu (2015) in the Philippine insurance market, they found significant and negative impact of expense ratio on the insurer operating profit, in both the fixed and random effect model. In a study by Chen-Ying Lee (2014), considering the insurance companies of Taiwan, the ratio on expense parameter was found to have statistical significance and having a negative effect/ impact on the ROA in the random effects model.

The non-life Insurance companies routinely purchase a large amount of reinsurance as a hedging mechanism. Pottier and Sommer (2006) identify insurers that use less reinsurance posing greater difficulty in financial strength evaluation. Chen, Doerpinghaus, Lin and Yu (2008) find reinsurance as a key determinant of the firms' long run position and having statistically significant and positive relationship. Chen-Ying Lee (2014) found a significant and positive relationship of reinsurance. A study by Yang (2017) focuses on exploring data regarding ratings on the credit pillar for an insurer and assessing the risk of down grading and affecting the reinsurance demand of the firm.

The insurers' current liquidity ratio is reported as a significant indicator impacting solvency by Lee and Urrutia (1996). In a study by Shiu (2004), liquidity was found to be statistically significant and positive in relation to insurer performance, whereas Adams and Buckle (2000) had an argument stating that high asset liquidity could increase agency cost for the firms' owners. A study by Sambasivan and Ayele (2013) concerning insurance companies in Ethiopia, established liquidity factor as having a significant negative effect on the profitability of insurers.

In a study by Mehari and Ameiro (2013), the asset tangibility was found to be statistically significant and positive in their sample of insurance firms. In a

study conducted by Ajao and Ogieriakhi (2018) on the Nigerian insurance companies, they found fixed assets to have a negative relation to ROA whereas Sambasivan and Ayele (2013) found insignificant relationship between assets of fixed type and ROA.

The study makes use of Investment Income ratio to gauge its effect on the ROA/profitability of insurance companies. The investment income in relation to earned premiums, signifies the pillar of income through investments for the company. The importance of the avenue provided by the investment income for insurance companies, is duly highlighted in research by Baker (1966). Nielson (1984) highlights investment income as a factor providing capacity to insurance companies. Kozak (2011) states that with a higher value of investments a company could achieve a condition of advantageous nature.

Chen and Huang (2001) stated the existence of a relationship prevailing among factors such as macroeconomic variables and premiums of an insurance company. Many other researchers have incorporated macroeconomic variables in the research for exploring firm performance in insurance industry such as Chen and Wong (2004) & Nino Datu (2015). Dorofti and Jakubik (2015) found GDP to have positive impact on ROE as well as ROA, in their study of non-life insurance.

In a study of over 2000 non-life companies across 91 countries, Doumpos, Gaganis and Pasiouras (2012) found the effect of macroeconomic conditions such as GDP growth, inflation rate, and inequality of income, as significant robust predictors of performance. In their research concerning macroeconomic environment and insurance sector profitability by Dorofti and Jakubik (2015) they found that inflation is the real threat that affects insurer profitability. However, macroeconomic factors such as GDP are likely to generate unexpected signs for insurance demand in different geographies (Dorren and Pendo 2013).

Inflation drives a critical role in impacting the sector and having adverse effect on its operations, such as claims, expenses, and provisions of technical type (Daykin, Pentikainen and Pesonen 1994). Hwang and Gao (2003) conducted a study on the important determinants of demand for insurance in China, especially after the period of economic reforms of 1978 and concluded that successful economic reform contributed a lot in promoting life insurance sector in China. Banerjee and Majumdar (2018) found inflation to have negative effect on ROA. Shiu (2004) also reported inflation to have a negative impact on performance of the UK general insurers.

IV Data Sources, Sample Selection and Methodology

Data Sources and Model

The panel dataset is constructed utilizing the data from the handbook provided on insurance statistics and published by the Indian insurance sector regulator, the IRDAI, and annual reports of companies and their public disclosures downloaded from their respective websites. Together the data fetches 284 observations on 24

companies and is an unbalanced panel data set because many new companies have joined during the past five years. The panel data set for the variables of interest has been constructed for the period 2005 till 2020.

The empirical model stresses that economic relationships may comprise of having dynamic characteristics. While assessing firm performance in terms of profitability, the prior period profitability is related to profitability of the firm in the present period. We follow the general dynamic method of moments model (GMM) as proposed in leading research (Arellano and Bond 1991, Blundell and Bond 1998).

$$l\_roa_{i,t} = \beta_0 + \beta_1 l\_roa_{i,t-1,\ t-2} + \beta_2 l\_lossratio_{i,t} + \beta_3 l\_expnratio_{i,t} + \beta_4 l\_reinsuti_{i,t} + \beta_5 l\_liq_{i,t} + \beta_6 l\_fxdassets_{it} + \beta_7 l\_inv_{i,t} + \beta_8 l\_gdp_{i,t} + \beta_9 l\_inflation_{i,t} + \beta_{10} listeddum + \beta_{11} grdum + \beta_{12} y2011\ \beta_{13} y2018 + \mu_{i,t} + \varepsilon_{i,t}$$

(Where l_roa = Return on Assets, l_lossratio = Loss Ratio, l_expnratio = Expense Ratio, l_reinsuti = Reinsurance Utlization, l_liq = Liquidity, l_fxdassets = Fixed Assets, l_inv = investment income, l_gdp = Gross Domestic Product, l_inflation = Inflation rate, l_listed dum = Whether the company is listed or not, l_grdum = Group dummy, PSU or Private company, y2011 and y2018 = Year Dummy Variable)

The presence of $Y_{i,t-1,\ t-2}$ provides cues from a prior period, making the model a dynamic panel model; the cross-sectional company unit is represented by i and time period by t, respectively, $\mu_{i,t}$ is the company specific fixed effect and $\varepsilon_{i,t}$ represents time varying company effect. The definitions of variables used are stated in Table 3.

Table 3: Definitions of the Dependent and Independent Variables

Variables	Description
ROA	Profit after tax to total assets
Loss Ratio / Claims Cost	Claims incurred to Net earned premium representing claims cost
Expense Ratio	Expenses to Net earned premium
Reinsurance Utilization	Ratio of premium on reinsurance premium ceded to direct business written plus reinsurance assumed
Liquidity ratio	Ratio of current assets to current liabilities
Fixed Assets	Ratio of fixed assets to total assets
Investment Income Ratio	Ratio of Investment Income to Earned Premium
GDP growth	Gross Domestic Product at constant prices
Inflation rate	Inflation as measured by consumer price index
Listed Dummy	Dummy variable 1 if the company is listed, 0 if not
Group Dummy	Dummy variable 1 if the company is PSU, 0 if not
Y2011	Year Dummy
Y2018	Year Dummy

Estimation Technique

The OLS model estimation variability can be overcome by application of the generalised method of moments (G.M.M.) model, which had been developed gradually through several research papers published in the field (Arellano and Bond 1991, Arellano and Bover 1995, Blundell and Bond 1998). The actual estimation is based as per the one step system GMM estimation method proposed by Prof Roodman. The system type GMM of Arellano and Bover (1995) as well as Blundell and Bond (1998) deals appropriately with the concerns of the difference type of GMM. The System type of GMM uses the differences of lags of the explanatory variables as variables in instruments. Tests proposed on second order serial correlation and over-identifying restrictions are performed to evaluate the appropriateness, i.e., the validity of instrument variables. The estimator is valid if second-order serial correlation is excluded in residuals and all chosen instruments being valid, i.e., over-identifying restrictions.

The choice between a static or dynamic model, bases on reasoning that the dynamic model is best suited because the lags of the dependent variable might have impact on the present value of that variable. Secondly for the choice between the difference or system GMM, we follow the rule of thumb wherein if the dependent variable exhibits random walk (the inherent uncertainty of insurance business and profitability confirms the same), then we must use the system GMM. Also, because we are using an unbalanced panel data, it is likely that using difference GMM may further weaken the estimates.

GMM model characteristics help overcome endogeneity especially dealing with panel data The dependent variable and its lagged values when used as instruments help control endogenous relationship. The 'internal' instruments used are from within the existing model (Roodman 2009). The GMM, is generally used for analysis of panel data, and is known to provide consistent results under the causes of different sources of endogeneity, (Wintoki, Linck, and Netter 2012). The estimation of model parameters using system GMM is reasonable under some conditions. The condition number one requires and states that the over identifying limits and restrictions, i.e., all instruments be valid, while the second required condition excludes the existence of second-order serial correlation in the models' residuals (Pervan 2019). We design the instrument matrix with the help of both the gmmstyle and the ivstyle variables in accordance.

V Results and Discussion

The descriptive nature in terms of statistics such as mean, standard deviation etc., of variables are presented in Table 4: the mean value of ROA stood at -.511 per cent showing that profitability is an overall concern for the sector and the range being -34.43 per cent to 9.45 per cent. Similarly, a higher mean value of the loss ratio (68.62) and expenses ratio (84.92) tells us that these are the factors that need attention. The range of expenses ratio is high given the new companies entering

the sector, which routinely experience high ratio in earlier years. The mean of reinsurance (37.68) depicts the interdependence of the sector on reinsurance.

Table 4: Descriptive Statistics

Variable	Observation	Mean	Std. Dev.	Min	Max
ROA	284	-.5116549	5.902909	-34.43	9.45
Lossratio	284	68.62127	178.1321	-2826.09	393.98
Expnratio	284	84.92032	1667.943	-7173.91	26666.67
Reinsuti	284	37.68708	112.3124	0	1869.93
Liq	284	.6142958	1.226204	.07	18.57
Fxdassets	284	.0203979	.0242767	.002	.24
Inv Income	284	1.657585	.6862694	-1.577225	4.114547
Gdp	284	5.42088	4.337362	-7.96	8.49
Lnflation	284	6.741127	2.745328	3.32	11.98

(Note: ROA = Return of Assets, Lossratio = Loss Ratio, Expnratio = Expenses Ratio, Reinsuti = Reinsurance Utilization ratio, Liq = Liquidity Ratio, Fxdassets = Fixed Assets Ratio, Inv Income=Investment Income, Gdp = GDP growth, Inflation = Inflation rate).

Presented in Table 5 is the matrix of correlation between the variables. All coefficients among the independent variables exhibit lower values which is desirable for the model being specified; this makes the model free from biases and helps produces efficient results. As per the table, the correlation coefficient between ROA and loss ratio, expenses ratio, fixed assets and liquidity, ranges from insignificant to negative impact on ROA. On the other hand, the coefficient such as GDP and inflation has a positive effect on the ROA. The dummy variables used in the model may potentially impact the ROA and have been analyzed in detail in the result section.

Table 5: Pairwise Correlation

Variables	(1)	(2)	(3)	(4)	(5)	(6)
l_roa	1.000					
l_lossratio	0.0077	1.000				
l_expnratio	-0.0008	0.9817	1.000			
l_reinsuti	0.0593	0.0232	0.0148	1.000		
l_liq	-0.1020	-0.0164	-0.0180	0.1154	1.000	
l_fxdassets	-0.0938	0.0273	0.0495	0.0170	0.2313	1.000
l_inv	-0.1857	-0.0304	-0.0342	-0.1912	0.2530	-0.0965
l_gdp	0.0695	-0.0176	-0.0164	-0.0596	0.2285	0.0797
l_inflation	0.0245	-0.0842	-0.0872	0.2053	0.3756	0.1683
listeddum	0.0720	0.0262	0.0195	0.0954	0.2305	-0.0682
grdum	0.0948	0.0384	0.0300	-0.0605	0.1538	-0.4658
y2011	-0.0274	0.0106	-0.0002	0.0328	0.0536	0.0577
y2018	0.0120	0.0165	0.0010	-0.0566	-0.1029	-0.0364

Contd…

Table 5: Pairwise Correlation

Variables	(7)	(8)	(9)	(10)	(11)	(12)	(13)
l_roa							
l_lossratio							
l_expnratio							
l_reinsuti							
l_liq							
l_fxdassets							
l_inv	1.000						
l_gdp	0.1639	1.000					
l_inflation	-0.0090	-0.0461	1.000				
listeddum	0.2254	0.0293	0.0277	1.000			
grdum	0.3041	0.0443	0.0419	0.2342	1.000		
y2011	-0.0330	0.0612	0.2197	0.0040	0.0060	1.000	
y2018	0.0115	0.0922	-0.3384	-0.0282	-0.0427	-0.0667	1.000

Source: Estimated by authors.

As per Roodman (2009), good estimators of the lagged dependent variable should probably be below 1.00. The model satisfies this requirement as the coefficient obtained 0.1683783 is within the range. The coefficients estimated by using the GMM model are short-run coefficients. We therefore have reported the coefficients of long-run type for all the significant variables for a better perspective and interpretation of results. The post estimation results are also provided. In the Table 6 the dynamic panel data estimations obtained through one-step system GMM are duly reported. The findings from the model, along with notes, are also duly appended thereafter.

Table 6: Dynamic (Panel Data) Estimation, System GMM (one-step)

No of observations	231	Wald chi2 (14)	111058.23
Number of Groups	24	Prob>chi2	0.000
No of Instruments	22		

l_roa	Coefficients	Std Error	z	P>|z|
l_roa L1	.1683783 ***	.0720598	2.34	0.019
L2	-.0743749	.0506588	-1.47	0.142
l_lossratio	-1.931107	1.9643930	-0.98	0.326
l_expnratio	-20.49353 **	11.7609000	-1.74	0.081
l_reinsuti	.0500742 ***	.0236739	2.12	0.034
l_liq	-.0230294	.0451528	-0.51	0.610
l_fxdassets	-.1618191 ***	.0721435	-2.24	0.025
l_inv	.0152216	.0338967	0.45	0.653
l_gdp	.0182235 ***	.0066350	2.75	0.006
l_inflation	.0945567 **	.0508993	1.86	0.063
listeddum	.0245089	.0958428	0.26	0.798
grdum	-.136398	.0955686	-1.43	0.154

l_roa	Coefficients	Std Error	z	P>|z|
y2011	-.0886093 ***	.0264556	-3.35	0.001
y2018	.0175741	.0247146	0.71	0.477
A R (1)				0.044
A R (2)				0.183
Sargan test				0.000
Hansen test				0.057

Notes: ***= significance @ five per cent level, **=significance @ 10 per cent level.
Source: Estimated by authors.

Notes: Table 6 conveys the output of GMM under the one-step system in the panel dynamic regression model. The p-value of coefficients of variables used are mentioned. The AutoRegressive (AR) tests (1 and 2) are estimated to tests for autocorrelation of order one (Ho – no first order autocorrelation) and (Ho – no second order autocorrelation) respectively. The Wald-chi^2 test is performed to ascertain the joint significance, the null hypothesis is all coefficients in the given model are zero. The Sargan test in our case, reveals that the model has not been weakened by many instruments. The total of instruments used is lesser than the number of models' cross-sectional units, the Hansen test reports are robust and is a test of over identification with the null hypothesis that altogether instruments are valid.

Our GMM with one-step system, indicates low profit persistence in the non-life insurance industry in India, as revealed from the l_roa L1 variable. This is in line with data that signifies a longer time to breakeven as well as for establishing itself in a significant competitive environment. Due to intense competitive pressures of pricing and underwriting, the resultant loss ratio is high. As revealed from the coefficients of year dummies till y2011, the sector had negative profits and only at the end of y2018 the marginal profits could be seen coming to the industry. The coefficients of the lagged ROA are also significant in L1. The long run GMM coefficients have also been computed and have been reported in Table 7.

Table 7: Long-run GMM coefficients (of significant variables)

l_roa	Coefficients	Standard Error	z	P>|z|
l_expnratio	-24.64285 ***	12.34616	-2.00	0.046
l_reinsuti	.0602127 ***	.0277339	2.17	0.030
l_fxdassets	-.1945826 ***	.0939124	-2.07	0.038
l_gdp	.0219132 ***	.0081916	2.68	0.007
l_inflation	.1137015 ***	.0662029	1.72	0.086

Note: ***= significance @ five per cent level, **=significance @ 10 per cent level.
Source: Estimated by authors.

The coefficient on the loss ratio has a negative sign *(β = -1.931107)* and is in accordance with the study by Mehari and Ameiro (2013) & Ana Maria and Ghiorghe (2014). Our model establishes its theoretical significance. The Coefficient on expense ratio, exhibits a statistically significant negative sign *(β = -20.49353, p =0.081)* at 10 per cent significance level; we observe a large change in profitability of -20.49 per cent because of it; the long-run coefficient is also statistically significant with a coefficient value of *-24.64285*.

The coefficient on reinsurance utilization exhibits a statistically significant positive sign *(β = 0.0500742, p =0.034)*. This outcome is compliant with the study by Chen, *et. al.* (2008). A percentage change in reinsurance utilization variable is associated with 0.05 per cent increase in the ROA in the model of short run and .06 per cent increase in the ROA in the model of long run. Thus it can be concluded that reinsurance ratio is value accreting, and a judicious use is expected at the same time and convert the cost of reinsurance to expand underwriting capacity in a bigger way, especially for new companies.

The coefficient of fixed assets has a statistically significant negative sign *(β = -.1618191, p = 0.025)*. This result follows the study by Ajao and Ogieriakhi (2018) but in contrast with the results obtained by Mehari and Aemiro (2013). Contrary to general expectations it means that a higher fixed asset can ruin the ROA also meaning that the significant fixed assets are not generative of value, maybe under usage would be the reason. A percentage change in fixed assets variable is associated with -0.16 per cent decrease in the ROA in the model of short run, and -.19 per cent decrease in the ROA in the model of long run.

The coefficient on GDP has a statistically significant positive sign *(β = .0182235, p = 0.006)*. This finding conforms with the study of Chen (2014), Dorofti and Jakubik (2015), Banerjee and Majumdar (2018). A percentage change in GDP is associated with 0.018 per cent increase in the ROA in the short run, at five per cent significance level and 0.021 per cent increase in the ROA in the long run at five per cent significance level. The coefficient on inflation has a statistically significant positive sign *(β =.0945567, p =0.063)*. A percentage change in Inflation rate is associated with 0.094 per cent increase in the ROA in the model of short-run and 0.11 per cent increase in the ROA in the model of long run. Since actuaries' factor in inflation in pricing insurance, this may be the reason for the increase of ROA.

We have coded the companies using dummy variable in the study namely the public sector group, those who have a very long standing and others belonging to the private sector. The group dummy variable is insignificant. The ROA component of the public sector group companies was on average and ceteris paribus lower than other companies by -.13 per cent, which shows that the edge is returning to the private companies. The listed/non-listed dummy variable is insignificant.

The year dummy variable that we used in the model, corresponds to the year 2011 and 2018. The choice of the years is based on the logic to assess profitability

in the year, following the global nature of crisis of the year 2008 and its lag effect on the industry profitability and gauge, the same after a few more years in 2018, when normalcy was seen returning to the market. In line with expectations of profitability in the year 2011, was on average -0.088 per cent lower as compared to the base year, whereas profitability in the year 2018 was on average higher at .017 per cent, in comparison to the base period. However, the statistical significance for year 2018 was not established.

VI Conclusion

The study sets forth the direction using dynamic panel analysis by using important variables and macroeconomic components that have impact on profitability. The study fills the gap by employing the generalized method of moments model which has been used rarely to analyze the relationship among variables on the indigenous data previously. Insurance companies need to pay attention to expenses, reinsurance and income generative assets and macroeconomic variables to have profitability. By incorporating key variables of firm specific nature, as well as macroeconomic variables and the investment income variable helps specifying the model precisely. The study can help going further with experimentation to analyze the different facets, stakeholder aspects and avenues in the insurance ecosystem, that may drive profitability beyond what has been done through the present research and therefore the scope lies in useful extensions of this study to analyze profitability behaviour in other branches of insurance and for financial institutions.

Endnotes

1. BRICS is the acronym for a group of countries: B=Brazil, R=Russia, I=India C=China S= South Africa.
2. The float is the money that belongs to the policyholder that is not in their hands yet.

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Socio Economic Impact on Household Health Expenditure in Rural Odisha

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In order to explore the factors responsible for the burden of health expenditure, this paper examines the effect of income, education and social class on total health expenditure, inpatient health expenditure and outpatient health expenditure in Kendrapara district of Odisha. Income, higher education and social class are the most significant factors in affecting the health expenditure pattern of the households. In case of Total health expenditure model, Inpatient health expenditure and Outpatient health expenditure Models, Per capita Income variable emerged as the most positive significant factor whereas social class is the most significant factor in the health expenditure pattern of the households. But higher education also has positively affected health expenditure.

Keywords: Burden of health expenditure, Kendrapara, Odisha, Inpatient, Outpatient

Introduction

The relationship between poverty and ill-health is indisputable. Small health-care expenditures might be financially catastrophic for low-income households. This is because practically all of their financial resources are consumed in fundamental requirements, making them less able to manage with even extremely minimal expenditures when compared to wealthier households. In health care systems, better provision of preventative and curative health care services can make a difference in people's health. However, receiving these services can force individuals to spend a significant percentage of their available money, pushing many households into poverty. The potential impact of how health systems are funded, on the well-being of families, particularly disadvantaged households, has influenced health system design. Health spending is an essential and long-standing societal aim. Because of lower earnings, filthy living conditions, and inadequate access to health care, not only do the poor have higher rates of sickness and mortality, but they also use health care less than those who are better off. Additionally, they spend a larger amount of their income on the limited health care that they have access to. Uncertainty about health and its associated expenses,

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frequently traps even non-poor households in a cycle of poverty. Inequalities in health outcomes, health care utilization, out-of-pocket spending, and usage of public sector subsidies between the poor and non-poor are commonly used, to quantify health equality. The emphasis in the case of out-of-pocket costs, is on attaining progressivity in health care spending. Health expenditures are progressive if they are proportionately greater for higher incomes and lower for lower ones. Another objective is to establish households of unequal capacity should make suitably different payments and (households of equal ability should make the same contribution), which are then assessed to determine if they have improved or deteriorated over time and why. There is a large literature dealing with issues related to health care expenditure.

Newhouse (1977) discovered a positive linear association between the proportion of health care spending to GDP and GDP4 in a major work. The findings of Newhouse were consistent with those of Kleiman (1974), who discovered that income was a key driver of health care expenditure. Gerdtham et al (1992) confirmed this, by identifying per capita income, urbanization, and the ratio of public financing to total health spending, as positive and significant factors. According to Gbesemete and Gerdtham (1992), per capita GNP is the most important factor in explaining per capita health care spending. Hitris and Posnett (1992) established a significant and positive relationship between per capita health spending and GDP. Later many academics investigated the effectiveness of health-care spending. The majority of these authors' efforts were cantered on the link between health-care spending and GDP. Hansen and King (1996), Gerdtham and Lothgren (2000), and Karatzas (2000), all agreed that health-care spending is influenced by the country's GDP. Another critical issue that several writers attempted to address, is whether health care expenditure is a necessity or a luxury. It is possible that the marginal value of health-care spending is really low.

Different aspects of health expenditure are based on different socio-economic background, out of pocket health expenditure and other catastrophic health expenditure. Prinja, *et. al.* (2012) studied disparities in self-reported health status, health-care use, and out-of-pocket health-care costs. According to Berki (1986), the connection between per capita OOP spending for inpatient treatment and wealth index, has a J-shaped distribution. Russell (1996) is concerned with the opportunity cost of medical spending. Wagstaff and van Doorslaer (2003) utilize the fraction of OOP spending in total household budget to calculate the incidence and scope of catastrophic OOP health expenditure in Vietnam. Berki (1986), defined catastrophic OOP health spending as health expenditure that exceeds a set proportion of total household expenditure. This threshold level is chosen at random. Xu, *et. al.* (2003) emphasized the connection between the frequency of catastrophic health expenditure and the magnitude of public health spending; the percentage of OOP spending should be calculated based on the household's ability to pay.

Health is not only influenced by the income of the household but also by the educational status of the people or by the educational status of the head of the

household. The correlation between health and education is positive. Because those with higher levels of education tend to be healthier than those with lower levels, which is linked to higher rates of infection, a greater number of chronic non-infectious diseases, a shorter time to recovery from illness, and a shorter life expectancy for the latter. Human development outcomes, such as health and education, are largely influenced by features of the household, such as the mother's level of education and the family's ability to pay for their children's education (Devarajan, Miler, and Swanson 2002). Gupta and Dasgupta (2002) found that education is an important determinant of provider choice, whether determined by sex, education, social class, or income: there is a positive correlation between socioeconomic position and health; this relationship is not the other way around, as declining morbidity among those with bad health cannot account for the correlation (Doornbos and Kromhout 1990).

The preceding studies are based on secondary data at the macro level. Researchers, governments, policymakers, and development planners have given little attention to the micro components of health research. Furthermore, in India, it has been shown that a major amount of health research has focused on the metropolitan regions - Kerala, Madhya Pradesh, West Bengal, and Uttar Pradesh - while giving less attention to others (Saigal 2002).

In this regard, the current study is based on primary data that attempts to determine the influence of various socioeconomic determinants on household health expenditure in rural Orissa. The main goal of the study is to measure the effect of income and education on total health expenditure, inpatient health expenditure and outpatient health expenditure. These two factors are the major determinants of household health expenditure in the study area.

Health Status of Odisha

Despite India's outstanding economic success following the implementation of economic reforms in the 1990s, Orissa has lagged behind other states in realizing the objective of "health for all," and health care services in this region remain the most backward and insufficient. Orissa is eighth from the bottom of India's poorest states, with 29.35 per cent of the population living below the poverty line (NITI Aayog Report). In terms of various health indicators, Orissa ranks last in India, particularly in infant mortality (around 36deaths per 1000 lives), crude death rate (7.3 per cent) life expectancy in rural area 68.0 (M) and 70.7(F) percentage and for urban71.3 (M) and 73.1(F) percentage, malnutrition (underweight above 31.0 percentage), maternal mortality (119/100000 population in 2018-2020), morbidity (higher than the national average), and access to and utilization of public health care facilities (20 per cent). The state's morbidity and death rates are generally high. The state's high levels of IMR and MMR are driven by two major factors: a lack of access to appropriate health care facilities and a high degree of malnourishment (GoO 2004). Regarding health infrastructure, it is clearly known that Orissa is lagging behind its health infrastructure both in physical and human

resources from its actual requirement. Apart from the above indicators in case of Human Development Index, the position of Odisha after 2001 has decreased from 11 to 15 during 2007-2008. Like the Worst Health Indicators, in case of expenditure pattern also, the state has been lagging behind from its target of actual health expenditure. Kendrapara is one of Orissa's coastal districts that have been severely impacted by disasters of many forms, including floods, cyclones, tornadoes, droughts, and marine and ecological calamities. Because of its geographical position and meteorological circumstances, more than 80 per cent of the area and 70 per cent of the people are located in areas prone to natural disasters.

Data Source and Methodology

The present study has used primary data from the field through house hold surveys. In case of primary data collected from the four villages of two blocks of Kendrapara district, multi stage random sampling will be conducted to select the area of study. Primary data are collected from the 100 households based on the social class of two villages from two blocks (Pattamundai and Rajnagar) of Kendrapara district. Among these two blocks from Pattamundai NAC, one village Alva which is near to the government hospital is selected. As it is a developed village from a developed block, all the health care facilities are available near this village. From the Pattamundai block, Srirampur village as underdeveloped village selected, far away from the government hospital and remains bottleneck from all the health facilities. The second block Rajnagar which is considered as underdeveloped and flood affected area, where two villages are selected as a developed village, is Gopalpur and underdeveloped area is Kanhupur which is an isolated area. The basis of house hold selection in case of women who is in either is progeny stage or having child below five years old. The women who have two children, in particular the second child is considered in the collection of data process. In case of preventive and curative health care services, only one person is considered in case of the measurement of poor status of the patient. For households having more than one sufferers, the last one would be included in the collection of data process. Twenty-five households are selected from each village as the sampling units. A total of one hundred households are selected on the basis of households having children below five years of age, in order to show the utilization pattern, curative and preventive health services. The household health expenditure is measured on the basis of expenditure incurred due to the household members fallen sick over a period of last 365 days. The household health expenditure consists of both outpatient expenditure and inpatient expenditure. In the same way, the outpatient and inpatient health expenditure consists of both direct cost and indirect cost. The primary goal of our research is to determine the impacts of income and education on family health spending; we used three multiple linear regression model. Models are estimated in order to be empirically validated. Six variables are utilized in the regression analysis: household health spending, household income, education of the head of the home (dividing into four

categories: illiterate, elementary education, above primary education, and gradation). In this case, the dependent variable is per capita household health expenditure, which is computed by dividing the total yearly household health expenditure by household size. Similarly, household per capita income (PHI) is derived by dividing total yearly household income by the size of the family. Per head income and Education (literate, primary education, above primary education, secondary education and higher education), are taken as independent variables. Dummy variable is used for education in all the regression analysis. Linear regression models are used to determine outpatient expenditure, inpatient expenditure and total health expenditure in the study area, where per capita health expenditure is taken as dependent variable and per capita income, and education is taken as independent variable.

Description of the Study Area

The health expenditure of the different social classes of four villages of two blocks of Kendrapara district in the study area was examined. The characteristics of the respondents and household members were studied separately. Most of the respondents in all the four social class were male members (59 per cent), and their proportion increased with the increase in the social class position. Most of the respondents of the four social classes belonged to the middle age group (31-40) and were married (78 per cent). The educational status, occupational status and economic status of the respondents increased with the rise of social class position.

There were 826 household members in the 100 sample households. The middle and very low classes had a greater number of female members in their households. On the whole the sample population of the four social classes was found to be young, due to which, a majority of the household members in all the four social classes were not married. The higher the social class position, higher was the occupational prestige of the household member. The numbers of children increased with the fall of social class position. The number of workers increased with the fall in social class position. The number of government service holders and employed persons was very low in very low, low and middle-class people.

Table 1: Average Expenditure of the Household in the Study Area

Items	High class	Middle class	Low class	Very low class	Total
Food	56.47	75.62	73.22	52.26	65.87
Clothing	8.64	6.16	4.14	5.29	6.26
Health	17.18	8.04	9.91	26.84	14.07
Education	2.90	2.04	2.16	1.98	2.31
Rent and taxes	1.50	1.28	1.99)	2.89	1.77
Others	13.3	6.84	8.55	10.71	9.71
Average total expenditure	100	100	100	100	100
Average total income	282400	210782.6	125706.39	58400	677288.99

Notes: Expenditure in annual basis (rupees), higher class=higher than 300000/middle 15000<30000/low15000 <50000/very low, less than 50000. Data are given in percentage basis (other than average total income).
Source: Field survey, July 2020.

In the above Table 1, the average expenditure of the household on food, health, education status, clothing and other items is explained. Regarding the expenditure of the household on food, it is also important in determining the health status of the people as the nutritious food determines the health condition of the people from this survey, it is seen that in case of middle- and low-class, people were spending their major part of expenditure on the food items. The high-class people spend 75.3 per cent of their income where as in middle, low and very low-class people spend 74.4, 73.4 and 73.9 per cent respectively. Total expenditure as a whole spends 77.9 per cent on food. In case of health, clothing and other expenditures are low as compared to low and very low-class people. As a whole, the health status of these sections is in a bad position as compared to the developed village Alva where the situation is quite better than other villages.

So, from this section it becomes clear that households having better income, education and health care facilities and close to the health centre have better utilization of the health care facilities; maximum households have poor health status due to lack of income, illiteracy and lack of health care services.

Discussion of Result

The main analysis of the present study is to estimate the total health expenditure and the factors which are affecting total household health expenditure here the descriptive statistics shows that the mean PHI is 2556115.52 per annum with standard deviation 22424.317 and coefficient of variation 5.028, whereas mean PHHE, is 3901.34 per annum with 795.609 standard deviation and 632993.89 coefficient of variation respectively. The mean education of semi-educated is 0.08 with 0.273 and 0.074 as standard deviation and coefficient variation respectively. In case of primary education, it is 0.20, 0.402 (standard deviation) and 0.162 as coefficient of variation

Table 2: Descriptive Statistics of Total Health Expenditure

Descriptive statistics→ Variables ↓	Mean	Standard deviation	Coefficient of variation	Highest value	Lowest value	Range
Per head income	2556115.52	22424.317	5.028	107333	4000	103333
Per head health expenditure	3901.34	795.609	632993.89	3901.33	270.4	3630.93
Illiterate	0.08	0.273	0.074	1	0	1
Primary	0.20	0.402	0.162	1	0	1
Up to metric	0.44	0.499	0.249	1	0	1
Graduation	0.28	0.451	0.204	1	0	1
Social class	2.63	0.917	0.842	4	1	3

Source: Primary data (July 2020).

The mean education up to matric is 0.44 with 0.499 and 0.249 as standard deviation and coefficient variation. In case of graduation, it is 0.28, 0.451 (standard

deviation) and 0.204 as coefficient of variation. In case of socially class mean is 2.63 with standard deviation 0.917 coefficient of variation 0.842

To find out the impact of household income (PHI) and education of the head of the household (categorised as illiterate, primary, above primary and graduation) on household health expenditures (PHE) three multiple linear regression model is found to be fitted as in Table 3 for total health expenditure, Table 4 for impatient health expenditure and table 5 for outpatient health expenditure.

Econometrics Models

1: Multiple Linear Regression Model for Total Health Expenditure

Total health expenditure is measured by adding the value of inpatient health expenditure and outpatient health expenditure.

$$\gamma = \beta_1 + \beta_2 X_1 + \beta_3 X_2 + \beta_4 X_3 + \beta_5 X_4 + \beta_6 X_5 + u$$

Y is dependent variable, i.e., Per Capita Health Expenditure (PHE)
X_1, X_2, X_3, X_4 and X are independent variables
X_1 = per capita Income, X_2 = primary education of the head of the household, X3 = above primary, X_4 = graduation, X_5 =social class
β_1, β_2, β_3, β_4, β_5 β_6 are parameters and μ is an error term
β_1 is constant or intercepts. β_2 is slope parameter of Income, β_3 is slope parameter of Primary education, β_4 is slope parameter secondary education, β_5 is slope parameter of graduation β_6 is the social class of the family.

Table 3: Estimated Regression Results of Total Health Expenditure

Variables	Coefficients	T-Statistics	Prob.	95 % Confidence Interval For B	
C	-1097.33	-2.809	0.006 ***	-1873.030	-321.621
PI	0.034	7.82	0.000 ***	0.025	0.042
PR	343.954	1.348	0.181	-162.708	850.616
SR	135.618	0.857	0.394	-178.699	449.936
HR	349.662	2.399	0.018 ***	60.213	639.111
SC	535.57	4.936	0.000 ***	320.122	751.018

Notes: R (Correlation): 0.698
R-square: 0.487
Durbin-Watson: 1.896
F-stat: 17.869

*** (one per cent level of Significance)
** (five per cent level of Significance)
* (10 per cent level of Significance)

Table 3 represents the estimated results of the total health expenditure model. The total health expenditure (PHE) linear regression model is fitted as

PHE=-1097.33+0.034PI+343.954PR+135.618SR+349.662HR+535.57SC

The regression results show that per capita income and education, specifically higher education, is significantly affecting the health expenditure pattern of the households. The income coefficient is 0.034, which indicates that a per cent increase in income brings 0.034 per cent increase in health expenditure, but in case of higher education it is significant at one per cent level, which brings 349.662 increase in household health expenditure. From the R^2 =0.487 value, it is known that the variation in the dependent variable explained by independent variables is 48 per cent. D-W statistics is also significant, as it is close to two, which means there is no error correlation. The F-stat value, i.e., 17.869 which is different from zero, clearly states that all the variables are significantly affecting the health expenditure model.

Table 4: Estimated Regression Results of Inpatient Health Expenditure

Variables	Coefficients	T-Statistics	Prob.	95 per cent Confidence Interval For B	
C	-1040.770	-3.748	0.000 ***	-1592.15	-489.387
PI	0.025	8.083	0.000 ***	0.019	0.031
PR	125.260	1.099	0.275	-101.114	351.634
SR	95.184	0.786	0.434	-145.208	335.577
HR	578.919	3.655	0.000 ***	264.397	893.441
SC	447.862	5.813	0.000 ***	294.876	600.848

R (Correlation): 0.669
R-square: 0.447
Durbin-Watson: 1.885
F-stat: 15.194

*** (one per cent level of Significance)
** (five per cent level of Significance)
* (10 per cent level of Significance)

Table 4 represents the estimated results of the Inpatient health expenditure model. The inpatient health expenditure (PHE) linear regression model is fitted as

PHE=-1040.77+0.025PI+125.26PR+95.184SR+578.919HR+447.862SC

Like the total health expenditure model, the inpatient regression results show that per capita income, social class and higher education are also significantly affecting the health expenditure pattern of the households. The income coefficient is 0.025, (significant at one per cent) which indicates that a one per cent increase in income brings 0.025 per cent increase in health expenditure, but in case of social class, it is significant at 1 per cent level which brings 447.862 increase in household health expenditure, with 1 per cent increase in social class. From the R^2 =0.447 value, it is known that the variation in the dependent variable explained by independent variables is 44 per cent. D-W statistics is also significant, as it is close to 2, which means there is no error correlation. The F-stat value, i.e., 15.194 which is different from zero, clearly states that all the variables are significantly affecting the Inpatient health expenditure model.

Table 5: Estimated Regression Results of Outpatient Health Expenditure

Variables	Coefficients	T-Statistics	Prob.	95 per cent Confidence Interval For B	
C	-366.526	-3.067	0.003 **	-603.771	-129.280
PI	0.012	8.862	0.000 ***	0.009	0.014
PR	51.144	0.673	0.503	-99.770	202.059
SR	29.403	0.621	0.536	-64.681	123.488
HR	99.644	2.285	0.025 **	13.066	186.223
SC	173.75	5.249	0.000 ***	108.022	239.478

Notes: R (Correlation): 0.745
R-square: 0.555
Durbin-Watson: 1.866
F-stat: 23.491

*** (one per cent level of Significance)
** (five per cent level of Significance)
* (ten per cent level of Significance)

Table 5 represents the estimated results of the Outpatient health expenditure model. The total Outpatient health expenditure (PHE) linear regression model is fitted as.

PHE=-366.526+0.012PI+51.144PR+29.403SR+99.644HR+173.75SC

Like total health expenditure and Inpatient health expenditure Models, the regression results of Outpatient health expenditure shows that per capita income and social class are significantly affecting the health expenditure pattern of the households. The income coefficient is 0.012, (significant at one per cent level) which indicates that a one per cent increase in income brings 0.012 per cent increase in health expenditure, but in case of social class, it is significant at one per cent level, which brings (173.75) increase in household health expenditure with one per cent increase in social class. Here higher education is seen to be significantly affecting the health expenditure of the household at five per cent level of significance. From the R^2 =0.555 value, it is known that the variation in the dependent variable, explained by independent variables, is 55 per cent. D-W statistics is also significant, as it is close to 2 which means there is no error correlation. The F-stat value, i.e., 23.491 which is different from zero, clearly states that all the variables are significantly affecting the health expenditure model.

Conclusion

From the above stated discussion and econometrics results, it is clearly observed that income and social class are the most significant factors in affecting the health expenditure pattern of the households. In case of Total health expenditure model, Inpatient health expenditure and Outpatient health expenditure Models, Per capita Income variable emerged as the most positive significant factor, where as social class is the most significant negative factor in the health expenditure pattern of the households. From the discussion it is seen that in case of total health expenditure,

income and social class variables affect more as compared to Inpatient and Outpatient expenditure models.

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